Part B
Action Programs for Key Infrastructure Sectors

Chapter 5: Lands and Water Resource Management

Chapter 6: Development of Agriculture in South Sudan

Chapter 7: Transport Services and Infrastructure

Chapter 8: Provision of Electric Power

Chapter 9: Water Supply and Sanitation

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5.1 The Setting

It is clear that sustained development in South Sudan, including reduction in poverty and improved food security, depends on secure access to the substantial land and water resources of the country. Moreover, successful implementation of an ambitious infrastructure program along the lines outlined in this Report to support this growth depends on sustained progress in dealing with these basic issues related to land and water rights and access. Continued conflict over and or uncertainty about these rights will result in delays in infrastructure investment decisions and implementation and lower overall economic growth.

At the time that the CPA was signed, the Government of National Unity (GNU) and the Government of Southern Sudan (GOSS) recognized the need for development of land policy, and related legislation, institutions, and supporting services. In the subsequent period, rights of access to agricultural land for cultivation of crops and livestock production, water for irrigation, forest products, and petroleum reserves for export revenues have been contested at national, regional and local levels. Conflicts among competing groups for access to and control over land and water are common in South Sudan. The decades of war, prevalence of weapons, and numbers of people with combat experience have increased the likelihood of disputes turning violent. Establishment of an effective, integrated, socially legitimate system for resolution of disputes over land, water and other natural resources is critical to South Sudan's future. While progress has been made in addressing these problems, the reality is that issues of access to land and natural resources and security for the population continue to demand urgent and sustained attention.

5.2 Climate and Ecological Zones

Altitudes in South Sudan range from 600 to 3,000 meters above sea level. Most of the geographical parts of the country have a sub-humid climate. Rainfall is favorable, with Western Equatoria and the highland parts of Eastern Equatoria receiving 1,200 to 2,200 mm of rainfall annually. The lowland areas of Eastern Equatoria, Jonglei, Upper Nile and Bahar el Ghazal receive between 700 and 1,300 mm of rainfall annually. The south-eastern tip of Eastern Equatoria receives the least rainfall, about 200 mm annually. Map 5.1 indicates the rainfall patterns for Sudan and South Sudan.

For Sudan as a whole, Harrison and Jackson (1958) described five major ecological zones based on floristic composition, rainfall and soil types. The ecological classification now most commonly used is a modified version of the classification by Harrison and Jackson. It delineates six major divisions and a number of subdivisions. South Sudan is classified as savannah woodland (high and low rainfall), flood region, montane zone, and semi-desert. The savannah woodland is subdivided into low rainfall savannah and high rainfall savannah. Low rainfall savannah occurs mainly in the north and is only represented in the south by a small area in the northern parts of Upper Nile State. High rainfall savannah covers most of the country with the exception of the floodplain around the Nile and the montane region of Didinga and Imatong Mountains. High rainfall savannah woodland is further divided into two sub-zones – savannah woodland and savannah woodland recently derived from rainforest.
5.3 Land Resources of South Sudan

South Sudan is in the midst of a transition from decades of civil war to a peaceful country. Land tenure and property rights issues could undermine that transition by hampering a productive agricultural sector and long-term economic growth. In 2010, USAID reported that rural people contest the right of the GOSS to hold and manage land in trust on their behalf, claiming that land “belongs to the people.” Ongoing conflicts, many violent, erupt among pastoralists and between pastoralists and farmers. Customary claims to land in peri-urban areas are routinely ignored, fueling conflict. Laws and state institutions for land administration and conflict mediation are weak, and there is confusion over which laws take precedent – statutory or customary?

5.3.1 Land Tenure and Ownership

Customary law has governed the use of land in the country for centuries, with each ethnic group applying its own laws relating to land and land rights within its own geographical setting. With the imposition of foreign rule over Sudan more than a century ago, various attempts were made to change this regime. The first serious attempt to control customary land was by the Anglo-Egyptian regime through the Land Ordinance of 1906. This made all land in Sudan the property of the government. In practice, however, land in South Sudan remained under the control of communities through the practices of customary laws and principles. In the post-independence period, the Unregistered Land Act of 1970 provided that any land not registered in accordance with the 1925 Land Settlement and Registration Ordinance was considered to belong to the Government of Sudan. Although the law was opposed and challenged by most communities in Southern Sudan, the government used it for the diversion of water through the construction of the Jonglei Canal and oil prospecting projects. This unilateral decision to exploit the natural resources of the South, with scant attention to human security, land rights and livelihoods, contributed to the outbreak of conflict in 1983. On the whole, land laws enacted by governments in Khartoum throughout the colonial and post-colonial periods have not seriously affected the customary land tenure system in South Sudan. During peace negotiations in Machakos and Naivasha, land was the main point of contention between the Government of Sudan and the SPLM. The result was the insertion of the concept of “Land belongs to the people” in the CPA and inclusion in the Interim Constitution of Sudan and Interim Constitution of Southern Sudan.

The CPA provided for the creation of the Southern Sudan Land Commission (SSLC), which came into existence in 2006. Its first major responsibility was the drafting of a new land law for Southern Sudan. The Land Act was promulgated in 2009; its main features are as follows:

- All land is owned by the people of South Sudan, and the Government of South Sudan is responsible for regulating use of the land.
- The Act provides for registration of land in South Sudan; all land, whether held individually or collectively, shall be registered and title granted.
- Public land is land owned collectively by the people of South Sudan and held in trust by the Government of South Sudan. Public land includes land used by government offices, roads, rivers and lakes for which no customary ownership is established, and land acquired for public use or investment.
- Community land is land held, managed, or used by communities based on ethnicity, residence, or interest. Community land can include land registered in the name of a community, land transferred to a specific community, and land held, managed, or used by a community.
- Private land includes registered freehold land, leasehold land, and any other land declared by law as private land. Freehold land can be held in perpetuity and includes the right to transfer and dispose of the land. Leaseholds can be obtained for customary and freehold land. Leases can be granted for periods of 99 years or less. Leases of more than 105 hectares of customary land must be approved by two local government bodies.
- The Land Act outlines a decentralized plan for land administration with County Land Authorities and Payam Land Councils.
- Foreigners cannot own land in South Sudan, but can lease land for periods up to 99 years. For agricultural investments, leases are up to 30 years and are renewable; for forestry purposes, land can be leased for up to 60 years and are renewable. Prior to the grant of a lease, a consultation with affected communities is required as is an environmental impact assessment.

### Map 5.1: Average Annual Rainfall in South Sudan and Sudan

Temperatures are typically above 25°C and can rise above 35°C, particularly during the dry season, which lasts from January to April. For pastoralists, the hot, dry conditions trigger seasonal human and livestock migration to more permanent water sources, which serve as dry season grazing pasture. It also reflects on the escalation of conflicts among the pastoralists in search for water. For some ethnic groups, such as the Dinka, they also serve as fishing grounds. At the onset of the main rains (April to June), people and cattle return to upland wet areas. Seasonal movements are less pronounced in the more agricultural areas such as the Hills and Mountains Zone and are almost non-existent in the exclusively agricultural Greenbelt Zone. These two zones have two rainy seasons, April to July and August to December. However, there is evidence that points to a decline in rainfall as a result of climate change. 28

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5.3.2 Institutional Responsibilities for Land Resources

The SSLC is responsible for establishing land policy within South Sudan, enforcing land law, resolving land disputes, assessing compensation for land acquisitions, and recording land-use practices in areas where natural resource development occurs, and conducting hearings and formulating rules of procedure. A land registry has been established in the Ministry of Housing and Physical Planning with coordinated registries maintained at the state level. Other institutions developing new land administration systems and laws include the Ministry of Legal Affairs and Constitutional Development and the Land Policy Steering Committee, which includes representatives from 13 ministries, commissions and boards. The Ministry of Agriculture and Forestry (MAF), which was formed in October 2005, is responsible for policy guidance, planning, assessment, resource allocation, regulation, and oversight of agricultural and forest land. At the state level, the Ministries of Agriculture and Animal Resources, and Irrigation (MAARI) are instituted with a wide sectoral mandate and with the counties holding responsibility for implementation. These newly formed institutions have been slow to develop. In many cases, the new institutions lack clear mandates, regulatory frameworks, necessary levels of funding, and the human capacity to operate effectively.

The SSLC is now working on implementation of the Land Act, as the Government of South Sudan aims to develop, distribute and implement a land policy and related legislation and regulations by 2013. One of the major challenges is to develop policies that would resolve differences among various interests in land at both the horizontal and vertical levels of governments and communities in South Sudan. This involves development of a land policy and the central and local institutions necessary to govern and administer land rights.

Consultations were undertaken during 2010 in all 10 states of Southern Sudan. A draft land policy was then prepared and has been available since February 2011. Key elements of the draft land policy are as follows:

- Resettlement of returning refugees and IDPs.
- Measures required strengthening the rights of women to land and property.
- Opportunities for potential commercial investment in land, including development of oil and other natural resources.

- The need to set aside land for the development of infrastructure, public projects, and urban areas.
- The need to address conflicts over competing claims to land and other natural resources.

Once these land policy issues are finalized and adopted, the Government expects to revise the Land Act to ensure consistency with the land policy.

5.3.3 Land Use in South Sudan

The total area of the country is reported by the National Bureau of Statistics (NBS) to be 644,330 km². The waters of the White Nile and its tributaries flow down from the highlands of Uganda, DRC, the Central African Republic and Ethiopia into the low clay basin that constitutes much of South Sudan, forming the world’s largest contiguous swamp. The FAO is currently updating estimates of land use in the country. This assessment gives a picture of land use patterns in the latter part of the previous decade. The results of the assessment are summarized in Table 5.1. Key findings in this update of land use are as follows:

- Only 4.3% of the land area is cultivated for production of food and agricultural raw materials. Much of this area is cultivated periodically rather than continuously.
- Many of the large number of subsistence farmers of the country practice some form of shifting cultivation in the absence of use of fertilizers, pesticides and herbicides. According to the World Bank, the actual area cultivated in any one year in South Sudan has ranged from a minimum of 1% to a maximum of 2% of the total land area – that is, from 0.65 million to 1.3 million hectares.
- Forest areas cover about one-third of the country with Western Bahel el Ghazal and Western Equatoria accounting for about 56% of the forest cover. Areas covered with shrubs account for about 39% of the land area, with Jonglei, Eastern Equatoria and Upper Nile accounting for about 58% of this form of land cover.
- Grasslands account for about 23% of the land cover, with Upper Nile, Jonglei, Eastern Equatoria and Unity states accounting for about two-thirds of the grasslands in the country.
- The survey finds that urban/industrial areas account for only 34,188 hectares (or 0.4% km²). With an urban population of 1.2 million people in 2008 (Annex Table 1.1), this suggests an average urban population density of 3,770 person per km² – a density that is only found in the megacities of Sub-Saharan Africa. A portion of the low density urban areas may have been included under grassland and or land covered with shrubs.

| Table 5.1: Land Use in South Sudan, circa 2007-2008 (Distribution in % by type of land cover or use) | State | Agriculture | Trees | Shrub | Grasslands | Urban & industrial | Bare rock & soil | Water bodies | Total |
|---|---|---|---|---|---|---|---|---|
| Upper Nile | 17.6 | 4.8 | 12.2 | 22.4 | 23.0 | 8.3 | 7.4 | 12.3 |
| Jonglei | 11.5 | 7.6 | 30.4 | 21.2 | 2.8 | 0.5 | 21.9 | 19.9 |
| Unity | 11.5 | 0.9 | 7.7 | 10.2 | 18.7 | 1.5 | 7.4 | 6.0 |
| Warrap | 15.7 | 3.0 | 5.6 | 6.4 | 4.1 | 0.7 | 1.7 | 5.3 |
| Northern Bahr el Ghazal | 8.8 | 7.6 | 2.0 | 3.9 | 3.5 | 1.1 | 19.8 | 4.7 |
| Western Bahr el Ghazal | 4.8 | 34.7 | 4.5 | 4.3 | 10.3 | 18.8 | 24.0 | 14.5 |
| Lakes | 6.7 | 7.5 | 6.8 | 6.3 | 5.2 | 11.5 | 4.3 | 6.9 |
| Western Equatoria | 12.4 | 21.1 | 8.3 | 7.0 | 5.1 | 49.5 | 3.8 | 12.4 |
| Central Equatoria | 13.8 | 7.6 | 7.2 | 4.2 | 24.6 | 6.4 | 2.6 | 6.9 |
| Eastern Equatoria | 4.1 | 7.1 | 7.4 | 11.0 | 2.8 | 7.6 | 14.0 | 11.1 |
| South Sudan | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

5.3.4 Land Classification by Livelihoods in South Sudan

Livelihood patterns are determined by the agro-ecological conditions as well as the culture and traditions of the various tribes. The Livelihood Profile prepared by SASSCU in 2006 states that Southern Sudan’s traditional livelihood systems are a combination of cattle rearing, crop production, fishing, wild food collection, hunting and trade. For most households in South Sudan, cattle-keeping is the fundamental basis for wealth and social status. Crop production plays an important complementary role, but is generally perceived as a less important activity more for cultural than agro-ecological reasons, especially among the Nilotic tribes (Dinka and Nuer). Access to food is highly seasonal and location-specific and in some parts of the country a majority of households move around to exploit seasonal patterns of rainfall. Mobility is crucial and food insecurity often arises where inter-tribal clashes and other conflicts constrain this mobility. The Livelihoods Profile (2006) defines seven distinct livelihood zones in Southern Sudan (see Map 5.2).

- Grasslands in the savannah zone of Southern Sudan: An Infrastructure Action Plan
- Greenbelt Zone. This zone includes Western Equatoria and parts of Central and Eastern Equatoria. It benefits from a bi-modal rainfall pattern which enables two planting seasons. The main livelihood is subsistence agriculture with the potential for surplus production. The main crops cultivated are root crops (cassava, sweet potatoes), maize, millet, groundnuts and finger millet. Poor infrastructure and related lack of access to markets are a major disincentive for farming households to increase their outputs. Despite the fact that there has been a reduction in new displaced people on the back of the Lord Resistance Army continue to interrupt agricultural production in parts of Western Equatoria, in particular in Ezo, Tambura and Nagero counties and selected payams in Nzara and Yambio counties.
- Hills and Mountains Zone. This zone covers parts of Jonglei, Central and Eastern Equatoria. It is characterized by reliance on agriculture and pastoralism. Reliance on seasonal labor and selling of charcoal, firewood, bamboo, poles and grass are common coping strategies in times of distress; for example, this was one of the areas worst affected by the 2009 drought. Most vulnerable

35. According to World Bank data, the megacities of Sub-Saharan countries have about 1,400 persons per sq. km., about 1,200 per sq. km in secondary urban areas, and about 90 persons per sq. km in rural areas. See Foster and Barca-Baera (2010).
36. This discussion in this Section draws heavily on the reports of USAID (2007) and FAO/WFP (2009).
were communities in the lowlands who engage in the production of short- and long-term sorghum, while communities in the mountains who cultivate cereals, pulses and vegetables were less affected because of more favorable rain conditions at these higher altitudes. The high reliance in 2009 on the production of firewood and charcoal contributed to a further decline in woodland and forest resources around towns and in more populated areas, forcing households (mainly women) to walk longer distances to fetch firewood.

Pastoral Zone. This zone lies in the arid south-east corner of South Sudan and encompasses parts of Eastern Equatoria and Jonglei. A nearly pure form of pastoralism is common and there is almost exclusive reliance and livestock trade for food. In this zone, seasonal migration in search of water and pasture for livestock is the predominant livelihood activity. (See Map 5.3 below for the annual pastoral migration routes in South Sudan and Sudan.) The 2009 drought limited pastoralists’ access to pasture and water resources, forcing them to migrate long distances. There are also reports of increased artisanal gold mining in some areas in 2010 in response to the poor livestock and harvest conditions the previous year.

Ironstone Plateau Zone. This zone covers parts of Lakes, Warrap, Northern and Western el Ghazal, Western and Central Equatoria. Households in this zone are heavily dependent on crop production, mainly sorghum, groundnuts, sesame and tobacco. In some areas, honey production is also an important supplementary activity. Households in this zone are usually well-placed to access food surpluses in the neighboring Greenbelt Zone. However, despite generally improving conditions for agricultural production in the past year, Western Bahr El Ghazal is affected by poor road conditions linking Wau and Juba due to several broken bridges, which has limited trading activities with the southern states.

MAP 5.2: Agro-Ecological Zones in South Sudan

Nile and Sobat Rivers Zone. The Western and Eastern Plains are separated by the Nile and Sobat River Zone. Apart from crops and livestock, wild foods and fish contribute significantly to household consumption in this zone. The latter items are collected in varying quantities depending on the season and household location.

Western and Eastern Flood Plain Zones. These two zones cover Upper Nile and parts of Unity, Jonglei, Warrap, Northern Bahr El Ghazal and Lakes. The primary livelihood activity is agro-pastoralism supplemented by fishing, wild food gathering and to some extent hunting in the Eastern Flood Plains. Livelihoods are highly dependent on changing water levels. Seasonal flooding increases the yield of pasture for livestock, fish and wild foods, but can affect agricultural production and cause displacements. Other economic activities in this region include the oil fields in Unity State and mechanized farms around Renk in Upper Nile, but benefits for the local population are generally limited to improvements of the local road infrastructure for which the 2% direct share of oil revenues is mainly used. In 2010, above normal rainfall and higher water
levels in rivers flowing from Ethiopia caused localized flooding in parts of Upper Nile, Unity, Jonglei and Northern Bahr El Ghazal resulting in destruction of crops and displacements of affected households. The situation was exacerbated by the often inadequate drainage in the newly constructed roads. Insecurity caused by inter-tribal/clin clashes prevented flood-affected households from accessing remote cropping areas on higher lands which remained flood free.

Given the current configuration of transportation infrastructure, Unity State, and to a slightly lesser degree, Upper Nile and the Northern parts of Jonglei, are almost exclusively dependent on Sudan for their market supply. Also Northern and Western Bahr el Ghazal depend largely on trade of cereals from the North.

### 5.4 Water Resources of South Sudan

According to the National Environmental Action Plan (NEAP), South Sudan has substantial water resources, but they are unevenly distributed across the region and vary considerably from year to year (Mohamed, 2007). The hydrologic variability, coupled with no investment in storage structures, has made South Sudan hostage to periodic floods and droughts. However, details about the water availability within the country.

5.4.1 Wetlands and Water Resources

The Nile is the world’s longest river of some 6,800 km. The Nile Basin is estimated to be about 3.1 million km² and includes the following 11 riparian countries: Rwanda, Burundi, Democratic Republic of the Congo (DRC), Tanzania, Kenya, Uganda, Ethiopia, Eritrea, South Sudan, Sudan and Egypt. South Sudan is located entirely within the Basin, and accounts for approximately 20% of the total area of the Basin. While the Nile and its tributaries are vital sources of water throughout the country, dependence of these countries on the water resources of the Basin varies considerably. Egypt and Sudan are heavily dependent on the Nile system, whereas the Nile is a very minor part of the water resources of the DRC, which depends much more heavily on the drainage basin of the Congo River. Map 5.4 provides information on the main rivers of South Sudan.

South Sudan’s major water resources are the White Nile, its tributaries, and aquifers. An estimated 28 billion cubic meters, representing 30% of the flow of Nile water, passes through South Sudan to Sudan and on to Egypt. The country has three major river basins of Bahr el Ghazal, Bahr el Jebel and the river Sobat (and 23 sub-basins). The river Sobat, which is formed by the confluence of the Baro and Pibor rivers, discharges about 14 billion m³ per annum into the White Nile. The Bahr el Jebel basin discharges about 30 billion m³ per annum, but only 14 billion m³ per annum passes into Lake No. The Bahr el Ghazal basin, which discharges about 12 billion m³ per annum looses 11.4 billion m³ per annum of its flow to the Sudd wetland leaving only 0.6 billion m³ to flow into Lake No. Hence the average discharge of the White Nile at Malakal is 28 billion m³ per annum. About 50% of the flow into the White Nile is lost in the wetlands of South Sudan, due primarily to evaporation and transpiration.

A large part of South Sudan is covered by wetlands as well. The most important of which is the Sudd. The Sudd is an inland delta of the White Nile and is made up of lakes, swamps, marshes, and extensive flood plains. It is also one of the largest wetlands in the world, averages in size at about 30,000 square kilometers and covers about 5% of the area of South Sudan. The Sudd has been declared a Ramsar site, which confers global recognition and importance to this wetland. There are many other wetland systems throughout South Sudan, some of which are quite extensive. However, wetlands in South Sudan are only protected if they are part of national parks, game reserves or forest reserves. As a result, many of the wetlands in South Sudan are at risk from exploitation. Estimates show that wetlands comprise 7% of the total area of South Sudan. The location of the main surface water resources of South Sudan are shown in Map 5.5.

The bulk of South Sudan’s groundwater resources are found in the Um Ruwaba Formation and basement complex which is characterized by unconsolidated clays and gravels with low to high permeability. The basement complex prevails in parts of Western Equatoria, Eastern Equatoria, Central Equatoria as well as in Western Bahr el-Ghazal states and is characterized by poor water bearing formation. However, fractures and weathered zones provide water of good quality and quantity. The Um Ruwaba formation is recharged by seasonal rainfall and river flooding. In South Sudan, ground water is the principal source of drinking water, but very little work has been undertaken to determine the distribution and extraction levels of these resources. Hence, the full extent of the aquifers and related characteristics is unknown at this time. There are compelling reasons to undertake ground water analytical studies as soon as possible.

37 For a more discussion of these risks, see USAID (2007).
Map 5.6 provides an overview of the hydrogeological zones of South Sudan. Salinity levels exceeding allowable limits have been observed in Jonglei and Unity states making ground water unsafe in some areas of these states. While higher concentrations of fluoride, sulphate and nitrates have been observed in a few states, overgrazing and deforestation has also affected water resources quality increasing turbidity and siltation in water structures. Other issues include the need to monitor ground water quality around oil exploration sites in Unity State and undertake assessments of the impact of the effluent from the waste stabilization and oxidation ponds around Juba. The MWRI has developed a national water quality guideline, but the major concern will continue to be undertaking periodic monitoring and enforcement of regulations related to water use.

In August 2011, the Government announced establishment of the Ministry of Electricity and Dams. At the time of drafting this Report, details on the ministry’s duties, functions and inter linkages with the MWRI had not yet been clarified. In particular, institutional responsibilities on management of multipurpose dams and accompanied regulatory arrangements need to be worked out to minimize gaps and avoid duplication of efforts. While the scope of water resources touches most sectors and ministries, the Ministry of Electricity and Dams, Ministry of Agriculture and Forestry, Ministry of Animal Resources and Fishery as well as the Ministry of Local Government and Irrigation (MWRI) has overall leadership in the water sector. In the water resources sub-sector, the Ministry has responsibility for the following: (i) drafting and overseeing the implementation of policies, guidelines, master plans and regulations for water resources development, conservation, and management in South Sudan; (ii) encouraging scientific research into the development of water resources in South Sudan; (iii) overseeing the design, construction, and management of dams and other surface storage infrastructure for irrigation, human and animal consumption and hydroelectricity generation; (iv) setting tariffs for water use; (v) creating policy on rural and urban water resource development and management; (vi) initiating irrigation development and management schemes; (vii) protecting the Sudd and other wetlands from pollution; and (viii) advising and supporting the states and local governments in building their capacity to assume all functions vested by the Constitution and government policy. The three key directorates responsible for the sub-sector are Water Resources Management, Irrigation and Drainage, and the Hydrology and Survey.

Policy framework. The MWRI has adopted a water policy in 2007 and a strategic framework in 2011. The overall goal of the water policy is to promote effective management of the quantity, quality and reliability of available water resources in order to maximize social and economic benefits while ensuring long-term environmental sustainability. Key guiding principles for water resources management are as follows: (i) water is a shared resource and appropriate legal frameworks shall be established to govern all aspects of water use; and (ii) water resources planning shall involve all relevant stakeholders and will be undertaken on the basis of natural hydrologic boundaries. The policy discusses aspects of water use in fisheries, navigation, livestock, forestry, industries, environment, wildlife and tourism development. However, it postpones the development of policies on irrigated agriculture to a future date, awaiting progress in the development and usage of water for irrigation uses and purposes. (Section 5.6.3 provides rough estimates of current and projected demand for water.)

The water sector strategic framework of 2011 discusses, among other things, South Sudan’s challenges pertaining to water resources management, the complexities that arise from the transboundary nature of its water resources and the priority assigned to integrated water resources management. Undertaking the roles played by several institutions and appreciating the need to integrate the decision-making process, the strategic framework recommends establishment of a Water Council to act as the principal multi-stakeholder advisory body for the water sector. The Council would also provide relevant support services to the Presidency and the Cabinet on approval of new and amended legislation and policies pertaining to all water related issues. In addition, the strategic framework recommends establishment of a Water Resources Management Authority to enforce regulatory functions on the management and use of water resources.

5.4.2 Institutional Responsibilities for Water Resources

Institutional framework. The Ministry of Water Resources and Irrigation (MWRI) has overall leadership in the water sector. In the water resources sub-sector, the Ministry has responsibility for the following: (i) drafting and overseeing the implementation of policies, guidelines, master plans and regulations for water resources development, conservation, and management in South Sudan; (ii) encouraging scientific research into the development of water resources in South Sudan; (iii) overseeing the design, construction, and management of dams and other surface storage infrastructure for irrigation, human and animal consumption and hydroelectricity generation; (iv) setting tariffs for water use; (v) creating policy on rural and urban water resource development and management; (vi) initiating irrigation development and management schemes; (vii) protecting the Sudd and other wetlands from pollution; and (viii) advising and supporting the states and local governments in building their capacity to assume all functions vested by the Constitution and government policy. The three key directorates responsible for the sub-sector are Water Resources Management, Irrigation and Drainage, and the Hydrology and Survey.

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At the state level, there are water resources management departments coordinated under the water and sanitation directorates. While these directorates are administratively accountable to their respective state ministries, they are technically accountable to the MWRI. The directorates lack clear mandates, regulatory frameworks, necessary levels of funding, and the human capacity much needed to operate effectively. Limited skilled manpower, coupled with lack of capacity, has made some of these directorates dysfunctional. A majority of the states don’t have designated staffs to coordinate water resources management programs. The experience of other sub-Saharan countries has been that development and adoption of a Water Act has helped to streamline institutional responsibilities and address overlaps and gaps in institutional responsibilities. So far, South Sudan has not developed a Water Act and as matter of high priority it needs to develop and adopt it. The proposed program of support outlined in this Report includes provision for such assistance.

5.5 Major Challenges in Land and Water Resource Management

5.5.1 Land Tenure Arrangements

As noted earlier in this Chapter, most rural residents in the country rely on customary land tenure systems, but these are under pressure from violence, insecurity, refugees and IDP resettlement. According to the IS Academie (2011), implementation of the Land Act of 2009 is slow.50 In the meantime, large-scale land acquisitions are ongoing, but lack transparency, and may lead to more conflict over water and land. There is a detailed agenda of concerns about the status of land tenure arrangements for the country. These are clearly articulated in a series of reports prepared under the auspices of the USAID-funded Sudan Property Rights Program.51 The list of concerns includes the following:

- Relations between traditional authorities on the one hand, and national and state governments on the other, regarding land.
- Management of land in urban areas.
- Arrangements for resettlement of returnees and IDPs.
- Restitution of land and property to rightful owners.
- Management of land in urban areas.

Resolution of these issues is central to the on-going efforts of the National Government to ensure that South Sudan is able to use its natural wealth and agricultural potential to promote an extended period of sustained strong economic growth that is broad-based and creates income and employment opportunities for a majority of the population. Continued substantial support from the international donor community will be required to build capacities at the national, state and local levels for effective administration and management of land-related issues. However, the outline of a detailed strategy for provision of such support over the medium-term is beyond the scope of this Report.

5.5.2 Riparian Rights and Use of Water in the Nile Basin

One of the most important challenges for the country is to strengthen capacities for effective management of its water resources. Authority over water resources needs to be clarified at national and local levels and governance of water resources needs to be coordinated among public and private entities and communities.

The Nile River represents the country’s biggest water management challenge, as well as its biggest opportunity. As noted earlier, the country is both an upstream country vis-à-vis Sudan and Egypt and a downstream country with respect to the rest of the riparian countries. The country is at the heart of the complexities associated with the Nile Basin Initiative (NBI), and the related transboundary water management of the River presents an extraordinary challenge. South Sudan’s independence adds to these issues by raising questions about the use and allocation of the Nile waters between Sudan and South Sudan.

The proposed program for development of commercial agriculture outlined in Chapter 6 includes a substantial increase in the use of irrigation to expand crop production. The longer-term development of the electric power sector is also built around the utilization of the Nile’s hydropower potential. But these interventions will raise questions among other riparian states about ownership and origin of the water. The reasons for this are clear when it comes to how the water rights will be allocated now that South Sudan is an independent country. There is a compelling case for joint management of these water resources to avoid political tensions over shared resources and sub-optimal use of the resources.

The history of hydro-politics in the Nile is complex and has significant ramifications for South Sudan and for development throughout the northeastern region of Africa. South Sudan is a state within states, within the Nile Basin have put agreements and treaties in place to avoid conflict over access to these water resources.52 At the present time, Egypt and Sudan have primary control over the Nile waters.

The current arrangements stem primarily from the following treaties: (i) the 1929 Agreement between Egypt and Anglo-Egyptian Sudan, which gave Egypt complete control over the Nile during the dry season when water was most needed for agricultural production, put substantial limits on the amount of water allocated to Sudan, and provided no water rights to any of the other riparian states; and (ii) the 1959 Nile Agreement between Sudan and Egypt for full control and utilization of the Nile waters. This agreement allowed the entire average annual flow of the Nile (estimated to be about 84 billion cubic meters measured at the Aswan High Dam) to be shared between Egypt and Sudan at 55.5 and 18.5 billion m³ respectively. Included in the agreement was an assumption that the remaining 10 billion m³ is accounted for by losses due to evaporation and related factors. The Agreement granted Egypt the right to construct the Aswan High Dam which can store the entire annual Nile River flow of a year) and granted Sudan the right to construct the Rosaries Dam on the Blue Nile and to develop irrigation and hydroelectric power generation until it fully utilizes its Nile share.

The contemporary challenge facing the Nile Basin countries is how to establish a legal framework for the utilization of its waters that is acceptable to all the riparian states. The basic issue has been that seven of these countries contribute to the waters of the Nile (Burundi, DRC, Ethiopia, Kenya, Rwanda, Tanzania, and Uganda), but have no formal rights to the use of these waters. Several studies have shown that, the tributaries of Ethiopia supply an estimated 86% of the waters of the Nile.53 In the case of Egypt, FAO data indicates that for 2009 about 97% of the actual renewable water available to Egypt comes from external sources (i.e., the Nile River). The current situation for South Sudan and Sudan is not clear as the FAO water resource data refer to pre-independence Sudan.54

There have been efforts deployed by some countries to bring about cooperation over the Nile waters. Negotiations for creation of a Cooperative Framework Agreement (CFA) started in 1997, but have not yet been concluded. The CFA seeks to establish a permanent Nile River Basin Commission through which member countries would act together to manage and develop the resources of the river. In February 1999, the Nile Basin Initiative (NBI), which is a partnership among the Nile Riparian states, was formally launched by the then nine countries that shared the resources of the River. The NBI is led by the Council of Ministers from the member states in charge of Water Affairs (Nile-COM) with the support of a Technical Advisory Committee (Nile-TAC). It has been set to promote sustainable economic development and stability across the basin. The NBI “seeks to develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace and security.” With support from the World Bank, African Development Bank and other donors, the NBI has launched a substantial program aimed at building capacities among member states and making investments in water resource development and management. The NBI provides an historic opportunity to manage the Nile for the good of the peoples of the basin and to use it as a vehicle for change for the better. Within the framework of the NBI, the Nile riparian states are exploring major cooperative investments in: power generation, transmission and interconnection, irrigated agriculture, navigation, fisheries, and related investments in land management, watershed protection and environmental conservation. These projects are a first phase of a long-term investment program that will support economic development and integration in the sub-region.

While South Sudan was not a major beneficiary of these programs, some activities have been undertaken in collaboration with the NBI:

- Technical staff from the MWRI have received training through the Applied Training Program (ATP) component of the shared vision program.
- Lau and Aswa integrated watershed management projects are under implementation.
- Baro-Akobo-Sobat multipurpose water resources study project is under preparation.

52 Lau and Aswa integrated watershed management component of the shared vision program.
54 Lau and Aswa integrated watershed management projects are under implementation.
55 Baro-Akobo-Sobat multipurpose water resources study project is under preparation.
Notwithstanding these developments, there has been continuing tension among NBI countries over what constitutes an equitable utilization of water. These tensions stem from an increased need of water for various purposes such as irrigation and other multi-purposes uses of water resources. While the NBI, which is a transitional arrangement, has succeeded in bringing the riparian states together for a common purpose, engaged in capacity building and led the implementation of some investment programs, establishment of a permanent institutional arrangement is still work-in-progress. In the past two years, seven upper riparian states launched the Nile Basin Cooperative Framework Agreement (CFA) in a bid to establish a permanent organizational structure and ensure an equitable utilization among all the riparian states of the Nile. The CFA was opened for signature on May 14, 2010 for a period of one year until May 13, 2011. Article 42 of the draft Cooperative Framework Agreement provides for its coming into force upon ratification by at least six members. So far six riparian states have signed the Agreement. (DRC, Sudan and Egypt have not yet signed the agreement.) The tenth riparian country, Eritrea was an observer and didn’t participate directly in the negotiations. The lack of agreement among all the riparian states indicates that the utilization of Nile waters will continue to pose a challenge at least for a foreseeable future. In the mean time, South Sudan should endeavor to meet the needs of its population by addressing the pressing water resource management and resource issues facing this new country.

5.6 Development Programs for Land and Water Resources

The major thrust of the proposed program for development of land and water resources in the decade ahead centers on three sets of interventions: (i) building human and institutional capacities for the management of the land resources of the country, with particular attention to the agenda spelled out above in Section 5.5.1; (ii) strengthening the institutional framework for water resource management at national and state levels within South Sudan and support the design and implementation of a policy framework for equitable use on a regional basis by the riparian states of the Nile basin; and (iii) improve substantially the infrastructure required for effective management of water resources within the country, including regular monitoring of water resources and withdrawal of these resources for agricultural, commercial and domestic use and investment in additional capacities for surface storage of water to meet growing demand. The proposed program also calls for a series of strategic and analytical studies that will streamline mandates and responsibilities and attract much needed private investment into the sector.

5.6.1 Building Institutional Capacities for Water Resource Management

**Strengthening the institutional framework.** Since 2004, and with the support of the international donor community, South Sudan has made some progress in creating an institutional framework for water resource management and has initiated essential sector strategic assessments and feasibility studies to rehabilitate dilapidated infrastructure and improve management of its water resources. A new National Water Policy was endorsed by the government in 2007, and the Ministry of Water Resources and Irrigation was established in 2008 with defined mandates and responsibilities. Building on these initiatives, action is now required on two fronts:

- Development of a Water Act: South Sudan doesn’t have a legal framework for the management of its water resources. As a result, delineation of institutional responsibilities in regulations as well as in service delivery has been masked with gaps and sometimes with overlaps. In addition, responsibilities for setting pricing policy for domestic as well as non-domestic uses has not been clearly defined creating confusions among responsible institutions. Thus, there are compelling reasons to develop and adopt a Water Act as a matter of high priority.

- Training program: South Sudan needs to build capacity of its sectorial institutions in development and management of water resources. The country has applied for membership with the Nile Basin Initiative (NBI) and it capacity in negotiations and conflict resolution needs to be enhanced to the fullest extent. A series of short-, medium- and long-term training programs are necessary to build the capacities of key government institutions, civil society and other entities.

**Improving basic information about the water resources of the country.** The lack of data on physical and natural resources has constrained the country’s ability to harness its rich ground and surface water resources potential. There are no major studies about the water resources in South Sudan. A three-pronged program is proposed for this component of the Action Plan outlined in this Report:

- Rehabilitation and expansion of the water resource data collection network in the country. Most of the meteorological and hydrological data collection network was destroyed during the civil wars, and only minimal capacities for these activities are now in place. Surveys indicate that out of 29 meteorological stations in the country, only five are currently operational. In addition, of the estimated 113 hydrological stations installed several years ago, about 10 are currently operational leaving the country with paucity of data much needed in water resources management and early warning forecast systems. The technical and institutional capacities for these activities are also quite limited. A substantial effort is required as soon as possible to build these technical and institutional capacities for water resources management.

- Integrated river basin master plan studies: Given the country’s urgency to implement large-scale infrastructure projects for irrigated agriculture, hydropower and other multi-purpose use projects, there are compelling reasons to undertake integrated river basin master plan studies as a matter of priority. This Report recommends undertaking integrated river basin master plan studies on Bahr el Jebel as well as Bahr el Ghazal basins. These studies will help in the following ways:
  - Preparation of water allocation and utilization plan with different scenarios and to generate data, information and knowledge on ground and surface water resources in the country.
  - Development of the resources in the basins with respect to occurrence, distribution, quality and quantity of water resources for the next 20-40 years.

46 Annex Table shows the location of all hydrological stations in South Sudan along with the required costs needed to upgrade the systems.
Table 5.2: Ongoing and Proposed Program of Capacity Building and Technical Support for the Water Resources Sector (In $’000 at 2010 constant prices and exchange rate)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<td>167</td>
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<td>Develop legal and institutional framework</td>
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<td>1 908</td>
<td>1 858</td>
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<td>150</td>
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<td>200</td>
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<td>Upgrade hydrological stations</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>1 000</td>
<td>6 000</td>
<td></td>
<td></td>
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<tr>
<td>Strengthen water information system</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
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<tr>
<td>Establish water resources management institute</td>
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<td>1 400</td>
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<td></td>
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<tr>
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<td>2 275</td>
<td>2 033</td>
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<td>1 150</td>
<td>1 150</td>
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<td>1 470</td>
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<tr>
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<td>150</td>
<td>50</td>
<td>400</td>
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<td>1 500</td>
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<td>5 000</td>
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<tr>
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<td>1 500</td>
<td></td>
<td>5 000</td>
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<td>Sudy of regulatory and institutional linkages</td>
<td>100</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Water pricing &amp; tariff studies</td>
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<td>100</td>
<td></td>
<td>300</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td>3 624</td>
<td>3 845</td>
<td>4 259</td>
<td>5 000</td>
<td>4 300</td>
<td>1 150</td>
<td>31 278</td>
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</tbody>
</table>

Source: Date for ongoing programs from SSDP and MWRI. Projections are those of authors.

Proposed program of capacity building and technical support. The program proposes substantial support for institutional capacity building of sectoral institutions as well as undertaking various technical studies to streamline institutional responsibilities and attract much needed investment into the sector. The proposed program includes training activities, upgrading and rehabilitation of hydrological stations, construction of water quality and soil testing laboratory and establishment of a water resources management institute. In addition various technical studies including highly prioritized integrated river basin master plan studies and development/adoption of a Water Act will be undertaken. Institutional studies, including regulatory and service delivery functions as well as linkages with other line ministries, will be undertaken to ensure efficient sectoral performance. Development of an irrigation policy will also be carried out as a priority.

Table 5.3: Estimation of Household Demand for Water (Billion liters per year)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2020</th>
</tr>
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<tr>
<td><strong>Consumption of improved water</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban population</td>
<td>1.9</td>
<td>3.1</td>
<td>4.6</td>
<td>6.5</td>
<td>8.8</td>
<td>12.6</td>
<td>74.7</td>
</tr>
<tr>
<td>Rural population</td>
<td>19.3</td>
<td>22.9</td>
<td>26.9</td>
<td>31.3</td>
<td>36.1</td>
<td>41.3</td>
<td>74.2</td>
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<tr>
<td>Total</td>
<td>21.2</td>
<td>26.0</td>
<td>31.5</td>
<td>37.9</td>
<td>44.9</td>
<td>55.9</td>
<td>148.9</td>
</tr>
<tr>
<td><strong>Consumption of unimproved water</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Urban population</td>
<td>5.4</td>
<td>6.6</td>
<td>7.9</td>
<td>9.1</td>
<td>10.3</td>
<td>11.8</td>
<td>8.0</td>
</tr>
<tr>
<td>Rural population</td>
<td>18.7</td>
<td>18.6</td>
<td>18.3</td>
<td>18.1</td>
<td>17.7</td>
<td>17.2</td>
<td>13.3</td>
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<tr>
<td>Total</td>
<td>24.1</td>
<td>25.2</td>
<td>26.2</td>
<td>27.2</td>
<td>28.0</td>
<td>28.3</td>
<td>21.3</td>
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<tr>
<td><strong>Total consumption</strong></td>
<td>27.5</td>
<td>32.7</td>
<td>36.4</td>
<td>38.6</td>
<td>42.7</td>
<td>44.6</td>
<td>65.7</td>
</tr>
</tbody>
</table>

Household demand for water. As Table 5.3 indicates, total household consumption of water in 2010 is estimated at 45.2 billion liters per year (equivalent to 45.2 million m³ per year). About 47% of this total household use is improved water. Based on the targets for expanding access to improved water in the decade ahead that are outlined in Chapter 9, total household consumption of water is projected to increase to about 140 million m³ by 2020, 88% of which would be improved water. (See Annex 6 for an explanation of the basis for these estimates.) If these targets for household access to improved water are realized, the implication is that there will be a fivefold increase in demand for improved water in the decade ahead.

Table 5.4: Agricultural Water Use in Selected Comparator Countries, 1998-2002

<table>
<thead>
<tr>
<th>Country</th>
<th>Area cultivated (ha '000)</th>
<th>Cultivated area irrigated (% of total)</th>
<th>Agriculture water use (bill m³ p.a.)</th>
<th>Agriculture share of total (%)</th>
<th>Water use per hectare (m³ p.a.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkina Faso</td>
<td>4 700</td>
<td>0.50</td>
<td>0.69</td>
<td>70.1</td>
<td>147</td>
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<tr>
<td>Burundi</td>
<td>1 351</td>
<td>0.58</td>
<td>0.22</td>
<td>77.1</td>
<td>164</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>10 604</td>
<td>1.80</td>
<td>1.81</td>
<td>93.6</td>
<td>491</td>
</tr>
<tr>
<td>Kenya</td>
<td>5 518</td>
<td>1.80</td>
<td>0.41</td>
<td>93.6</td>
<td>273</td>
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<tr>
<td>Malawi</td>
<td>2 970</td>
<td>0.61</td>
<td>0.10</td>
<td>83.6</td>
<td>74</td>
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<tr>
<td>Sudan &amp; South Sudan</td>
<td>16 644</td>
<td>11.20</td>
<td>36.07</td>
<td>97.1</td>
<td>2167</td>
</tr>
<tr>
<td>Uganda</td>
<td>7 700</td>
<td>0.12</td>
<td>0.12</td>
<td>92.5</td>
<td>16</td>
</tr>
</tbody>
</table>

Memo item:

South Sudan: An Infrastructure Action Plan

As noted earlier, the FAO Aquastat database does not provide separate estimates for water resource supply and consumption for South Sudan. As a result, there is no complete baseline data from which projections of demand can be developed. For the purposes of this Report, an indicative estimate has therefore been made for water consumption for 2010 from which demand projections have then been developed. These estimates are no more than indicative of possible trends, given the uncertainties about the base level of consumption for 2010.
Agriculture sector water demand. In the absence of data for South Sudan, a highly indicative estimate of agricultural demand for 2010. Table 5.4 compares the results of this baseline estimate with FAO data for selected comparator countries. As the Table indicates, total water use by agriculture is closely linked to the total area cultivated and in particular to the cultivated area that is irrigated. As noted in Chapter 6, the actual area cultivated in South Sudan in any one year varies from 650,000 to 1.3 million hectares, with only 32,100 hectares that is irrigated, which implies that somewhere between 2.5% and 5% of the actual cultivated area is irrigated. Given the relatively small area that is cultivated, the share of irrigated land is somewhat higher than that for comparator countries, except for Sudan. For the purposes of this Report, it is assumed that the amount of land actually cultivated in 2010 was 1 million hectares, equivalent to the average of the range reported by the World Bank for recent years. The other issue related to agricultural demand for water concerns the livestock sector. As Chapter 6 indicates, South Sudan has an important source of livelihood for large number of rural families. Based on data for comparable countries it is assumed that this livestock population consumed about 0.23 billion m³ in 2010. Agriculture accounts for about 96% of total water use, households account for about 3%, with industrial use accounting for the balance. The agricultural sector would continue to be the dominant source of demand for water for the entire decade, driven by the large investment in commercial agriculture and irrigation. Particular attention will have also to be given to meeting the needs of the livestock industry. Lack of water at critical times in the year can be an important cause of conflict among local communities. Additional water facilities will be needed to meet the needs of the industry.

In the absence of data for South Sudan, a highly indicative estimate of agricultural demand for 2010 is presented in Table 5.4. This is compared with FAO data for selected comparator countries. As the Table indicates, total water use by agriculture is closely linked to the total area cultivated and in particular to the cultivated area that is irrigated. As noted in Chapter 6, the actual area cultivated in South Sudan in any one year varies from 650,000 to 1.3 million hectares, with only 32,100 hectares that is irrigated, which implies that somewhere between 2.5% and 5% of the actual cultivated area is irrigated. Given the relatively small area that is cultivated, the share of irrigated land is somewhat higher than that for comparator countries, except for Sudan. For the purposes of this Report, it is assumed that the amount of land actually cultivated in 2010 was 1 million hectares, equivalent to the average of the range reported by the World Bank for recent years. The other issue related to agricultural demand for water concerns the livestock sector. As Chapter 6 indicates, South Sudan has an important source of livelihood for large number of rural families. Based on data for comparable countries it is assumed that this livestock population consumed about 0.23 billion m³ in 2010. Agriculture accounts for about 96% of total water use, households account for about 3%, with industrial use accounting for the balance. The agricultural sector would continue to be the dominant source of demand for water for the entire decade, driven by the large investment in commercial agriculture and irrigation. Particular attention will have also to be given to meeting the needs of the livestock industry. Lack of water at critical times in the year can be an important cause of conflict among local communities. Additional water facilities will be needed to meet the needs of the industry.

Table 5.5: Estimation of Total Demand for Water (Billion m³ per year)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2020</th>
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</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>0.38</td>
<td>0.42</td>
<td>0.48</td>
<td>0.72</td>
<td>1.20</td>
<td>1.80</td>
<td>4.80</td>
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<td>Cropland</td>
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<td>0.23</td>
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<td>0.25</td>
<td>0.25</td>
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<td>Livestock</td>
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<td>0.65</td>
<td>0.72</td>
<td>0.97</td>
<td>1.45</td>
<td>2.06</td>
<td>5.10</td>
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<tr>
<td>Sub-total</td>
<td>0.61</td>
<td>0.65</td>
<td>0.72</td>
<td>0.97</td>
<td>1.45</td>
<td>2.06</td>
<td>5.10</td>
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<td>0.03</td>
<td>0.04</td>
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<tr>
<td>Improved water</td>
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<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
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<tr>
<td>Unimproved water</td>
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<td>0.05</td>
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<td>0.07</td>
<td>0.07</td>
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<td>0.17</td>
</tr>
<tr>
<td>Sub-total</td>
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<td>0.05</td>
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<td>0.07</td>
<td>0.07</td>
<td>0.08</td>
<td>0.17</td>
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<tr>
<td>Harvested area</td>
<td>1,000</td>
<td>580</td>
<td>1,028</td>
<td>1,070</td>
<td>1,160</td>
<td>1,320</td>
<td>2,500</td>
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<td>Irrigated area</td>
<td>3.2</td>
<td>3.6</td>
<td>5.0</td>
<td>7.4</td>
<td>10.0</td>
<td>16.0</td>
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<tr>
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<td>904</td>
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<td>1,562</td>
<td>2,042</td>
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</table>

Source: Authors estimates for South Sudan; FAO Aquastat database for comparable countries.

Table 5.6: Ongoing and Proposed Program of Capital Works for the Water Resources Sector (in $ ’000 at 2010 constant prices and exchange rate)

<table>
<thead>
<tr>
<th>Program</th>
<th>Estimate 2010</th>
<th>Projected</th>
<th>Total 2011-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase supply of water</td>
<td>709</td>
<td>4,839</td>
<td>13,087</td>
</tr>
<tr>
<td>Open rives and dykes</td>
<td>3,267</td>
<td>6,367</td>
<td>14,001</td>
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<tr>
<td>Mapping assessment &amp; water management</td>
<td>1,588</td>
<td>2,497</td>
<td>7,232</td>
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<tr>
<td>Proposed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction of haffirs</td>
<td>4,000</td>
<td>4,000</td>
<td>44,000</td>
</tr>
<tr>
<td>Construction of microdams</td>
<td>3,000</td>
<td>3,000</td>
<td>27,000</td>
</tr>
<tr>
<td>Construction of multipurpose dams</td>
<td>150,000</td>
<td>150,000</td>
<td>650,000</td>
</tr>
<tr>
<td>Equipment for flood control works</td>
<td>1,000</td>
<td>1,000</td>
<td>14,000</td>
</tr>
<tr>
<td>Flood and dyke protection works</td>
<td>3,000</td>
<td>3,000</td>
<td>42,000</td>
</tr>
<tr>
<td>Clearing of blocked waterways</td>
<td>709</td>
<td>9,694</td>
<td>851,320</td>
</tr>
<tr>
<td>Total</td>
<td>709</td>
<td>9,694</td>
<td>851,320</td>
</tr>
</tbody>
</table>

Source: Based on ongoing programs from SSDP and MWRI. Projections are those of authors.
Proposed new programs. The South Sudan Development Plan (SSDP) calls for new expenditures of some $453 million on programs related to water resource management during 2011-2013. The bulk of the funds are proposed for investment in additional capacities to supply fresh water, including $400 million for construction of the proposed Sue multipurpose dam. Only $5 million is proposed for capacity building and technical studies in this period.

The Action Plan for water resource management set out in this Report calls for new capital outlays of about $820 million, in addition to the ongoing program of $34 million. The bulk of the funds would be used to finance the construction of two more multipurpose dams that would provide water for household and industrial use, and depending on further analysis and site investigations, also provide additional water for agricultural use. An amount of $650 million is included for these two dams. Preliminary information obtained from the MWRI indicates that the proposed dam will store about 1-2 billion m³. It would supply water for electricity generation and meet the water demand of the Wau town. In addition, it would be used as a source of supplemental irrigation during the dry periods sufficient to cultivate about 40,000 feddan (16,800 hectares). The SSDP made a notional allocation of $400 million for this project, which implies a capital cost of $200-$400 per thousand m³. A feasibility study on the Wau multi-purpose water resources project is currently underway. Given the size of the scheme, the MWRI, along with other line ministries and stakeholders, will need to establish a panel of experts to review the results of the assessment and evaluate economic costs and benefits.

Because the country is prone to flooding, the Report also recommends procurement of earth moving machineries to support dyke construction works much needed for flood protection works or contracting to the private sector for such work. Another important component of the program is the construction of water harvesting structures such as hafris, ponds and cisterns. These structures are critical for the livelihood of the population in the arid zones, as well as for the large number of livestock in South Sudan.

### 5.7.2 Financing Arrangements for the Program

Table 5.7 provides a summary of the proposed funding arrangements for the land and water resources program. Total funding requirements for the decade ahead amount to about $880 million (at 2010 constant prices and exchange rate). The program would be funded by the National and state governments and by the donor community. South Sudan would fund two-thirds of the cost of the program, with the donor community meeting the rest. One important qualification to the foregoing financing arrangement is that it may be possible to attract private funding from international investors who are attracted to business opportunities in the agricultural sector for one or both of the large scale dams proposed for the decade ahead.

This would involve the mobilization of about $200 million of private equity and $450 million of debt financing from commercial sources. Once the detailed feasibility study for the Wau project is completed, a transaction advisory team can be retained to assess the prospects for mobilizing such funding.

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<tr>
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<td><strong>Capacity building &amp; technical studies</strong></td>
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<td>255</td>
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<td>3,495</td>
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<tr>
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<td>3,625</td>
<td>3,845</td>
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<td>4,300</td>
<td>1,150</td>
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<td><strong>Capital expenditures</strong></td>
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<td></td>
</tr>
<tr>
<td>Government</td>
<td>709</td>
<td>4,839</td>
<td>6,865</td>
<td>1,383</td>
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<td>-</td>
<td>-</td>
<td>13,087</td>
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<td></td>
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<td>571,900</td>
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<tr>
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<td>4,855</td>
<td>8,864</td>
<td>7,514</td>
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<td>-</td>
<td>-</td>
<td>41,718</td>
<td>245,100</td>
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<tr>
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<td>-</td>
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<td>16,186</td>
<td>56,050</td>
<td>73,935</td>
<td>77,805</td>
<td>42,753</td>
<td>265,305</td>
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<tr>
<td>Total</td>
<td>709</td>
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<td>20,728</td>
<td>74,897</td>
<td>168,000</td>
<td>218,000</td>
<td>121,000</td>
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<td><strong>Total program</strong></td>
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<tr>
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<td>709</td>
<td>4,839</td>
<td>6,865</td>
<td>1,383</td>
<td>-</td>
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<td>13,087</td>
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<td>574,145</td>
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<td>Proposed</td>
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<tr>
<td>Ongoing</td>
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<td>877,998</td>
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Source: Annex tables 6.7 and 6.8 and estimates by authors.
6 Development of Agriculture in South Sudan

6.1 Current Status of Agriculture, Fisheries and Forestry

6.1.1 The Setting

Agriculture is the backbone of the economy of South Sudan. Estimates on value addition by agriculture, forestry, and fisheries accounted for 36% of non-oil GDP in 2010 (see Annex Table 2.4). It is evident that about 80% of the population lives in rural areas, with agriculture, forestry, and fisheries providing the primary livelihood for a majority of the households in each state (Map 6.1). Much of the rural sector activity is currently focused on low-input, low-output subsistence agriculture instead of production for markets. Among the significant reasons for this are: (i) the need for improved agricultural inputs and techniques such as seeds and fertilizers, storage facilities and advisory services, and irrigation development; (ii) the difficulties faced by farmers in accessing markets due to the poor road network, lack of other transport modes and nuisance taxes and charges, including bribes; (iii) the lack of a critical mass of farmer and rural producer associations as a means of entering the market place with the aim of minimizing the cost of inputs, accessing loan finance at affordable rates and influencing farm-gate prices; and (iv) uncertainties pertaining to property rights and access to land.

Two and a half decades ago, the country was net exporter of agricultural products to regional markets; due to war-related destruction, poor infrastructure and lack of investment in the agriculture sector, South Sudan is now a net importer of food. It currently imports as much as 50% of its needs, including 40% of its cereals from neighboring countries, particularly Uganda and Kenya. Total food imports are estimated to be in the range of $200-300 million a year. While the country produces and consumes a wide range of agricultural commodities, with the passage of time some commodities have become prominent in the national pattern of consumption. Cereals, primarily sorghum and maize, millet and rice are the dominant staple crops in South Sudan. According to the 2009 National Baseline Household Survey (NBHS) more than 75% of rural households consume cereals. At the state level, the percentage ranges from a low of 28% in Upper Nile state to 62% in Western Bahr el Ghazal and to as much as 95% in Northern Bahr el Ghazal. For the country as a whole, cereal consumption accounts for about 48% of total basic food consumption in term of value. Livestock accounts for approximately 30%, fish 4%, roots 2%, seeds about 3.8% and other non-cereal crops combined, 12.7%.

Sorghum is the main crop cultivated with a wide range of local landraces. It is the main staple food in all states, except for the three Equatorias where the local diet is also based on maize flour (largely imported from Uganda) and cassava (mainly in the Green Belt). In Northern and Western Bahr el Ghazal, Warrap and Lakes, sorghum is often intercropped with sesame and millet. Maize is normally cultivated in limited areas, close to homesteads and often used for green consumption. In some locations such as Upper Nile, maize is cultivated in larger plots, instead of sorghum, provided the soil is suitable. Minor cereal crops such as bulrush millet, finger millet and upland rice are also cultivated in certain locations. Groundnut is cultivated on sandy soils in most locations and makes an important contribution to the household diet. It is the main cash crop which contributes to farming household income at certain periods of the year. In parts of Central and Western Equatoria, sweet potato, yam, coffee, mango and papaya are commonly grown. Okra, cowpea, green gram, pumpkin and tobacco are also widely grown around homesteads. Vegetables such as onions or tomatoes are not commonly grown in rural areas, but are increasingly cultivated near cities to supply urban markets.

Livestock provides the main source of livelihood for a substantial portion of the population, with herds (mostly cattle) concentrated primarily in western parts of Upper Nile state, and in East Equatoria, Jonglei and Bahr el Ghazal states. Livestock are raised by nomads and semi-nomads and are entirely dependent on access to grazing land and watering points. However, the increasing number of sedentary farmers is reducing the amount of grazing land available, and as noted in Chapter 5, that is a source of internal conflict in the country.

With over 95% of agricultural production being rain-fed, weather variability is a major factor in determining crop performance. In lowland areas, flooding is a normal occurrence, but variability of the water levels affects harvested area and yields. Agriculture is, for the most
part, based on small, hand-cultivated units often farmed by women-headed households. Despite land availability for farming, manual land preparation limits the area households can cultivate. Making use of animal traction would allow households to cultivate larger plots and plant more crops and trees, benefiting female-headed households. Making use of animal traction by women-headed households would allow increased access to credit and regional and international markets for food security, poverty alleviation and facilitate animal production and fisheries, value-added addition and access to credit and regional and international markets for food security, poverty alleviation and socio-economic development.

A series of policy papers were prepared during 2006-2007 for food and agriculture, forestry, animal resources, and fisheries. In 2010, the FAO sponsored a review of these various policy papers that, in turn, has led to the drafting of a comprehensive food and agricultural development policy framework for the country. A major ongoing concern for policy makers is that most of the food sold in the market in South Sudan is imported and a significant proportion of food insecure people rely on imported food aid. An important focus of the ongoing review of the food security policy and related framework has been the following:

- Development of production support services, with particular emphasis on how the private sector can be harnessed to provide various services including input delivery and mechanization.
- Expansion of agricultural markets, value chain development and finance, with special emphasis on agribusiness development.
- Inter-relationships between food security, social development and climate change.

The draft policy statement is to be presented to the Council of Minister of South Sudan and if approved, it will become the official policy document for guiding agricultural development in the country.

### 6.2 Agricultural Land Use in South Sudan

#### 6.2.1 Estimates of the Cropped Area

In spite of having 50% of its arable land mass as prime agricultural land only 4% of this area is cultivated continuously or periodically. The very low ratio of cultivated to total land compares with 28% in Kenya and 8% in Uganda. Most of this land use in South Sudan is accounted for by smallholder subsistence farmers that, in the absence of fertilizers, pesticides and herbicides, practice some form of shifting cultivation. As Table 6.1 indicates, the total area that is cultivated on a shifting basis is estimated at about 2.8 million hectares. Areas covered with trees and shrubs account for 72% of land use, with grasslands accounting for about 23% of the total area.

The Western Flood Plains livelihood zone has the most cropland (34% of national cropland). Greenbelt and Eastern Flood Plains zones are the other two important crop production regions, accounting for, respectively, 18% and 26% of national cropland. Altogether, these three livelihood zones account for 78% of national cropland. Five states account for 70% of the national cropland (and 56% of the national territory): Upper Nile, with 19% of total cropland; Warrap, 15%; Jonglei, 14%; Western Equatoria, 11%, and Central Equatoria with 11%. Almost all irrigated crops (mainly rice) are in Upper Nile; rice on flood land is all in Northern Bahr el Ghazal while fruit trees

### Table 6.1: Land Use in South Sudan (In hectares)

<table>
<thead>
<tr>
<th>Category</th>
<th>Area</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivated</td>
<td>2,760,131</td>
<td>4.3</td>
</tr>
<tr>
<td>Trees</td>
<td>20,742,243</td>
<td>32.6</td>
</tr>
<tr>
<td>Shrubs</td>
<td>25,032,308</td>
<td>39.3</td>
</tr>
<tr>
<td>Herbaceous</td>
<td>14,522,385</td>
<td>22.8</td>
</tr>
<tr>
<td>Urban/industrial</td>
<td>34,188</td>
<td>0.1</td>
</tr>
<tr>
<td>Bare rock &amp; soil</td>
<td>159,106</td>
<td>0.2</td>
</tr>
<tr>
<td>Water bodies</td>
<td>462,105</td>
<td>0.7</td>
</tr>
<tr>
<td>Total</td>
<td>6,372,466</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Annex Table 6.1

In spite of having 50% of its arable land mass as prime agricultural land only 4% of this area is cultivated continuously or periodically. The very low ratio of cultivated to total land compares with 28% in Kenya and 8% in Uganda. Most of this land use in South Sudan is accounted for by smallholder subsistence farmers that, in the absence of fertilizers, pesticides and herbicides, practice some form of shifting cultivation. As Table 6.1 indicates, the total area that is cultivated on a shifting basis is estimated at about 2.8 million hectares. Areas covered with trees and shrubs account for 72% of land use, with grasslands accounting for about 23% of the total area.

The Western Flood Plains livelihood zone has the most cropland (34% of national cropland). Greenbelt and Eastern Flood Plains zones are the other two important crop production regions, accounting for, respectively, 18% and 26% of national cropland. Altogether, these three livelihood zones account for 78% of national cropland. Five states account for 70% of the national cropland (and 56% of the national territory): Upper Nile, with 19% of total cropland; Warrap, 15%; Jonglei, 14%; Western Equatoria, 11%, and Central Equatoria with 11%. Almost all irrigated crops (mainly rice) are in Upper Nile; rice on flood land is all in Northern Bahr el Ghazal while fruit trees
and tree plantations are exclusively in Green Belt Zone encompassing Western, Central, and Eastern Equatoria which have the longest LGP in South Sudan.

According to the World Bank, the actual area cultivated in any one year in South Sudan has ranged between a minimum of 1% and a maximum of 2% of the total land area – that is, from about 650,000 to 1.3 million hectares.50 According to FAO-WFP reports, about 1 million hectares were put under cultivation in 2008. Cereals typically account for 80% or more of the cultivated area each year; for example, the area under cereals that was harvested in 2008 was about 850,000 hectares. Sorghum is the main cereal, followed by millet and maize. The average area cultivated by these household is typically in the range of 1-4 feddans (0.4-1.7 hectares).

6.2.2 Rainfall, Land Use and Population Densities

Agriculture is predominantly rainfed with the level of annual rainfall ranging from north to south and from east to west. As noted in Chapter 5, it ranges from less than 500 mm/year in the semi-arid lands of Eastern Equatoria to about 1,800 mm/year in the Green Belt zone. South Sudan experiences unimodal and bimodal rainfall regimes, the bimodal areas covering much of Greater Equatoria (Western, Central, and Eastern Equatoria) while the unimodal areas characterize the rest of the country. Agricultural performance consequently varies considerably from place to place and from year to year, ranging from the possibility of two harvests per annum in Greater Equatoria between Tambura and Kajo Keji, to one harvest in the unimodal areas further north.

The length of growing period (LGP) ranges from 280-300 days per annum in the southern parts of South Sudan to 130-150 days in the northern parts.51 More than 70% of South Sudan has a LGP longer than 180 days and is, therefore, suitable for crop production, but as noted earlier, only a very small percentage of this area is actually cultivated each year. Classifying the aggregated land use by LGP shows that 27% of cropland in South Sudan is located in areas where agricultural potential is high (an LGP more than 220 days) and another 42% in areas with medium agricultural potential (an LGP between 180 and 220 days). This two states – Warrap, Northern Bahr el Ghazal and Central Equatoria – also have relatively high shares of the national cropland, but they have population densities of more than 20 persons per km². A recent World Bank study finds that areas in South Sudan that have “high” and “medium” production potential based on the LGP have the highest population density.52 According to Boserup (1965 and 1981), 50 people per km² is a threshold population that indicates the possibility of agricultural intensification.53 Map 6.2 sets out the spatial distribution of areas with high, medium and low agricultural potential and high, medium and low population densities. In South Sudan, there are high to medium population densities in areas of high and medium agricultural potential: the high agricultural potential areas have a population density of about 66 persons per km² while areas with medium agricultural potential have a population density of 54 persons per km². Although these areas presently have low per capita cropland values, they are likely to generate quick wins in terms returns from new public and private investments leading to expansion of cropland and increased agricultural production.

With assistance from USAID and World Bank, the National Government has formulated strategies for expansion of the areas under cultivation that takes into account the assessments of the agricultural potential in various parts of the country. The objective of these assessments is to identify geographic areas in the country that can have a high payoff in terms of their development impact. Typically, the criteria used in identifying such areas include agricultural potential, access to markets, and density of population. For the purposes of this Report, this ongoing analysis has provided the basis for an indicative estimate of the prospects for expansion in cultivated areas in all 10 states. The results are set out in Table 6.2 below. The analysis suggests that the livelihood zones with large potential are the Green Belt, Ironstone Plateau and Hills and Mountains; the relevant states are Western Bahr el Ghazal, the three Equatoria states, Warrap, Upper Nile and Jonglei. As Table 6.2 indicates, the Western, Central and Eastern Equatoria states would account for almost 60% of the proposed increase in cultivated areas. Large amounts of additional land (26% of the proposed increase) would also be brought under cultivation in Jonglei, Warrap, and Western Bahr el Ghazal.

### Table 6.2: Current and Proposed Additional Cropland for the Medium and Longer-Term

<table>
<thead>
<tr>
<th>State</th>
<th>Current cropland</th>
<th>Proposed additional cropland</th>
<th>Total cropland</th>
<th>Share (%) of additional cropland</th>
<th>Cropland as % of state total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Nile</td>
<td>504.9</td>
<td>178.8</td>
<td>683.7</td>
<td>5.0</td>
<td>6.6</td>
</tr>
<tr>
<td>Jonglei</td>
<td>373.6</td>
<td>262.5</td>
<td>636.1</td>
<td>7.3</td>
<td>3.1</td>
</tr>
<tr>
<td>Unity</td>
<td>119.5</td>
<td>48.4</td>
<td>167.9</td>
<td>1.3</td>
<td>4.5</td>
</tr>
<tr>
<td>Warrap</td>
<td>405.4</td>
<td>318.2</td>
<td>723.6</td>
<td>8.9</td>
<td>9.4</td>
</tr>
<tr>
<td>Northern Bahr Ghazal</td>
<td>247.6</td>
<td>146.5</td>
<td>394.1</td>
<td>10.4</td>
<td>8.4</td>
</tr>
<tr>
<td>Western Bahr Ghazal</td>
<td>73.1</td>
<td>373.9</td>
<td>447.0</td>
<td>19.4</td>
<td>13.4</td>
</tr>
<tr>
<td>Lakes</td>
<td>248.2</td>
<td>183.0</td>
<td>431.2</td>
<td>21.1</td>
<td>16.6</td>
</tr>
<tr>
<td>Western Equatoria</td>
<td>317.8</td>
<td>977.7</td>
<td>1,294.7</td>
<td>48.5</td>
<td>27.3</td>
</tr>
<tr>
<td>Central Equatoria</td>
<td>313.9</td>
<td>878.4</td>
<td>1,192.3</td>
<td>41.5</td>
<td>27.6</td>
</tr>
<tr>
<td>Eastern Equatoria</td>
<td>77.6</td>
<td>219.1</td>
<td>296.7</td>
<td>11.0</td>
<td>11.1</td>
</tr>
<tr>
<td>Total</td>
<td>2,680.8</td>
<td>3,586.5</td>
<td>6,267.3</td>
<td>100.0</td>
<td>9.7</td>
</tr>
</tbody>
</table>

Source: Annex Table 7.1 and estimates by authors. Note: current cropland includes 10% of “grass with crops” and “trees with crops.”

An important unresolved practical issue at this juncture is the pace at which this land can be developed. The answer depends considerably on the extent to which the Government, with assistance from the donor community and private investors, address the existing constraints to agricultural expansion in South Sudan.

### 6.3 Key Challenges for the Sector

There are a number of major constraints to agricultural and rural development in South Sudan, in addition to those discussed in Chapter 1. In order to achieve sustained and broad-based economic development, these challenges/constraints must be addressed. Infrastructure improvement, provision of public goods and access to extension and veterinary services will be a crucial aspect of the Government’s strategic response to these challenges. Notwithstanding the range of crops produced, agricultural production in South Sudan remains largely traditional with low yields. In the cereals subsector, for example, it is widely acknowledged that the vast majority of farmers do not use high yielding seeds nor do they use any synthetic fertilizer or herbicide. As Table 6.3 indicates, South Sudan’s average yield is low relative to most other countries in the region, averaging only 0.97 tonnes per hectare during 2005-2009; it is far below the average of 7.64 tons per hectare in Egypt where the bulk of the cereals are grown under irrigation. These low cereal yields in South Sudan stem from a range of problems faced by smallholder farmers.

A survey undertaken in 2006 by Ministry of Agriculture and Forestry, with support from FAO and the WFP, asked farmers which factors were the most important, or in their view the most important, to increased smallholder productivity. The survey was based on the assumption that smallholder farmers could be induced to increase productivity but only if the policy changes and smallholder factors that inhibit productivity were solved. The survey was conducted in about 1,200 villages in 10 states: Upper Nile, Jonglei, Eastern Equatoria, and the Central Equatoria. The results of the survey are shown in Table 6.4.

### Table 6.3: Cereal Yields (Tons per hectare)

<table>
<thead>
<tr>
<th>Country</th>
<th>Average 2005-2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi</td>
<td>1.31</td>
</tr>
<tr>
<td>Chad</td>
<td>0.78</td>
</tr>
<tr>
<td>DRC</td>
<td>1.64</td>
</tr>
<tr>
<td>Djibouti</td>
<td>1.49</td>
</tr>
<tr>
<td>Egypt</td>
<td>7.53</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>1.54</td>
</tr>
<tr>
<td>Kenya</td>
<td>1.58</td>
</tr>
<tr>
<td>Malawi</td>
<td>0.94</td>
</tr>
<tr>
<td>Rwanda</td>
<td>1.53</td>
</tr>
<tr>
<td>South Sudan</td>
<td>1.19</td>
</tr>
</tbody>
</table>

Source: FAO databases and Table 6.5.

51 The length of growing period (LGP), defined as the number of days when both moisture and temperature conditions permit crop growth, is often used as a proxy for an area’s suitability for farming. For example, an area with LGP 120 days per year (dry or semi-arid area) may allow for one crop of soy or one only crop per year while an area with a LGP between 180 and 220 days/year (e.g., Green Belt Zone) may have multiple crop (or crops) sequentially in one year.
53 Boserup (1965) describes the concept of agricultural intensification for the first time in his book “The Conditions of Agricultural Growth”.
The wide range of challenges that face the sector today can be conveniently grouped around the following nine sets of concerns.

**Weak entrepreneurship base and absence of commercial farming.** Agriculture remains a subsistence activity by smallholder farmers using simple implements; the average farm size is in the range of 0.4-1.7 hectares. Intensive farming is still limited. In addition, irrigation farming is still limited. Modern farming technologies. Farming remains primarily rain-fed; irrigation farming is still limited. In addition, irrigation farming is still limited. The absence of rural and feeder roads and, therefore, access to domestic, regional and international markets – railway/rolling stock, electricity and transport systems as well as ICT – inhibit movement of goods and services into and out of rural areas, increases the cost of transportation and dampen producers' incentives to generate surplus. The absence of rural and feeder roads and, therefore, access to domestic, regional and international markets is a key bottleneck to increased agricultural production. Similarly, the near complete absence of rural electrification limits the choice of farm implements and the adoption of modern farming techniques. These concerns are addressed at some length in the various sectoral chapters in Part B of this Report.

**Lack of agricultural productivity-enhancing technologies.** There is little use of improved varieties of seed or breeds of livestock. Crop farmers save their seed for planting in the next season, and there is little selection for improved varieties. There is a need for improved varieties that are resistant to common diseases and which are more productive. The traditional livestock breeds could increase productivity by upgrading the genetic base, but market incentives to improve quality are lacking.

**Poor and inadequate infrastructure.** Lack of developed trunk and feeder roads (and, other types of infrastructure – railway/rolling stock, electricity and transport systems as well as ICT) inhibit movement of goods and services into and out of rural areas, increases the cost of transportation and dampen producers' incentives to generate surplus. The absence of rural and feeder roads and, therefore, access to domestic, regional and international markets is a key bottleneck to increased agricultural production. Similarly, the near complete absence of rural electrification limits the choice of farm implements and the adoption of modern farming techniques. These concerns are addressed at some length in the various sectoral chapters in Part B of this Report.

**Weak markets and non-existent market information systems.** As Chapter 10 indicates, South Sudan has yet to achieve the level of mobile voice and data telecommunication that is now commonly available in many rural communities in Africa. In addition, the absence of ICT in rural communities limits market information generation and dissemination. This also restricts market size, outreach and agricultural value chains development. Consequently the economic benefits of modern telecommunication still elude rural communities in South Sudan.

**Paucity of microfinance facilities.** Formal banking services are still extremely limited. The Southern Sudan Microfinance Facility is a government sponsored private micro-finance umbrella agency that is attempting to foster micro-finance market development. Presently, only a few microfinance institutions provide minimal financial services in some market towns, but there are no financial services for the agricultural sector – for producers or for agribusinesses.

**Weak farmer/producer organizations.** Years of war and displacement of population have weakened or destroyed whatever farm cooperatives existed before. Some donor

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**Figure 6.1: Constraints for Crop Cultivation in South Sudan**

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pests/crop diseases</td>
<td>21%</td>
</tr>
<tr>
<td>Shortage of seeds</td>
<td>18%</td>
</tr>
<tr>
<td>Erratic rainfall</td>
<td>17%</td>
</tr>
<tr>
<td>Lack of agr. tools</td>
<td>13%</td>
</tr>
<tr>
<td>Poor soil fertility</td>
<td>9%</td>
</tr>
<tr>
<td>Shortage of labour</td>
<td>8%</td>
</tr>
<tr>
<td>Insecurity</td>
<td>6%</td>
</tr>
<tr>
<td>Lack of ox plough</td>
<td>5%</td>
</tr>
<tr>
<td>Limited access to land</td>
<td>3%</td>
</tr>
</tbody>
</table>


---

**MAP 6.2: Spatial Patterns of Agricultural Potential and Population Density**

55 Some commercial banks in Kenya (e.g. Kenya Commercial bank and Equity bank) have opened branches in Juba and a few other towns in Southern Sudan. The portfolio is still narrow with no lending to the agriculture sector at the moment.
projects have worked with smallholders to organize themselves into groups, cooperatives or associations.56 However, many of the producer members do not farm as a business, and decisions are not made based on cost/benefit basis. There is little ability to calculate costs of production and to use market information to determine if products will be competitive and profitable in markets. Extremely weak literacy and numeracy skills, particularly among women, are constraints to smallholders becoming commercialized.

Shortage of farm labor. Even though 90% of the population of South Sudan lives in rural areas, close to 80% of farm labor is provided by women who combine this activity with their other domestic chores. Farming is not viewed favorably (as a befitting profession) by young men and women, who often migrate to cities. In addition, farm labor, when available, is expensive and often lacks appropriate skills and the incentive to work. The expectation that many of the South Sudanese returning from Sudan would swell the ranks of farm workers may not materialize in the absence of incentives for the returnees to settle and farm in rural communities. Besides, it is instructive to note that most returnees were not farmers previously; most were city dwellers and may, in the absence of incentives, have little inclination to move to rural communities and engage in farming activities.

Unclear land tenure and demarcation. The concerns about land tenure are discussed at length in Chapter 5. Large-scale farming requires access to land with unambiguous rights to profitably develop the land.57 Under the 2009 Land Act foreigners are not permitted to own land, but can lease land for a maximum of 99 years; community lands may be allocated for investment purposes, but that investment must reflect an important interest for the community and contribute to economic and social development of the local community; and land acquisition of 250 fedans or more (104 hectares) must be approved by state authorities. Having a uniform national land law and transparent ownership rights and obligations will facilitate the decision of foreign investment in agriculture in South Sudan. In addition, given the predominant role that women play in farming, the laws must be gender sensitive and accord women the right to land ownership.

6.4 Strategy for Development of the Agricultural Potential

Developing the country’s agricultural and livestock potential has been identified in the SSDP as the most feasible way to enable broad-based economic growth and food security in the short- to medium-term. South Sudan soils and ecological characteristics make the country suitable for the supply of wide range of agricultural products. Furthermore, the strategy envisages a South Sudan that would exploit opportunities to process food products and raw materials for value addition, job creation and increased earnings. The key drivers in the strategy for expansion of agricultural production are threefold: (i) expand substantially the area under cultivation; (ii) increase yields in areas that are already under cultivation along with ensuring high productivity on newly farmed lands; and (iii) expand opportunities substantially for production of marketable surpluses of livestock and fish products.

6.4.1 Strategy for Expansion of Cultivated Agriculture in South Sudan

There is, of course, a range of possible scenarios for the development of very large potential for crop anuosi of cropland agriculture in South Sudan. For the purposes of this Report, one possible scenario for expansion of cropland has been considered. The total cultivated area would be increased from 2.7 million ha in 2010 to 4 million ha by 2020 and based on Table 6.2 above, perhaps 6.7 million hectares by say 2030 (Table 6.4). These increases in the cultivated area would come from bringing areas currently covered by forest, shrubs and grass under cultivation.

A two-pronged approach would be used in the decade ahead to develop this large potential for crop production:

- A larger share of the existing 2.7 million hectares of land that is cultivated periodically by smallholder farmers would be brought under continuous cultivation with improved access to markets, lower transport costs that reduce the cost of and access to inputs such as fertilizer and herbicides, use of out-grower models, and so on.

- A substantial investment would also be made in cultivation of new land by medium- and large-scale commercial farming operations, many of which would operate with out-grower models that would allow nearby existing or new smallholder farms to supply fresh foods and agricultural raw materials for processing by the commercial operation. (For example, sugar cane grown by smallholders, and processed by a central facility operated by a large-scale commercial operation.)

As discussed below, much more work is needed on the details of a possible strategy for cropland development for the next one to two decades. Therefore, the scenario presented here is largely indicative at this stage. In this scenario the total area of cropland harvested annually would increase from about 1 million hectares at the present time to 2.5 million hectares by 2020. A large part of the increase would be accounted for by increased cultivation of cereals, initially for the domestic market to address the ongoing food security problem, but later in the decade for export of surpluses to regional markets as well. The remaining cultivated areas would be used to expand substantially the production of high value fruits and vegetables for local and export markets, and other cash crops such as sugar, groundnuts and tree crops such as oil palm, tea and coffee. In this indicative scenario, the cultivated area would increase from 4.2% of the total land area at present to about 6.3% by 2020; however, the cultivated area that is harvested annually would increase from about 37% at present to 65% by 2020. This expansion in cultivated cropland would be supported with a substantial investment in irrigation in the decade ahead. The irrigated area would increase from a negligible 32 thousand ha at present (3% of the harvested area) to 400 thousand ha by 2020 (equal to 16% of the harvested area).

Successful development and implementation of this model in the decade ahead would then lay the foundations for further large expansion of the cultivated area to about 6.3 million hectares by 2030.

Table 6.4: Indicative Plan for Cropland Development (In hectares '000)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Estimate 2010</th>
<th>Indicative 2020</th>
<th>Indicative 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvested area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cereals</td>
<td>921</td>
<td>1,880</td>
<td>2,800</td>
</tr>
<tr>
<td>Other crops</td>
<td>79</td>
<td>620</td>
<td>1,900</td>
</tr>
<tr>
<td>Total</td>
<td>1,000</td>
<td>2,500</td>
<td>4,700</td>
</tr>
<tr>
<td>Cultivated land under rotation</td>
<td>1,681</td>
<td>1,500</td>
<td>1,570</td>
</tr>
<tr>
<td>Cultivated area</td>
<td>2,681</td>
<td>4,000</td>
<td>6,270</td>
</tr>
<tr>
<td>Memo items:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigated area (ha '000)</td>
<td>32</td>
<td>400</td>
<td>1,000</td>
</tr>
<tr>
<td>Cultivated as % total land area</td>
<td>4.2</td>
<td>6.2</td>
<td>9.7</td>
</tr>
<tr>
<td>Harvested as % of cultivated area</td>
<td>37.3</td>
<td>62.5</td>
<td>75.0</td>
</tr>
<tr>
<td>Irrigated area as % total harvested</td>
<td>3.2</td>
<td>16.0</td>
<td>21.3</td>
</tr>
</tbody>
</table>

Source: Table 2.7.

As discussed below, much more work is needed on the details of a possible strategy for cropland development for the next one to two decades. Therefore, the scenario presented here is largely indicative at this stage. In this scenario the total area of cropland harvested annually would increase from about 1 million hectares at the present time to 2.5 million hectares by 2020. A large part of the increase would be accounted for by increased cultivation of cereals, initially for the domestic market to address the ongoing food security problem, but later in the decade for export of surpluses to regional markets as well. The remaining cultivated areas would be used to expand substantially the production of high value fruits and vegetables for local and export markets, and other cash crops such as sugar, groundnuts and tree crops such as oil palm, tea and coffee. In this indicative scenario, the cultivated area would increase from 4.2% of the total land area at present to about 6.3% by 2020; however, the cultivated area that is harvested annually would increase from about 37% at present to 65% by 2020. This expansion in cultivated cropland would be supported with a substantial investment in irrigation in the decade ahead. The irrigated area would increase from a negligible 32 thousand ha at present (3% of the harvested area) to 400 thousand ha by 2020 (equal to 16% of the harvested area).

Successful development and implementation of this model in the decade ahead would then lay the foundations for further large expansion of the cultivated area perhaps to about 6.3 million hectares by 2030 as in Table 6.4 above. In this scenario, the harvested area increases to 4.7 million ha, or 16% of the land area, with 75% of the total cultivated area being harvested annually. About 20% of the harvested area would be irrigated. This level of irrigation in the longer-term would almost certainly raise important issues for Nile Basin riparian countries regarding the use of water within the Basin.

More work is needed on the proposed strategy for the decade ahead (2011-2020) to determine: (i) the likely cost of bringing this additional land under cultivation in particular parts of the country; and (ii) the off-farm costs for roads, electric power and other infrastructure, and for off-farm storage and processing of products. The discussion below on infrastructure requirements for agriculture and the related discussions in other chapters of this Report provide insights into the off-farm development costs associated with these programs. In the case of on-farm costs, these may range from the equivalent of a few hundred US dollars per hectare for modest improvements to as much as $3,000 per hectare for the water distribution costs of large-scale irrigation projects. At an average of $500 per hectare, for example, the on-farm cost of bringing the additional 1.3 million ha of land under cultivation and improving capacities of the areas already cultivated could be in the range of $1 billion. At an average of $1,000 per hectare the on-farm development cost rises to $2 billion. Most of these on-farm costs would have to be borne by the private sector, either by smallholders or large-scale commercial investment, much of which would have to come from offshore investors. The mobilization of these levels of investment for agriculture represents another major challenge for the decade ahead.

56 USADF through its Sudan Productive Capacity Program and GIZ have been actively helping farmers to form groups and associations.
57 In early 2009 USAID started up a new, 2-year land tenure program, which is helping to develop a new land policy for Southern Sudan.
6.4.2 Choice of Models for the Transformation of Agriculture

To achieve these objectives, given the small size of the South Sudan market, the strategy must be both domestic and export-oriented, contributing to food security, facilitating agriculture-supported domestic industrialization and maximizing exports. A high priority would be accorded to scaling up production of high value crops using adaptive technology and cost effective means of production. And, in order to achieve technical efficiency, resource allocation should be rationalized and output maximized. In addition, binding transport and other trade logistic constraints to market access must also be addressed.

Like Ethiopia, Ghana, Kenya, Uganda, Tanzania and Rwanda, South Sudan can enhance agricultural production and increase productivity by creating a conducive policy environment as well as making new and sustained investments in agricultural production and related supporting services including off-farm processing and infrastructure services. For a country such as South Sudan, which is seeking to transform its rich but barely exploited agricultural endowments, knowing what model of agricultural development approaches has or has not worked in other countries is advantageous. Box 6.1 summarizes the approaches taken by Ethiopia and Ghana. While every country is unique, with different ecological characteristics and agricultural practices, a key lesson from the experience of these two countries is that the Government of South Sudan will need to play an important role in fostering agricultural development.

Under the AU/NEPAD CAADF framework, it is the role of government, with assistance from its development partners, to articulate the sector development strategy, create an enabling policy environment, demonstrate commitment to promote the attainment of key targets and increase public and private investment to levels that will result in sustained growth in agriculture of 6% a year. An integral part of an enabling environment is the provision of basic infrastructure and extension services. These investments would take the form of budget allocations by the government, as well incentive-driven private domestic and foreign direct investment.

As has been stated above, only 4% of South Sudan’s estimated 320,000 km² or more of arable land is being cultivated mainly by smallholder subsistence farmers. The transformation of the agriculture sector will, of course, require that more cropland be brought under cultivation; it will also entail a holistic approach that encompasses recognition of the role of smallholder farmers and their associations as the nucleus that must be nurtured and strengthened. Above all, the strategy will be export-oriented and driven by foreign direct investors who will undertake the development of modern large scale farms with capacity to scale up farming as business units as well as train the small scale farmers; the establishment of holistic farm systems based on rain-fed cropping as well as irrigation systems that can profitably harness land and water resources to expand agricultural production, process and market value chain products in national, regional and global markets; enhanced market access by rural communities to urban centers, regional and global markets; and transversal provision of extension and research services. Rising global demand for agricultural products and cereals, in particular, suggests that, if ever there was an opportune time for a strategic transition to a more efficient farming system in South Sudan, it is now.

Box 6.1: Models for Promoting Agricultural Growth: Experience of Ethiopia and Ghana

Ethiopian Model: Ethiopia is considered a leader in the use of strategic international (foreign) partner to promote agricultural development. Agriculture is the backbone of the Ethiopian economy, accounting for 85% of employment and nearly 50% of GDP. Since 1991, the Agricultural Development Led Industrialization Program (ADLP) has served as the vehicle for promoting agricultural modernization, national growth and poverty reduction. Through ADLP, agricultural development has resulted in significant commercialization and entrenchment of value addition in the agricultural sector, expansion of capital base and accumulation of investment and technology. At the federal level, the Agriculture and Ministry of Agriculture and Rural Development serves as a central office to facilitate land leases of 5,000 hectares (ha) or larger for investment purposes. AISD is the central depository of these plots and expedites the issuance of licenses, permits, and approval of all land leases. At the state and local levels, the relevant authorities provide extension services and facilitate access to micro-finance and technical assistance services and training for smallholder farmers and farmer cooperatives. The aim of AISD is to lease three million hectares of land for large-scale commercial farming. Since 2004, the agency has allocated 607,760 ha to investors (of which 157 projects are over 1,000 ha), realizing total investment commitment of approximately US $78.6 million. Foreign direct investors include a German bio fuel project; an investor in a livestock project (leasing 150,000 ha); and a Saudi Arabian government-backed company investing in rice and palm oil projects.

Ghana Model: In 2005 the Government of Ghana launched the Northern Ghana agricultural development program aimed at raising agricultural GDP, promoting national food sufficiency and raising smallholder income. The region was targeted because of its relatively high poverty, large agricultural potential due to the existence of abundant uncultivated arable land, good water supply and yet low output yields. The region has agricultural potential for import substitution in rice, maize and soy. The key targets of the program are: (i) double the per capita income of 250,000 farmers per year; (ii) increase Support Directives for Agriculture and Rural Development (ASD) serves as a central office to facilitate land leases of 5,000 hectares (ha) or larger for investment purposes. ASD is the central depository of these plots and expedites the issuance of licenses, permits, and approval of all land leases. At the state and local levels, the relevant authorities provide extension services and facilitate access to micro-finance and technical assistance services and training for smallholder farmers and farmer cooperatives. The aim of ASD is to lease three million hectares of land for large-scale commercial farming. Since 2004, the agency has allocated 607,760 ha to investors (of which 157 projects are over 1,000 ha), realizing total investment commitment of approximately US $78.6 million. Foreign direct investors include a German bio fuel project; an investor in a livestock project (leasing 150,000 ha); and a Saudi Arabian government-backed company investing in rice and palm oil projects.

Ghana Model: In 2005 the Government of Ghana launched the Northern Ghana agricultural development program aimed at raising agricultural GDP, promoting national food sufficiency and raising smallholder income. The region was targeted because of its relatively high poverty, large agricultural potential due to the existence of abundant uncultivated arable land, good water supply and yet low output yields. The region has agricultural potential for import substitution in rice, maize and soy. The key targets of the program are: (i) double the per capita income of 250,000 farmers per year; (ii) increase Support Directives for Agriculture and Rural Development (ASD) serves as a central office to facilitate land leases of 5,000 hectares (ha) or larger for investment purposes. ASD is the central depository of these plots and expedites the issuance of licenses, permits, and approval of all land leases. At the state and local levels, the relevant authorities provide extension services and facilitate access to micro-finance and technical assistance services and training for smallholder farmers and farmer cooperatives. The aim of ASD is to lease three million hectares of land for large-scale commercial farming. Since 2004, the agency has allocated 607,760 ha to investors (of which 157 projects are over 1,000 ha), realizing total investment commitment of approximately US $78.6 million. Foreign direct investors include a German bio fuel project; an investor in a livestock project (leasing 150,000 ha); and a Saudi Arabian government-backed company investing in rice and palm oil projects.

6.4.3 Other Key Elements of the Strategy

Leadership and Alignment: To be successful, a lead agency must assume overall responsibility for the implementation of the strategy. As noted earlier, responsibility for promoting agricultural and rural development lies with four ministries. Effective implementation of the agricultural development strategy will require the establishment of a Joint Board or Steering Committee comprising the four ministries and the Ministry of Industry and Investment, with the later serving the Chair of the Steering Committee. Other relevant stakeholders must also be co-opted into the Committee.

Supportive policy environment. A conducive policy environment with incentive mechanism for domestic and foreign investment in agriculture value chain activities is a prerequisite for transforming the sector. Hence, the government should strive to enact policies and adopt regulations that promote and protect equitable private investment in arable land development, encourage market-driven seed production and distribution system, adopt a national investment codes and actively promote domestic and foreign trade in agricultural commodities.

Strategic International Partners in Agriculture. South Sudan’s private sector is still nascent and domestic private investment in agriculture and livestock is hampered by traditional practices that lack market orientation. Successful implementation of the agriculture development strategy will, necessarily, require the stimulation of local investment in agriculture, which will take time to realize. At this point in time, South Sudan requires robust investment of capital in land and technology; this can only be realized through the attraction of strategic international partners, individual, institutions and even foreign governments willing to invest in agricultural land development, production of high value crops and the development of associated infrastructure.

Infrastructure. Years of war and benign neglect has left South Sudan with destroyed or neglected transport, power, water/sanitation, ICT and other infrastructure and support facilities. The need to rebuild the country’s infrastructure is the subject of South Sudan Infrastructure Action Plan. The implementation of the recommendations of the Plan and agriculture transformation strategy will be key determinants of whether or not the country can transit from the present low production to low productivity mode to a viable, diversified modern economy that is driven by a transformed agricultural sector.

Delivery mechanisms. This will entail use of market driven organizations with policy and regulatory support from 56 Other African countries that have managed similar high agricultural growth rates for a decade or more include Morocco and Togo in the 1980s, and Benin, Cameroon, Malawi and Chad in the 1990s. Burkina Faso and Nigeria also had similar high growth rates during 2000-2005. See World Bank country database at www.WorldBank.org.

Program (CAAADP) provides framework and the Northern Ghana Program the vehicle for national implementation of CAADF; (ii) agricultural transformation using pilot schemes in high potential areas and subsequently replicating and scaling up in other regions (Volha Region and Accra Plains); (iii) holistic and participatory, involving all stakeholders: government, local authorities, resource smallholder farmers and cooperatives; (iv) scaling up using private sector operates, national and international, and (v) work with blueprint comprising detailed designs and execution modules, and delivery units.

Key components of the value chain for the Ghana model were as follows: (i) 200 warehouse entrepreneurs to operate as aggregators of smallholders; (ii) 25-35 private sector-led commercial farms using idle arable land; government facilitates land aggregation and allocation ensuring social equity in value chain crops; (iv) a transversal support system that included farm inputs, credit, infrastructure, and off-farm logistics; and (v) a credibly manned delivery unit under the Ministry of Agriculture to drive implementation.

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government. To this end, the attraction of the right type of FDI will bring with it efficient delivery structures such capital investment in off farm infrastructure (collection, processing and storage systems) and out-grower farmer organizations that ensures that smallholder farmers are integrated into the production and delivery mechanisms.

6.4.4 Expansion of Crop Production

Current status of crop production. As noted earlier, a wide range of food and cash crops is grown in South Sudan depending on the agro-ecological zone. The Green Belt zone with the highest level of annual rainfall is the area with the highest potential for sustained crop production. The crops include cassava, sorghum, groundnuts, sesame, maize, finger millet, cow peas, beans, pigeon peas, vegetables (onions, okra, tomatoes, cabbage, egg plant, cucumber and pumpkins). Rice production was expanded under the Aweil Rice Scheme which collapsed during the war. At the present time some rice production is continuing by farmers who adopted rice production outside the scheme. Coffee is also grown commercially and there are a handful of tobacco farmers. Fruit trees include banana, plantain, pineapple, mangoes and citrus. Other crops include sweet potatoes, yams, and papayas which are grown for home consumption and sale in local markets. The proposed strategy would aim to encourage expansion in most of these activities, subject to access to profitable marketing opportunities.

Strategy for cereals production. The sub-sector is critical to the prosperity of South Sudan, given its importance in the livelihood of a vast majority of the population. The need to revamp the sector and significantly increase production is compelling for the following reasons:

- At the domestic level, South Sudan has the potential to be both self-sufficient and to become a major exporter of cereals. The main constraints to realizing this potential are largely internal and therefore, within the control of the policy makers: marginal use of available arable land, low and declining productivity due to poor farming methods, high marketing margins caused by poor infrastructure, and, proliferation of taxes. The removal of these constraints is not only feasible and within reach but will be transformative and beneficial to the country;

- The opportunity cost of not developing the sector is huge. Cereals, encompassing wheat, maize, sorghum and rice, among other grains, is a US$80 billion a year global industry and the average prices have risen steadily in recent years due to increasing demand from larger and more affluent societies, particularly China, the ever increasing demand for bio-fuels and rising demand for animal feed. These demand-pull forces, aided by erratic weather patterns, have outstripped impressive global technological advances, resulting in ever increasing food prices for rich and poor countries alike. With its agricultural potential the country should be able to beneficially fill some of the huge global cereal supply gap.

Net production of cereal (i.e. less post harvest loss of 20%) stood at approximately 695 thousand tons while consumption was about 885 thousand tons, resulting in the importation of about 200 thousand tons (see Table 6.5). Not only does the shortfall constitute a serious food security challenge, but it also raises the risk of eroding external and fiscal balances, increasing food aid dependency and impeding development of the sector. Against this backdrop, the Ministry of Commerce, Industry and Investment, in collaboration with the Ministry of Agriculture and Forestry, proposed the following targets for the development of the cereals sub-sector by 2016: (i) increase the volume of cereals produced to 1 million tons; (ii) increase yields for cereals from 0.97 tons per hectare to 1.1 tons per hectare; (iii) increase the volume of cereal exports from the current level of 148 thousand tons to 1.5 million tons; and (iv) mobilize $350 million of FDI for commercial production of cereals for the domestic and international markets.

As noted earlier, production of cereals (and other crops) in South Sudan can be expanded by (i) increasing the area of cropped land, and (ii) raising productivity, that is, increasing the amount of production per unit area. The scenario outlined in Table 6.4 above is elaborated on in Table 6.5 below, which incorporates both of these strategies. This Report proposes a doubling of the harvested area of cereals in the decade ahead to about 1.88 million hectares and through improved farm productivity and reduction in the current high level of post harvest losses, raise yields from the current average of about 0.94 tons per hectare to 1.3 tons per hectare by 2020. These strategies, if successfully implemented, would increase cereal production (net of post harvest losses) from about 700,000 tons in 2010 to 2.4 million tons by 2020. Assuming a steady increase in cereal production per capita with improved supply conditions and livelihoods from about 100 kg per person at the present time to 130 kg per person by the latter part of the decade, South Sudan would meet domestic consumption requirements by 2016-2017 and then have an exportable surplus of cereals in the range of 600,000 tons a year by 2020. At recent international prices of about $300 per ton for maize and wheat, the value of cereal production would increase from about $200 million in 2010 to about $700 million a year by 2020, with an exportable surplus of a little under $200 million a year at that time.

| Table 6.5: Projected Production and Consumption of Cereals in South Sudan |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Production      |                 |                 | 2010  | 2011  | 2012  | 2013  | 2014  | 2015  | 2020  |                 |
| Total available cultivated area ('000 ha) | 2,681 | 2,694 | 2,746 | 2,754 | 2,835 | 2,991 | 4,000 | 4.1 |
| Cereal area harvested ('000 ha) | 921 | 500 | 939 | 986 | 1,060 | 1,166 | 1,880 | 7.4 |
| Cereal area as % total cultivated | 34 | 19 | 34 | 36 | 37 | 39 | 47 |
| Production ('000 tons) | Gross | 695 | 475 | 916 | 971 | 1,060 | 1,225 | 2,444 | 13.4 |
| Imports/Exports ('000 tons) | (190) | (480) | (250) | (307) | (330) | (277) | 614 | 13.4 |
| Consumer demand | Cereal consumption ('000 tons) | 885 | 955 | 1,163 | 1,278 | 1,391 | 1,501 | 1,830 | 7.6 |
| Memo items: | Net yield (tons/ha) | 0.75 | 0.95 | 0.98 | 0.99 | 1.00 | 1.05 | 1.30 | 3.2 |
| | Per capita cereal consumption (kg) | 93 | 95 | 110 | 115 | 120 | 125 | 130 | 3.4 |
| | Population ('000) | 9,494 | 10,048 | 10,594 | 11,116 | 11,589 | 12,012 | 14,079 | 4.0 |

Source: Estimates by authors.

Strategy for production of high value fruits and vegetables. With its rich soil and favorable climate, several parts of South Sudan have enormous potential for competitive production of high value fruits and vegetables for the domestic and external markets. South Sudan smallholder farmers cultivate pineapples, mangoes, onions, tomatoes and yams. At the present time, the contribution of these fruits and vegetables to agricultural output is negligible; production has fallen dramatically and so has the export values of these products. Furthermore, the industry has only minimal commercial orientation. In general, by definition, it has become necessary for many fruits and vegetable producers to own or control the entire value chain from production through marketing as this allows the supplier to control the logistics without having to rely on third

A three-pronged strategy has therefore been formulated for expansion of production of high value fruits and vegetables in South Sudan:

- Identification and attraction of the right kind of strategic foreign direct investment;
- Establishment and support of farmer cooperatives that can be linked to larger commercial farms; and
- Linking these commercial farms to regional and international transport and logistics networks.

Box 6.2: Expanding Horticulture Production: a Kenyan Example Company Profile: Homegrown Company Ltd.

Homegrown is the largest vegetable exporter in Kenya. It is a success story of packaged horticulture produce. The company ventured into Kenya in 1982 and focused on processing and exporting vegetables to the United Kingdom. The firm’s strategy has been the production and packaging of produce at the source for export directly to market without further packaging abroad. The firm operates its own nucleus of farm production units to meet a given level of demand, plus a network of farmers contracted to provide the balance. It is an out-grower model.

In order to ensure quality, and supply of fresh produce, Homegrown enters into partnership with local farmers to complement its own production. Through this partnership, the company is able to source about 25% of its requirements in some cases, such as French Beans, 100% of the total requirement from independent farmers (as opposed to employees farming company land). Farmers are supplied with the latest farming technology, such as crop varieties and husbandry techniques. The provision of technical extension by the contractor has played a key role in ensuring that farmers are able to optimize production in both quality and quantity. Homegrown also supplies fertilizers, and agrochemicals on credit to those farmers who need it, as many small farmers still find it difficult to obtain credit despite the importance of the sector. Kenya’s financial market remains somewhat biased against agricultural production.

All farmers supplying to Homegrown must have a supply contract. The contract stipulates the specific commodity, the supply period, the desired quality and quantity, and the price. The system implies that farmers manage production schedules and the necessary inputs to meet the contracts. Farmers also agree to follow recommended crop husbandry practices to maintain required quality. Contracts allow Homegrown an assurance of production. The major constraint faced by the company is ensuring that farmers follow technical instructions so as to produce the required quality and quantity standards. This is especially important for those commodities in which the company is entirely supplied by contracted farmers. The EU market has exceptionally stringent standards for agricultural products, so there is very little room for error.

There are both benefits and constraints to Homegrown out-grower model. Farmers enjoy the benefits of an assured market for their produce, and an assured price for various grades of produce. Homegrown can assure farmers of a market for their produce because of its extensive knowledge of, and connection with, global buyers. Homegrown will also look after the logistics of the sale. The "just in time" nature of the business makes this a critical activity. However, Homegrown requires strict adherence to delivery schedules, agreed quantities and quality standards. The contract terms can be very demanding with little flexibility. Furthermore, farmers sometimes feel that the market price offered by the company is low compared to the prices for the final product, a tension that needs careful management to ensure all parties feel fairly treated.

The MAF has recently outlined a more detailed program for private investment in high value fruits and vegetables (as well as for cereals and tree crops such as oil palm, tea and coffee). Map 6.3 highlights the locations where these investment opportunities may be pursued.60

The foregoing strategy is informed by the characteristics of the market as well as lessons drawn from the experience of Kenya and other Sub-Saharan countries. Kenya is a successful exporter of fruits and vegetables, and is presently the leading all-season supplier of high-quality horticultural products to brand name supermarket chains in the EU and several other countries in Europe. The sector has had phenomenal growth rates averaging over 15% a year with consistently rising annual sales, which reached $330 million in 2010.61 As of June 2011, as many as 22,000 smallholder Kenyan farmers were engaged in export-oriented horticulture, with over 17,000 persons employed by firms across the horticulture value chain. The industry has made a transition from the dominance of an amalgam of smaller farmer/local exporter selling their produce to independent importers in Europe to a fully integrated sector controlled by a few large farms controlling the value chain and selling directly to large supermarkets in the importing countries. These firms are able to (i) provide the logistics at a level that ensures economies in scale in operations; (ii) meet the demand preferences of supermarkets who prefer to deal with a small, but well organized and integrated suppliers; and (iii) adhere to the stringent quality assurance (phytosanitary standards) requirements of importing the countries.

The Kenyan model for development of a high value fruits and vegetables market is built on the following seven key elements.

- **Policy of openness to FDI:** The government has enacted laws and adopted legal frameworks such as the abolition of export and import taxes, allowing residents to open foreign currency denominated accounts and liberalizing borrowing regulations for domestic and foreign companies. In response to these incentives, new investments have been attracted from India, China, United Kingdom, Italy and Germany. Due to its openness, Kenya, as a member of the East African Community and COMESA, now serves as the business hub for investors in Eastern Africa.

- **Upgrade of human capital:** Kenya has moved from low cost labor force to one with critical mass in the
number of workers with skills and technical expertise, capable of meeting the human resource needs of the firms in the sector. Investors point to a competent and motivated and productive labor force,

- **Build key infrastructures:** Kenya has a good network of roads (trunk and feeder) that leads to ports (Mombasa) and Jomo Kenyatta International airport with modern cold storage and freight handling facilities. Kenya’s export processing zones (EPZ) boast of good supply water, electricity and ICT.

- **Decrease investment risk:** Although Kenya is still experiencing high level of corruption, there have been improvements as reflected in Kenya’s ranking in the World Bank Doing Business Index. Kenya laws recognize and protect property rights and the enforcement of contracts. Furthermore, the level of communal violence has decreased in the aftermath of the 2007 election crises.

- **Create business friendly institutions and support industry:** In order to diversify its economic base Kenya created the Industrial and Commercial Development Corporation (ICDC) and the Development Finance Company of Kenya (DFCK). Both organizations provide loan and equity financing. Furthermore, while providing facilitating leadership, the government has allowed firms to operate without undue government intervention or bureaucracy.

- **Improve on natural resources:** Although Kenyan horticulture firms engage in crop production, they have engaged in value adding production system and product transformation such as increase fertilizer use, all season cropping through irrigation farming, and product upgrading through packaging and processing such as canning, drying and freezing.

- **Expand extension services and encourage private sector and civil society organizations:** Kenya farms enjoy a high level of extension services from the Ministry of Agriculture and Rural Development and Kenya Export Development Support (KEDS) and Kenya External Trade Authority, which is responsible for the overall policy direction. The government also provides support to the Kenya Agricultural Research Institute (KARI), the Fresh Produce Exporters Association of Kenya among others.

### 6.4.5 Development of the Livestock Industry

**Current status of the industry.** Livestock production represents a significant proportion of agricultural activity in South Sudan. The main populations of livestock are cattle, goats, sheep and poultry: the main products are meat, dairy products, hides and skin and eggs. Livestock production, especially cattle, is undertaken in the more arid and semi-arid zones such as East Equatoria. Livestock systems are either nomadic pastoralist or mixed crop-livestock systems and are a major source of livelihoods, especially in the floodplains and the semi-arid pastoral areas. Table 6.6 shows the estimated livestock population by state. According to these estimates there are almost 12 million cattle, 14 million goats and 13 million sheep in the country. This population is equivalent to about 2.6 animals per hectare of grassland in South Sudan as a whole and 1 animal per hectare of grassland and savannah. These population densities per hectare are relatively high.

Livestock is an important economic asset, in addition to having a huge cultural value. Ownership of cattle is also a risk mitigation tool for pastoralists and farmers, the latter continually facing uncertainty caused by crop failure. Data from the Ministry of Animal Resources and Fisheries as well as the Food and Agricultural Organization (FAO) indicate that about 85% of South Sudanese households own one or more animal. This suggests that South Sudan has approximately 1.1 million livestock farmers.

Even though livestock is ubiquitous across South Sudan, from the southern equatorial forests to the arid and savannah north, the commercial value of livestock remains negligible. The estimated value of livestock production and products suggest that the income generated currently stands at about SDG 1.4 billion annually, equivalent to only 20% of the sector’s potential. Market value is limited to the sale of red meat, mostly within the immediate local rural market and adjacent urban centers, particularly Juba, Yi and Malakal, some livestock is also sold to Sudan. Several years back South Sudan exported cattle to Uganda and Kenya and through the Port Sudan to Saudi Arabia and other regional markets. Paradoxically, South Sudan currently imports meat from Uganda in spite of having the largest number of livestock per capita in Africa.

**Major challenges facing the livestock industry.** Perhaps, the single most important challenge to the transformation of the industry is social model, which circumscribes market orientation and limits value chain exploitation. Currently, livestock in South Sudan is not viewed as an industry as much as it is a deeply rooted cultural phenomenon that represents the very fabric of South Sudanese society. The livestock ownership is not measured by the market value of the animals; instead, it represents a status symbol that commands respect of the community and provides the owner with a source of nutrition and the ability to settle marriage dowry. Occasionally, cattle owners sell some stock, usually from his/her very old (oxen) stock to generate supplementary income. Consequently, only a small fraction of the commercial value is currently being realized.

#### Table 6.6: State Distribution of Livestock in South Sudan (In thousands)

<table>
<thead>
<tr>
<th>State</th>
<th>Cattle</th>
<th>Goats</th>
<th>Sheep</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td></td>
<td></td>
<td>Share (%)</td>
</tr>
<tr>
<td>Upper Nile</td>
<td>990</td>
<td>651</td>
<td>447</td>
<td>2 088</td>
</tr>
<tr>
<td>Unity</td>
<td>1 189</td>
<td>1 511</td>
<td>1 784</td>
<td>4 484</td>
</tr>
<tr>
<td>Jonglei</td>
<td>1 475</td>
<td>1 423</td>
<td>1 227</td>
<td>4 126</td>
</tr>
<tr>
<td>Northern Bahr el Ghazal</td>
<td>1 590</td>
<td>1 306</td>
<td>1 658</td>
<td>4 554</td>
</tr>
<tr>
<td>Western Bahr el Ghazal</td>
<td>1 256</td>
<td>1 184</td>
<td>1 139</td>
<td>3 579</td>
</tr>
<tr>
<td>Lakes</td>
<td>1 320</td>
<td>1 252</td>
<td>1 489</td>
<td>4 061</td>
</tr>
<tr>
<td>Warrap</td>
<td>1 539</td>
<td>1 313</td>
<td>1 392</td>
<td>3 601</td>
</tr>
<tr>
<td>Central Equatoria</td>
<td>893</td>
<td>1 286</td>
<td>1 173</td>
<td>3 432</td>
</tr>
<tr>
<td>Eastern Equatoria</td>
<td>895</td>
<td>1 042</td>
<td>1 152</td>
<td>3 088</td>
</tr>
<tr>
<td>Western Equatoria</td>
<td>680</td>
<td>1 189</td>
<td>1 152</td>
<td>3 020</td>
</tr>
<tr>
<td>Total</td>
<td>11 816</td>
<td>13 974</td>
<td>12 612</td>
<td>38 402</td>
</tr>
</tbody>
</table>

Source: WFP-FAO-MAF 2006

The prevailing social model is not only a hindrance to growth and poverty reduction in the country, but represents a significant opportunity cost, in terms of lost growth and income. It is also a risk to food security and sustainable development of the country’s natural resources. Projections of South Sudan population growth and domestic and external demand for livestock and livestock products highlight the urgency to transform the current social model into one with a commercial orientation. Furthermore, as the livestock population increases, there will be more pressures on grazing land and water resources, heightening the prospects of more conflicts
among pastoralist and between pastoralists and farmers as they compete for limited fodder and water resources. Transforming and commercializing the sector is, therefore, an urgent necessity. Achieving this transformation will require, in addition to a mindset change, the alleviation of other constraints facing the sector.

The above-mentioned 2006 survey undertaken with the support of FAO and WFP identified a number of concerns among livestock producers, the most important of which was the lack of veterinary services. As Figure 6.2 indicates, 31% of producers cited lack of these services as their main concern.

Even though changing from the social model is the paramount obstacle to transforming South Sudan’s livestock sector into a commercial orientation, several other constraints must be addressed if the sector objective is to be realized. Looming among these other constraints are the following:

- **Weak off-farm infrastructure.** In addition to generalized paucity of basic infrastructure such as roads (trunk and rural/feeder), South Sudan suffers from inadequacy of livestock markets where farmers trade their livestock. Given the size of the country and the dispersion of farmers over a wide area, there is need to create several more markets with the necessary facilities.

- **Insecurity and cattle rustling.** Even though the war in Sudan has formally ended, South Sudan is still faced with pockets of internal insecurity from ethnic conflicts and the existence of factional militia. In addition, cattle raids are still pervasive. Both factors combine to impede trade and limit investment, circumscribing the development of the livestock sector.

- **Lack of trust.** Inter-communal strife and low level of trust among South Sudanese constitute a hidden tax on transactions. In the livestock sector, the absence of trust can hinder the formation of farmer cooperatives and the establishment of partnership in value chain exploitation.

- **Poor breeds.** The prevalence of domestic genotype livestock breeds limits the productivity and yield of the sector. Almost all livestock in South Sudan comprises of the Toposa and Ingesanna indigenous breeds, which have not been upgraded for many generations.

- **Poor animal health.** The prevalence of animal diseases limits the market value of livestock and represents a binding constraint on exports of South Sudan livestock. Rampant existence of tse-tse fly and recurrent outbreaks of Rift Valley Fever effectively quarantine livestock to local markets. Low availability and access to adequately qualified animal health service providers and poor animal husbandry practices among farmers lead to low birth and high mortality rates for both young and mature herd, resulting in low yields.

- **Inadequacy of animal feeds.** South Sudan livestock suffer productivity losses due to poor animal nutrition due to poor or inadequate grazing practices, poor pasture and water management and lack of supplement in animal diet.

- **Nascent private sector and low level of entrepreneurship.** The private sector in South Sudan is under developed and lacks entrepreneurship, stifling the formation and management of agri-business in general and livestock operations, in particular.

- **Challenging economic policy environment.** Several policy factors inhibit growth of the livestock sector. These include: (i) inadequate and high cost of labor; (ii) high transportation costs; (iii) unclear land tenure; and (iv) high and multiple taxation.

### Box 6.3: Insights from the Development of the Livestock Industry in Ethiopia

In 2006 Ethiopia had close to 45 million head of cattle, which is continuing to expand rapidly in number. Ethiopia is currently the largest livestock exporter in the Eastern Africa representing about 10% of the country’s export earnings, which amounted to US$165 million in 2007 with strong showing in live animal sales, meat and hides and skin exports. Export destinations are diversified and include regional markets, Kenya, Somalia, Egypt and Sudan and global destination, primarily: Saudi Arabia, UAE for live animals and meat and, UK and China for hides and skin.

Ethiopia’s exports are driven by small-scale pastoralists and livestock cooperatives that work closely with private sector value chain operators – all with a strong trading mindset; the country has very few large-scale livestock farmers. The government has played a support role in the industry, including: (i) enforcement of animal health and product quality standards, deregulation of domestic prices, liberalizing foreign trade, providing institutional support for the export sector; (ii) promoting a liberal investment climate; and (iii) with the support of state governments, providing access to grazing pastures and water. Support institutions have been created such as high quality SPS labs, an extensive research and development platform that includes several veterinary faculties, and colleges for the training of farmers, health workers and service providers.

Strategy for expansion of the livestock industry. The livestock industry in the country has a very substantial potential to emerge as a major food product industry in the decade ahead. The Government has identified the industry as a principal axis for making agriculture the engine of growth and poverty reduction in the country. Under the medium-term industrial strategy (2011-2016) outlined by the Ministry of Commerce, Industry and Investment in 2011 the key objectives for the livestock sector are: (i) increase domestic sales of red meat from the current level of about $200 million to $250 million a year by 2015; (ii) expand the number of primary markets for livestock from 117 at present to 380 by 2015; and (iii) develop an export market for red meat, with sales of $50 million a year by 2015.

As with programs for cereals production, South Sudan can draw on the experience of Ethiopia for the design of its livestock program (see Box 6.3 above). However, the design of the program must also address the unique constraints facing the sector in South Sudan, particularly with respect to the imperative for a paradigm shift from the social to a market mindset model. A three-tier approach is proposed for attaining the objective: (i) changing mindset set up with a versatile and context relevant information and awareness campaigns; (ii) the creation of a market-based platform; and (iii) with government support, creation of a private sector driven value chain system that focuses on production.

- **Launching a national campaign to change mindset in local communities.** Changing to market and commercially oriented mindset is the single most important factor for the development of the country’s livestock sector. Unlocking the enormous commercial potential will entail a transformational cultural change from the current social model of acquisition and conservation to a commercial market model that monetizes stock through market-based transactions. It will entail the use of a detailed focus group that does the following:
  - Identifies the target audience which is all citizens, particularly livestock farmers.
  - Conveys a clear message that development of a commercial livestock industry will enhance economic welfare.
  - Identifies change agents. These will include commercially oriented farmers, key government advocates with community leadership, logistics providers, and niche markets that can benefit livestock producers.
  - Highlights successful cross-border livestock examples, including Ethiopia, Kenya and Uganda.

- **Creating a sustainable value chain, emphasizing production of high-quality livestock.** The low quality of breeds, poor animal health practices and low quality of animal product safeguards constitute the main technical challenge because of the impact they exert throughout the value chain. In addition, the government should rein in the cattle rustling and improve infrastructure logistics. A key imperative for creating a strong value chain hinges on the production of high quality market-bound animals. Hence emphasis should be placed on:
  - The enactment of policies and regulatory initiatives to raise the quality of cattle and meat. This will entail the adoption of international SPS standards.
  - Improvement of animal husbandry, including technical assistance through the provision of a critical mass of experts who are paired with community animal health workers, and extension service officers that cover all aspects of animal husbandry – from training of farmers to ensure proper feeding and breeding of animals to the establishment of modern slaughter houses and cold storage.
  - An overt effort to produce high quality animals. Government could initiate a time-bound price

### Panyijar, Mayon and Leer in Unity; and Terekeka in Central Equatoria. With support from the Ministry of Animal Resources and Fisheries, the working groups should include all segments of the meat production value chain, including operators of slaughter houses, traders and market agents. The Chamber of Commerce could play a key role in facilitating the working group. Such a market-driven system will value and price animals according to their potential for high meat and hides quality, sending the signal that the value of the meat and hides is above the value that the market places on the intrinsic quality animals.
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subsidy program with a minimum price offer for animals that meet international quality standards. This may entail entering into sales contracts with guaranteed prices. The subsidy should be phased out as soon as market agents are entrenched and equipped to handle grade classification and pricing animals based on quality.

Create quality and reliable infrastructure to enhance timely market access of farmers. The access should include both backbone infrastructure and feeder roads that reduce transport costs and ensure timely arrival of products to the market as well as cold storage and other facilities. Launch a robust survey of regional and international markets to determine demand requirements and develop an action plan to meet the needs of these markets. Given the limited size of the domestic market, a central thrust of the marketing strategy will entail the development of external niche demand markets mimicking relevant elements of the Ethiopian market diversification model.

For the purpose of estimating the water requirements of the livestock industry for the water demand analysis in Chapter 5, Annex Table 6.4 assumes that the livestock population will grow at 3% a year in the decade ahead, with the total population of cattle, sheep and goats exceeding 50 million by 2020. It is by no means certain that the livestock population will grow in this manner, but if it did, livestock densities in South Sudan would rise in the decade ahead, also driven in part by the proposed expansion in cultivated areas. These potential land pressures will require close attention to the manner in which the commercial livestock industry is developed. With a major expansion in commercial farming, it may be that an increasing large share of the livestock population does not migrate but becomes more fully integrated into farming operations that combine cultivation and sale of animals for meat production and into the development of grazing reserves that combine forest reserve management with livestock farming, or integration of livestock farming with tree crop agriculture, including for example, oil palm, cashews, coffee, citrus and mango. In addition to forage found under these plantation crops, products from the tree crops can also be used to increase feed supply for livestock.62

6.4.6 Fisheries and Forestry Development

Fishery development. According to a 2010 baseline survey report on agriculture and animal resources in South Sudan, about 14% of households in South Sudan, particularly those in the Sudan area along the River Nile and its tributaries, engage in fishery as a means of livelihood.63 Detailed statistical data for the industry does not exist because no field assessments have been undertaken; however, the fisheries production potential is believed to be in the range of 100,000 to 300,000 metric tons per year. This is based on combined water surface area of 90,000 square kilometers of the River Nile. According to an FAO (2008) report, aquaculture development may have vast potential in the Central, Eastern and Western Equatoria states, in the Northern and Western Bah El Gazal states, as well as in Warrap state. In addition to river and lake fishing, there is significant potential for fish farming in South Sudan that remains to be exploited.

The main constraints to fisheries development in South Sudan are the absence of policy incentives, lack of storage facilities due to weak or total absence of power supply and the absence of effective processing technologies. In addition, inadequate transport infrastructure which limits producers access to markets, is a deterrent to fisheries development in South Sudan.

Table 6.7: Forest Land in South Sudan (Hectares ‘000)

<table>
<thead>
<tr>
<th>Land use category</th>
<th>Area</th>
<th>Share (% of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest reserves</td>
<td>640</td>
<td>3.1</td>
</tr>
<tr>
<td>Forest plantations</td>
<td>23</td>
<td>0.1</td>
</tr>
<tr>
<td>Other forested areas</td>
<td>20,079</td>
<td>96.8</td>
</tr>
<tr>
<td>Total</td>
<td>20,742</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Table 6.1 and government sources.

62 The integration of livestock intensive crop farming has been studied in some detail in Asia and the Americas, for example, but there has been very little done on these possibilities in Africa. See, for example, FAO, “Integrating Crops and Livestock in West Africa.” Chapter IV. FAO Corporate document Repository. www.fao.org/DOCREP/004/ X3041E/X3041E04.htm.

63 The Joint Baseline Survey Report of the Agriculture and Animal Resources in South Sudan by GOSS/FAO with financial assistance for the European Union. A table summarizing the key agricultural baseline survey indicators as attached in Annex 1.

Forestry. South Sudan has diverse natural forests and woodlands, making it one of the richest areas of concentrations of biodiversity in Africa. It is estimated that natural forests and woodlands of South Sudan cover a total area of about 207,422 km2 or about 33% of the total land area. These moist forests contain valuable commercial products, including cabinet grade timber trees such as mahogany, ebony and teak, among others. In addition to the direct benefits in the form of income, food and fodder for wildlife and domesticated animals, the forests provide valuable indirect benefits in forms of environmental protection (shade, wind belts), improved agricultural production (from increased soil fertility through mulching and nitrogen fixation) and food (Shea butter and wild fruits and fodder for wildlife). As Table 6.7 indicates, forest reserves account for only 3% of the total forested area of the country and commercial plantations are negligible accounting for about 0.1% of the total forested area.

The main challenges to the existing natural forests and woodlands in Southern Sudan include forest base degradation from wild fires; overgrazing and over cutting of trees during successive wars. According to a MAFF-GOSS 2006 report, the productivity of South Sudan natural forests and woodlands is low and declining due to shallow soils found in many areas and intermittent droughts, which limit tree growth. The absence of a strong forestry management, policy and regulations, has also contributed to degradation and inefficiency in forestry development and exploitation.

6.4.7 Infrastructure Requirements for Agriculture

The availability of arable land and favorable climate is a necessary, but not sufficient condition for successful development of the sector. A critical requirement is the availability of logistics, including key off-farm infrastructure, to facilitate timely and cost-effective movement of products to domestic and international markets. The required infrastructure includes, for example, truck and feeder roads, airports with regular flights to market destinations, cold chain facilities that include cold storage at airports and other destinations, reliable road transport services at competitive freight rates, prompt customs clearance for exports and key agricultural inputs that must be imported. To compete effectively in regional and international markets and against imports of agricultural products from neighboring countries, and attract the large amounts of FDI that will be required, South Sudan must have the ability to facilitate the provision of essential off-farm infrastructure. The key requirements include the following:

- A network of market access roads: trunk roads as well as rural feeder roads.
- Off-farm storage and processing facilities.
- Cold chain facilities, including cold storage at airports and other locations throughout the country.
- Reliable supplies of electricity and water.
- Air freight processing stations key airports that can operate 24 hours a day.
- Reliable and economically affordable road and air freight to the main consumer centers in the region and overseas.
- Access to low cost communications networks.
- Adequate supplies of skilled labor.

Some of these facilities would be provided by the national or state governments and some by the private sector. As the discussion in the next Section indicates, where appropriate the latter should be integral parts of the proposed SIAP agreements with potential investors.

Transport requirements for agricultural development. The transport requirements of the country and proposed action plan for addressing these requirements is discussed at some length in Chapter 7. In sum, the current road network is fragmented with many roads unusable during the rainy season. Transport typically entails long travel time and high prices. These shortcomings impedes access to rural and agricultural production areas, leaving them isolated from markets for more than half of the year. There is substantial evidence that investments in roads and improved road connectivity positively affect agricultural productivity and output. Experience from other countries in Sub-Saharan countries indicates that a relatively low level of road infrastructure and market average trip times result in high transaction costs for sales of agricultural inputs and output that, in turn, limits agricultural productivity and growth.64 However, remoteness and demand constraints may not be the only factor limiting production. Improved roads will not reduce transport and marketing costs significantly in the short-term if transport and trade services are not competitive or volumes of marketed products are small. Similarly, production increases may not be forthcoming in the absence of availability of credit, land tenure arrangements that encourage investment and government policies that increase risk.

The Government is keenly aware of the poor state of the road network and of the fact that lack of rural connectivity
• Market Accessibility: An approach used by the African Infrastructure Country Diagnostic studies (2009) focuses on market accessibility of agricultural production zones.

• High Population-High Agriculture Potential Measure: Advocated by the World Bank in its recent report on the agricultural sector of South Sudan, this is a composite measure of accessibility to the road network by areas with both high population density and high agricultural potential.

### Table 6.8: Distribution of Road Network by Zones of Agricultural Potential (kilometers)

<table>
<thead>
<tr>
<th>Agricultural potential zone</th>
<th>Interstate roads</th>
<th>Other primary</th>
<th>Secondary roads</th>
<th>Tertiary roads</th>
<th>Total roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH</td>
<td>389</td>
<td>1,249</td>
<td>1,004</td>
<td>887</td>
<td>3,529</td>
</tr>
<tr>
<td>HL</td>
<td>485</td>
<td>644</td>
<td>1,570</td>
<td>1,416</td>
<td>4,112</td>
</tr>
<tr>
<td>MH</td>
<td>582</td>
<td>874</td>
<td>1,121</td>
<td>2,577</td>
<td>4,098</td>
</tr>
<tr>
<td>ML</td>
<td>276</td>
<td>939</td>
<td>1,193</td>
<td>2,040</td>
<td>3,222</td>
</tr>
<tr>
<td>LH</td>
<td>443</td>
<td>373</td>
<td>535</td>
<td>1,351</td>
<td>1,866</td>
</tr>
<tr>
<td>LL</td>
<td>522</td>
<td>400</td>
<td>862</td>
<td>1,784</td>
<td>2,484</td>
</tr>
<tr>
<td>Total</td>
<td>2,697</td>
<td>4,476</td>
<td>6,285</td>
<td>2,303</td>
<td>15,761</td>
</tr>
</tbody>
</table>


The development and rehabilitation of roads in areas with the highest agricultural potential and population density would have a high development impact, allowing small scale farmers to expand production and compete with food imports in the short-run and commercial firms to penetrate and conquer cross-border market and compete effectively in global markets in the medium to long-run. To facilitate an assessment of the actions needed to improve rural connectivity, the portion of the national road network that is located in each of the six zones of agricultural potential has been estimated. As Table 6.8 indicates, about 10,220 km of roads are located in the three zones with a high agricultural potential (HH, HL and MH) – equivalent to about 65% of the national network, using the World Bank estimates for the size of the national network, which are somewhat larger than the estimates used for this Report in Chapter 7.

For the purposes of this Report, the High Population-High Agriculture Potential Measure has been used to formulate a strategy and action plan to improve rural connectivity in the decade ahead. The approach emphasizes the need to invest in roads in areas with high population density and high potential for agricultural production. Under this approach, priority access is given to regions or areas with “high production potential and high population density” (HH), “high production potential and low population density” (HL), and “medium production potential and high population density” (MH). The objective is to achieve a high Cropland Connectivity (CLC).

Application of the RAI Index with a 2 km requirement for access to the interstate primary road network of South Sudan results in a CLC Index measure of 39%. About 18% of the rural population and 7% of the currently cultivated areas of high agricultural potential are within 2 km of the all season primary road network. This level of rural connectivity was judged to be too low. However, if the rural population and high potential agricultural land that is within 5 km of an all-season road is used, the CLC Index measures 64% for that part of the country that is classified as having high agricultural potential. About 51% of the total cropland and 71% of the rural population in these high potential areas would be within 5 km of all-season roads. This level of road access is judged to provide the basis for a strong agricultural supply response.

### Table 6.9: Length of Road Required for Rural Connectivity Target (in kilometers)

<table>
<thead>
<tr>
<th>Road category</th>
<th>Required all-season roads</th>
<th>Total roads</th>
<th>Required as % of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstate primary roads</td>
<td>2,697</td>
<td>2,697</td>
<td>100.0</td>
</tr>
<tr>
<td>Other primary roads</td>
<td>2,764</td>
<td>4,476</td>
<td>61.8</td>
</tr>
<tr>
<td>Secondary roads</td>
<td>3,695</td>
<td>6,285</td>
<td>58.8</td>
</tr>
<tr>
<td>Tertiary roads</td>
<td>2,303</td>
<td>2,303</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>11,459</td>
<td>15,761</td>
<td>72.7</td>
</tr>
</tbody>
</table>


To provide this level of access to an all-season network of roads, about 11,460 km of existing roads would need to be converted to all-weather status, either as paved roads or all-weather gravel roads. This includes the above-mentioned 10,220 km of roads in the zones with high potential and the balance of 1,240 km of the interstate road network. Such a program would convert about 73% of the existing road network in South Sudan to all-weather status. Analysis of the location of these roads relative to the land areas that are classified as having high potential for agriculture indicates that the bulk of the roads are in the three Equatoria states and Jonglei. These four states account for almost 80% of the all-weather road network required to meet the rural connectivity target. Most of this proposed all weather network is located in the Greenbelt (34% of the proposed network), the Hills and Mountains agro-ecological zone (22%) and the Pastoral zone (21%). As Table 7.7 in Chapter 7 indicates, the proposed program put forward in this Report to improve road connectivity in the decade ahead calls for the upgrade of 14,560 km of road to paved and all-weather status, including a notional allocation for 2,180 km of tertiary roads pending the results of the ongoing inventory of the road network, that will determine the actual length of the tertiary network in place today.

Additional road development targeting areas with high potential for irrigation-based commercial agriculture should also be prioritized and rehabilitated on the merit of the expected high pay-off in terms of agricultural expansion, employment creation and technology transfer. As Map 6.4 indicates, areas with high irrigation potential for possible development in the decade ahead include areas of Western Equatoria, Eastern Equatoria, and parts of the Western Flood Plain Zone, including Northern Bahr el Ghazel and Warrap.

### Table 6.10: Proposed Distribution of All-Season Roads for Enhanced Rural Connectivity (In kilometers)

<table>
<thead>
<tr>
<th>State</th>
<th>Interstate roads</th>
<th>Other primary</th>
<th>Secondary roads</th>
<th>Tertiary roads</th>
<th>Total roads</th>
<th>Share of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Nile</td>
<td>-</td>
<td>9</td>
<td>17</td>
<td>-</td>
<td>26</td>
<td>0.2</td>
</tr>
<tr>
<td>Unity</td>
<td>-</td>
<td>72</td>
<td>15</td>
<td>-</td>
<td>87</td>
<td>0.8</td>
</tr>
<tr>
<td>Jonglei</td>
<td>84</td>
<td>553</td>
<td>660</td>
<td>590</td>
<td>1,886</td>
<td>16.8</td>
</tr>
<tr>
<td>Northern Bahr el Ghazel</td>
<td>200</td>
<td>72</td>
<td>126</td>
<td>-</td>
<td>397</td>
<td>3.5</td>
</tr>
<tr>
<td>Western Bahr el Ghazel</td>
<td>286</td>
<td>75</td>
<td>140</td>
<td>-</td>
<td>501</td>
<td>4.5</td>
</tr>
<tr>
<td>Lakes</td>
<td>575</td>
<td>69</td>
<td>232</td>
<td>2</td>
<td>878</td>
<td>7.8</td>
</tr>
<tr>
<td>Warrap</td>
<td>129</td>
<td>130</td>
<td>282</td>
<td>-</td>
<td>542</td>
<td>4.8</td>
</tr>
<tr>
<td>Western Equatoria</td>
<td>578</td>
<td>512</td>
<td>686</td>
<td>539</td>
<td>2,326</td>
<td>20.7</td>
</tr>
<tr>
<td>Central Equatoria</td>
<td>587</td>
<td>891</td>
<td>188</td>
<td>562</td>
<td>2,220</td>
<td>19.8</td>
</tr>
<tr>
<td>Eastern Equatoria</td>
<td>256</td>
<td>305</td>
<td>1,192</td>
<td>610</td>
<td>2,363</td>
<td>21.1</td>
</tr>
<tr>
<td>Total</td>
<td>2,697</td>
<td>2,687</td>
<td>3,539</td>
<td>2,303</td>
<td>11,226</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Ministry of Roads and Bridges.
Water resources and irrigation. Before the second war broke out in 1983, the overall plan for irrigation development in Southern Sudan was to irrigate about 270,000 ha of land.46 Because of the ensuing conflict these plans were not realized and there has been no significant development of the country’s irrigation potential. The current area of irrigated crop area is negligible occupying only 321 sq km (32,100 hectares) – less than a tenth of one percent of national land space. About 12,700 sq km of the irrigated cropland in Southern Sudan is in Upper Nile state, irrigated areas in Jonglei and Western Equatoria states are 300 and 500 ha respectively, with the remaining 18,600 ha in small parcels of land across the country. In addition, about 6,000 ha of flood land, confined primarily to Northern Bahr el Ghazal, is used for rice production. By livelihood zones, Eastern Flood Plains has most of the national irrigated cropland, followed by the Green Belt and Nile Sobat River Basin.

Given the country’s rich land and water endowment, the potential for irrigated agriculture is large. With its substantial water resources, South Sudan can, though irrigation, increase agricultural production by converting into cropland, some parts of its land cover that is currently not under cultivation or is cultivated only periodically. The MWRI has identified irrigation as means for attaining food security and improvement of water management for agriculture and as a remedy to the dual problems of recurrent droughts and periodic floods. The locations for potential development include the following: (i) the lowlands, where farmers make use of flooding to supplement water for growing rice; (ii) areas adjacent to river floodplains, where farmers cultivate short-maturing varieties of sorghum; (iii) areas around swamps/marshes where extension of the growing season is possible by planting in moist soils left by receding floods; (iv) drought-prone eastern mountainous and semiarid areas with low water storage and infiltration capacity; and (v) southwest and western (Green Belt zone) whose agricultural output usually exceeds subsistence level and where modern irrigation techniques can further increase agricultural production, enhance food security and supply agro-industries.

The choice of locations for irrigation development should be guided by the prospects and potential to increase cropland and cropping season (i.e. LGP) in areas where, due to low rainfall, unutilized arable can be converted to cropland using irrigation schemes to harness water resources for agricultural production. The analysis of the classification of aggregated land use in South Sudan shows that 27% of existing cropland is located in areas where agricultural potential is high (LGP > 220 days) while as much as 42% is located in areas with medium to low potential because of low LPG. Furthermore, as underscored earlier, the areas with medium to low LGP have high population densities. On this basis, the best opportunities for expanded smallholder and commercial irrigated-based agriculture appear to be in parts of the Eastern and Western Flood Plains, the Nile-Sobat Rivers area, and the Green Belt zone.

Nile-Sobat River Basin Irrigation Schemes. The potential area that can be irrigated in the Nile-Sobat River Basin is estimated to be about 654,700 ha. On average, the annual rainfall in the Basin area is between 200 to 400 mm. However, with the introduction of irrigation, the area acquires huge potential for increased agricultural production. Development of this potential would make a significant contribution to agricultural output, enhance food security and boost export earnings. It is anticipated that crops such as sorghum, rice, maize, oil seeds (groundnut, sesame, sunflower) and gum acacia would feature prominently in these programs because of the suitability of the soil as well as the large unmet domestic, regional and global demand for these commodities. Along with the introduction of large-scale commercial irrigation, there are opportunities for development of small- to medium-scale irrigation schemes (primarily for production of rice and possibly sugar cane) in the following areas of the Nile-Sobat Basin:

- Between Geigar and Gelhak, the development of pump schemes for smallholder farmers is feasible. As much as 11,840 ha could be irrigated in this manner.
- Between Gelhak and Melut there is an estimated irrigable area of 27,890 ha.
- Between Melut and Malakal an area estimated at 17,000 ha could be irrigated.

Western and Eastern Flood Plains Irrigation Scheme. As with the Nile-Sobat River Basin, the Western and Eastern Flood Plains have a significant proportion of its land area prone to floods. It is estimated that as much as 600,000 hectares of land could be converted into cropland in Warrap, Unity and Jonglei states. However, in these two zones a large amount of the total landmass is covered by trees, flood land and water with rocks. Before this potential can be developed, extensive due diligence and environmental assessments must be first undertaken to ensure that such development is sustainable and based on sound environmental and ecological principles. Moreover, construction of such schemes must also be in compliance with the evolving provisions of the Nile Basin Initiative on water resource management/utilization. Within these two zones, flood rice and sugar cane can be grown on a commercial scale to meet local demands and generate export earnings. Furthermore, alongside irrigation for crop farming, there are opportunities to construct water catchments for better management of floods and droughts and for provision of a year-round supply of water for livestock farmers. There are good prospects for commercial livestock farming in the medium term.47 In addition to facilitating crop and livestock farming, the construction of catchments will contribute to a reduction of the incidence of cattle raiding and the attendant ethnic conflicts over control of water resources, which is prevalent in the zones.

Mangalla Irrigation Scheme. Mangalla is located at the confluence of the White Nile and one of its tributaries in Central Equatoria state. The area has considerable potential for large commercial farming using irrigation to produce sugar cane. The region has rich alluvial soil within a vast marshy plain from the overflow of rivers during the rainy season. It is estimated that approximately 250,000 hectares can be irrigated. Mangalla is only 45 km from Juba. It has good market access and power supply from bagasse and presents opportunities for operating a cane processing plant that could supply domestic and regional markets.

Irrigation schemes in the Green Belt Zone. As noted earlier, the Green Belt has a high LPG in addition to being densely populated. It is among the livelihood zones with the highest agricultural potential, having both a long growing period and relative high population density. The zone has approximately 508,000 ha of virgin land under tree cover, some of which can be converted into agricultural land. The introduction of irrigation schemes would provide significant opportunities for year-round cropping activities. The development of small- to medium-scale irrigation schemes in the Green Belt would increase agricultural production and income of smallholder farmers engaged in fruits and vegetables farming. The region’s proximity to EAC and COMESA regional markets with sizable unmet demand for cereals and oilseeds provides good market opportunities for producers. In addition, the region has easy and fast access to international markets through the seaport of Mombasa and Juba and Nairobi international airports. Nairobi airport is known to have world-class produce handing logistics for exporters of fresh fruits and horticulture.

MAP 6.4: Location of Prospective Areas for Development of Irrigation Schemes

46 Among the schemes considered are the Mangalla Sugarcane Scheme in Central Equatoria, Parakw (Pokto) scheme for different varieties of crops in Jonglei and, with support from UNDP and FAO, the Aweil Rice Scheme in Northern Bahr el-Ghazal. The Aweil scheme was expected to irrigate an area approximately 2,440 ha.

47 The livestock population of Jonglei, Unity and Warrap accounts for 35% of total livestock in South Sudan.
A possible program for irrigation development. As a first step in the development of this potential, this Report proposes that as a matter of priority, a master plan for irrigation development be prepared for the decade ahead. The master plan will need to give particular attention to the amounts of existing or potential cropland to be brought under smallholder irrigation schemes and the amount to be developed under medium- and large-scale commercial farming and the likely investment cost per hectare. Construction costs in South Sudan are known to be high. In the event that water related investment costs per hectare for large-scale commercial operations were say $6,000 per hectare, it is entirely possible that the viable area of irrigation land would decline substantially. Furthermore, the proposed program for irrigation development needs to be drawn up within the framework of a national water resources strategy that includes close attention to the domestic and regional institutional arrangements for development of these water resources, along the lines outlined in Chapter 5.

Table 6.11: Proposed Investment Program for Irrigation Development

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land under irrigation (hectares '000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smallholder program</td>
<td>32.1</td>
<td>35.0</td>
<td>40.0</td>
<td>50.0</td>
<td>60.0</td>
<td>80.0</td>
<td>200.0</td>
</tr>
<tr>
<td>Large scale commercial</td>
<td>-</td>
<td>(15.7)</td>
<td>(2.9)</td>
<td>3.5</td>
<td>25.9</td>
<td>52.0</td>
<td>200.0</td>
</tr>
<tr>
<td>Total</td>
<td>32.1</td>
<td>19.3</td>
<td>37.1</td>
<td>53.5</td>
<td>85.9</td>
<td>132.0</td>
<td>400.0</td>
</tr>
<tr>
<td>Capital cost per hectare (US$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Estimates by authors.

Attracting high impact foreign direct investment.
As a direct consequence of decades of war and abject neglect, there has been near complete depletion of the country’s technical, institutional, financial, man-made and social capital, which has, in effect, circumscribed the country’s ability to engineer and sustain development and growth without direct foreign assistance, particularly, foreign direct investment. The lack of financial and technical resources required for the country to achieve its development objectives is clearly evident in the agriculture sector. As discussed in the preceding sections of the Chapter, notwithstanding its natural land and water resource endowments, the agriculture sector is producing at substantially below capacity with yields that are far below those of less endowed neighboring countries. If the country is to achieve an export-led agricultural transformation and growth, it must attract high impact foreign direct investment and link it to the country’s smallholder farmers and farmer cooperatives. Further, given the importance of cereals in the food basket of the population, the cereals industry should be at the center of efforts to strengthen the traditional sector and lay the foundations for a competitive performance in export markets.

The challenge is to identify and attract the right type of foreign direct investment to South Sudan: those with high impact on development and that contribute to building the capital base of the country. South Sudan can benefit from the experience of many other African countries in this regard. The recent experience of South Sudan’s neighbors provides a valuable lesson, on the type of Strategic International Agriculture Partners (SIAP) that South Sudan should seek to attract. Summarized below are a set of best practices and insights from Ethiopia, Ghana, Kenya, Uganda and other East African countries. Experience elsewhere in the region suggests that there are three widely used operating models for large-scale commercial agriculture:

- **Investor Controlled Model**, under which the investor manages the farm and is the sole entity that grows, harvests and markets crops.
- **The Out-grower Model**: Under this model, the investor does not directly engage in large-scale farming; instead the investor relies on local farms and a farmer groups and independent suppliers to produce crop, which the investor then purchases. A prerequisite for operational


45 As a first step in the development of this potential, this Report proposes that as a matter of priority, a master plan for irrigation development be prepared for the decade ahead. The master plan will need to give particular attention to the amounts of existing or potential cropland to be brought under smallholder irrigation schemes and the amount to be developed under medium- and large-scale commercial farming and the likely investment cost per hectare. Construction costs in South Sudan are known to be high. In the event that water related investment costs per hectare for large-scale commercial operations were say $6,000 per hectare, it is entirely possible that the viable area of irrigation land would decline substantially. Furthermore, the proposed program for irrigation development needs to be drawn up within the framework of a national water resources strategy that includes close attention to the domestic and regional institutional arrangements for development of these water resources, along the lines outlined in Chapter 5.

Subject to the completion of a master plan for irrigation that addresses these foregoing concerns, an indicative program for the development of 400,000 hectares of irrigated agriculture has been included in the program for agriculture. The underlying assumption is that 50% would be smallholder farm development and 50% would be large-scale commercial farming with links to the smallholder outgrowers. Assuming application of best practice investment costs, the water related component of the program would cost $1.6 billion (Table 6.11). The $600 million for commercial farm operations would have to be mobilized from private investment. The $400 million required for smallholder development would have to be funded from public sources using Government and donor resources. Assuming the program was successful in concentrating on the production of high value crops that yielded revenue of say $2,000 a hectare, gross revenues from the program would amount to about $1 billion a year. This would be a substantial contribution to the GDP of the country, to employment opportunities and to import replacement and/or export revenues.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative capital cost (US$ mill)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smallholder program</td>
<td>64</td>
<td>70</td>
<td>80</td>
<td>100</td>
<td>120</td>
<td>160</td>
<td>400</td>
</tr>
<tr>
<td>Large scale commercial</td>
<td>(47)</td>
<td>(9)</td>
<td>10</td>
<td>78</td>
<td>156</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>23</td>
<td>71</td>
<td>110</td>
<td>198</td>
<td>316</td>
<td>1,000</td>
</tr>
<tr>
<td>Annual capital expenditure (US$ mill)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smallholder program</td>
<td>-</td>
<td>5.8</td>
<td>10.0</td>
<td>20.0</td>
<td>20.0</td>
<td>40.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Large scale commercial</td>
<td>(47.0)</td>
<td>38.3</td>
<td>19.2</td>
<td>67.4</td>
<td>78.2</td>
<td>106.9</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>(41.2)</td>
<td>48.3</td>
<td>39.2</td>
<td>87.4</td>
<td>118.2</td>
<td>156.9</td>
<td></td>
</tr>
</tbody>
</table>

Source: Estimates by authors.
effectiveness of this model is the existence of a well-organized and coordinated structure of local out-grower farmers, with sound agricultural knowledge and capacity to maintain standard and produce high quality crops with minimum supervision from the investor. Investors in bio-fuel schemes often use this model.

- **Hybrid Model.** This model combines elements of the investor controlled and out-grower models. Under the hybrid model, the investor maintains a large scale farm and also buys crops from local out-grower farmer groups or cooperatives. A key advantage of this model, at least from South Sudan's standpoint, is that the investor plays a role in organizing and training local farms, thus the community benefits from employment, income, and knowledge and technology transfer. It is common for the investor to initiate this model. However, many African countries, including Ghana, Morocco, Kenya and Ethiopia have developed investment criteria that mandate the foreign investor to integrate traditional farmers and local out-grower producers in the firm's production and supply chain structure.

The position taken in this Report is that South Sudan should identify and attract a SIAP that falls with the Hybrid Model because the relevant local community will benefit from employment opportunities arising from scale operations of the investors as well as the technical transfer and managerial knowledge. The Government should aggressively seek out this type of investors using the resources of the country’s investment promotion agency. The Government should also develop structured investment standards and codes that would ensure the inclusion of South Sudan’s smallholder farmers and farmers groups in the chain of the international scale farmer. Prior to entering into SIAP agreements, the Government of South Sudan may want to draw on international experience with best practice SIAP models.

**Design and implementation of SIAP agreements:** The principal actors are usually the national host government and the international agricultural partner. The foreign partner can be a foreign government, a sovereign wealth fund, a private enterprise endorsed by its home country government. Depending on structure of the deal, other actors, such as multilateral financial institution such as the World Bank or the African Development Bank, or MIGA may be included. The need to involve the host country’s government is pivotal because it is the authority best suited to negotiate with state and local governments as well as civil society; structure a legally binding agreement; and, place the investment within the framework of the national development plan. The involvement of the national government also ensures a uniform approach and avoids the prospects of different localities offering competing concessions.

In order to maximize the mutual benefits of the investor and the host country its citizens, the following factors should be central to the agreement:

- **Duration of the agreement.** Land leases (not outright sale) range from 10-99 years. The actual duration will depend on the crop. For example, for annual crops, the duration typically does not exceed 30 years.

- **Labor force and technology transfer.** Most SIAPs agree to recruit and train the local labor force. Labor force is a subject of mutual interest of the country and the investor. SIAPs are concerned about the availability of dependable labor force from which they can draw from, the host country and involved communities are interested in employment creation and development of the host country, country very often transforming the sector from dependence on traditional agricultural methods using simple equipment to the use of mechanized equipment (tractors) and other productivity-enhancing tools and equipment.

- **Compensation.** In addition to taxes, it is common for compensation to include the construction of community facilities such as rural roads, irrigation schemes, water treatment and supply systems, schools, clinics and as well as the training of local farmers or farmer groups on agricultural methods, raising their knowledge and productivity.

- **Land.** Property rights and enforceable land lease contracts are central in land deals as is the protection of the land rights of the community. The involvement of the host government and civil society is central to ensuring the safety of the SIAP investment as well as securing equitable compensation to the community. The central government is best suited to arbitrate and protect the rights of the investor as well as the communities involved in the host country. A good and transparent land deal will entail early involvement of civil society, creating a process where the voices of community members can be heard and their concerns addressed. The deal must be seen to be fair and seen to be equitable in terms of quantity, quality and price of the land involved. Some land deals also address water access issues, including annual water rents.

- **Yield.** One of the many advantages of large-scale farming is that it can contribute to national food security by increasing yields and supply of crops in the domestic market. Agreements usually specify the percentage of output of the investor that must be sold in the domestic market. The yield percentage must be clearly specified in the agreement.

- **Taxation.** When structuring agreements care must be taken to balance the tax revenue interests of the state and the profitability of the investor. Depending on the crop and complexity of the farming operation, investors would like to monetize their investments as soon as possible and often seek the granting of tax holidays in order to generate quick cash flows. Other provisions in the agreement deal with land transfer, land duties and transfer of profits to the investor's parent company in foreign countries.

- **Security.** Having a stable and political and economic environment is of utmost importance to the investor. Security is a subject of mutual interest of the country and the investor. An investor perceives high political risk such as conflict situations, unstable policy environment with the prospects of theft or government expropriation, then it would not enter into agreement. It is not unusual for investors to demand a stabilization clause to ensure that the regulatory framework governing investment is not threatened. Both the government and the investor are interested in and will ensure the inclusion of a fair arbitration process that will address disputes that may arise.

### 6.4.9 Linking Strategic Investors to Smallholder Farms and Cooperatives

In order to maximize the benefits from foreign direct investment local stakeholders must be mobilized and actively linked to the larger commercial farmers. Furthermore in order to create effective farmer cooperatives that will supply the larger commercial farmers, the members of the cooperatives must be trained by the commercial farmer on modern farming approaches, including the application of fertilizer and pesticides and on methods of ensuring high standard of products.

In recognition of the importance of logistics and access to good arable land and favorable climate (mainly in the Green belt zone) and air/freight services and communities within a radius of one hundred miles to the Juba airport should be targeted. Farmer-based organizations and cooperatives, under the guidance of the Ministries of Agriculture and Forestry and Rural Development and Cooperatives, would enter into supply agreements with the commercial farmers. A technical assistance package for farmer-based organizations and out-growers would be designed and supported by the commercial farmers and the government. Key issues to be addressed in the technical assistance packages would include fertilizer availability and use, seed cultivation and multiplication, integrated pest control and management, and post-harvest management.

**Government should facilitate the leveraging of the strategic partner basket of resources to support the traditional sector.** It is well known and empirically documented that most international agricultural investors provide financing resources, technology, off-farm and some basic infrastructure. To galvanize the impact of these benefits, the government should support the creation of agro-business hubs and formation of community-based grower cooperatives and other farmer-based organizations that would be linked with the foreign commercial scale operations in their area. These integrated clusters of the traditional sector are to be channeled through the government, in partnership with commercial farm, could provide technical assistance packages, design some basic infrastructure as well as provide technical and managerial training in very cost ways.

**The strategic partner can deliver technical assistance.** Raising the productivity of the country’s cereal subsector is imperative. The country cereal producers have the lowest yields in Africa. The presence and support of the strategic commercial farmer can reverse this phenomenon. GoSS, through the Ministry of Agriculture, the state level ministries and county departments of agriculture, in partnership with the scale farmer can provide technical training to extension officers and the establishing of farmer field schools.

**Strategic farmers can assist seed production programs.** With support from government, the strategic international farmer could facilitate the establishment of viable county seed production units. Within the framework of a supply chain that links the international scale farmer to traditional farmers organization, the international farmer will benefit from the establishment high yield seed production units. The government should provide a time-based subsidy to the seed units pending when farmers’ operations become financially self-supporting.

**Fertilizer production and distribution.** At the present time, the vast majority of traditional farmers do not use any synthetic fertilizer, herbicide or pesticide, which, in part, accounts for the low yields relative to farmers in the broader region. GoSS, through the Ministry of Agriculture and Forestry, in close collaboration with the scale farmer, should earmark funds for financing the establishment of a fertilizer production and distribution system that enables farmers and farmer based organization to acquire fertilizer in a timely and cost effective manner.

**Higher quality and more widely available extension services.** Continuous training and development is an absolute necessity in order to upgrade the competitiveness
of the cereal industry. Specific and downtrodden targeting of agronomists should be institutionalized and administered though State and County government structures. Training/ skills development is needed in:

- Production practices of the different grains
- Food science and practical skills in grain processing as business units
- General business skill (including farm management and financial, marketing and risk management
- Pesticide use and handling, market quality assurance and SPS requirements
- Collection, handling and interpretation of market and business information

Adaptive research. Sustainable competitiveness of the South Sudan cereal sub-sector will depend on its ability to adopt and adapt latest and relevant production and processing technologies. A research laboratory that aims at commercial application of such technologies will ensure that extension services provide and dovetailed to South Sudan circumstances.

Mechanized farming equipment. Currently approximately 80% of local production comes from small and traditional farmers. Only a tiny proportion is mechanized agriculture, and the remaining 20% of production is predominantly due to commercial scale farmers. Mechanization of mechanized tractors is equitable and that they are available to female farmers should be trained in basic tractor operations, training program for operators. In this regard, selected women farmers should scale up the acquisition and distribution of tractors there are concerns regarding the capacity to maintain these tractors. The other is investment undertaken on medium- and large-scale farms that are undertaken primarily with the use of farm labor with little or no use of outside capital. The other is investment undertaken on medium- and large-scale farms that are undertaken primarily with the use of farm labor with little or no use of outside capital. The other is investment undertaken on medium- and large-scale farms that are undertaken primarily with the use of farm labor with little or no use of outside capital.

A comprehensive list of ongoing donor-funded capacity building and technical support is not available for the Ministry of Agriculture and Forestry, the Ministry of Animal Resources and Fisheries, and the government ministries responsible for the agriculture sector. Information from the AIMS database of the MoFEP identifies $11.5 million of technical support and capacity building in 2010, with actual disbursements of $6.4 million during the year – equivalent to 11% of and 9.4% of planned and actual total disbursements in 2010. There is significant provision of technical support and capacity building in other ongoing programs supported of donors. For the purposes of this Report, it is assumed that the total amount of technical support and capacity building funded by donors in 2010 was 30% of their total disbursements. This puts the total amount of such support at about $27 million a year at the present time. The total operating budget (salaries plus operating expenses) of the MoAARF taken together for 2010 and 2011 was $19 million equivalent (Table 6.11). Donors and government are therefore spending about $50 million a year on agricultural services of various kinds (other than capital expenditures) – equivalent to about $35 a year for each rural household. It is not clear how much of these services provide reasonably direct benefits to the rural population of the country. The position taken in this Report is that for successful implementation of the proposed strategy for agriculture, there will have to be a major expansion in basic extension and other services to smallholder farmers, pastoral and fishing families. Some of the increase in services will come from commercial investors under the proposed out grower models; but there will also have to be a substantial increase in public support services as well.

In the early stages of the program, build-up in these public service capacities would be undertaken by the government with strong support from the international donor community. In the latter part of the decade, large scale commercial investors would become important suppliers of services to smallholder farms that contract to supply agricultural, livestock and fisheries products on a regular basis. As Table 6.11 indicates, operating services funded by the government an donor community would need to increase to close to $100 million a year by 2020, with much of the $50 million increase going into extension, veterinary and other direct services to farm families.

6.5 Development Expenditure Requirements and Financing

The proposed program for agriculture, forestry and fisheries will require a significant build-up in recurrent and capital spending in the sector. The program for the decade ahead is built around three broad thrusts: (i) a major expansion in private investment in medium- and large-scale commercial farming to supply the domestic and international markets with a range of food products and agricultural raw materials; (ii) a substantial build-up in public spending on services provision, especially for smallholder farms, combined with efforts to improve access to working capital loans and agricultural inputs; and (iii) a substantial improvement in the quality of infrastructure in these areas, in the degree of access to markets and in the cost of the infrastructure services.

### Table 6.12: Indicative Cost for Development of the Agriculture, Forestry and Fisheries Sector ($ millions at 2010 constant prices and exchange rate)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Management and service provision</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National government</td>
<td>18.3</td>
<td>19.9</td>
<td>21.9</td>
<td>24.5</td>
<td>27.4</td>
<td>30.7</td>
<td>54.1</td>
<td>342.8</td>
<td></td>
</tr>
<tr>
<td>Capacity building &amp; technical support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donor programs</td>
<td>21.9</td>
<td>27.1</td>
<td>28.5</td>
<td>30.5</td>
<td>35.1</td>
<td>33.0</td>
<td>36.8</td>
<td>326.3</td>
<td></td>
</tr>
<tr>
<td>Donor programs</td>
<td>25.0</td>
<td>30.0</td>
<td>60.0</td>
<td>100.0</td>
<td>150.0</td>
<td>206.0</td>
<td>675.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-total</td>
<td>80.1</td>
<td>109.3</td>
<td>158.8</td>
<td>218.1</td>
<td>289.1</td>
<td>367.6</td>
<td>934.5</td>
<td>4,835.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22.4</td>
<td>36.0</td>
<td>54.2</td>
<td>72.6</td>
<td>93.0</td>
<td>115.3</td>
<td>227.0</td>
<td>1,306.8</td>
<td></td>
</tr>
<tr>
<td>Donor funding</td>
<td>72.9</td>
<td>90.3</td>
<td>95.0</td>
<td>100.0</td>
<td>105.0</td>
<td>110.0</td>
<td>122.5</td>
<td>1,087.8</td>
<td></td>
</tr>
</tbody>
</table>

69. See Annex 7 for a discussion of the basis for these estimates.
South Sudan: An Infrastructure Action Plan

Growth in basic services (% p.a.)

6.5.2 Public Expenditures on Agriculture, Forestry and Fisheries
In 2010, public spending on programs for agriculture, forestry and fisheries amounted to about $95 million, including donor support in the amount of $73 million and national budget expenditures of $22 million equivalent. Public expenditures on programs for which the Ministry of Animal Resources and Fisheries is responsible amounted to about $30 million equivalent in 2010; for Ministry of Agriculture and Forestry programs, total public spending was about $65 million. At the time this Report was prepared, total outlays in 2011 were estimated to be about $125 million.

Table 6.13: National Government Expenditures on Agriculture, Forestry and Fisheries (In SDG millions)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Realized expenditures</th>
<th>Budget 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Agriculture &amp; Forestry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recurrent expenditure</td>
<td>28.044</td>
<td>36.950</td>
</tr>
<tr>
<td>Capital expenditures</td>
<td>4.797</td>
<td>25.345</td>
</tr>
<tr>
<td>Sub-total</td>
<td>33.841</td>
<td>62.295</td>
</tr>
<tr>
<td>Ministry of Animal Resources &amp; Fisheries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recurrent expenditure</td>
<td>15.527</td>
<td>21.656</td>
</tr>
<tr>
<td>Capital expenditures</td>
<td>4.899</td>
<td>22.176</td>
</tr>
<tr>
<td>Sub-total</td>
<td>20.426</td>
<td>43.832</td>
</tr>
<tr>
<td>Total for two ministries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recurrent expenditure</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Capital expenditures</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>46.847</td>
<td>106.127</td>
</tr>
</tbody>
</table>

The United States of America and European Union have the largest ongoing programs with commitments of almost $70 million and $50 million respectively (Table 6.15). The MDTF, Canada, Common Humanitarian Fund and World Bank account for another $60 million of the ongoing commitments. The other 10 donors account for the balance of $10 million of ongoing commitments, six of whom have programs of less than $2 million. The fragmentation of the donor program is a matter of concern for the National Government. The proposed action plan for agriculture set forth in this Report calls for a carefully focused set of public and private interventions in selected geographic areas of the country, backed by programs of technical support and capacity building at the national and state levels. Successful implementation of this strategy will require a close attention to issues of donor coordination in the sector.

Table 6.14: Ongoing Donor Funded Agriculture, Forestry and Fisheries Projects ($ thousands)

<table>
<thead>
<tr>
<th>Category</th>
<th>Realized expenditures</th>
<th>Budget 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock</td>
<td>6.423</td>
<td>1.213</td>
</tr>
<tr>
<td>Fisheries</td>
<td>9.390</td>
<td>1.737</td>
</tr>
<tr>
<td>Forestry</td>
<td>4.197</td>
<td>2.187</td>
</tr>
<tr>
<td>Crops and other</td>
<td>2.67</td>
<td>1.124</td>
</tr>
<tr>
<td>Total</td>
<td>192.247</td>
<td>192.247</td>
</tr>
</tbody>
</table>


Capital outlays by the national government have averaged less than $10 million a year in the past two years. However, the strategy set forth in this Report calls for a substantial build-up in government capital spending on farm service facilities, and extension and research services. As Table 6.12 indicates capital outlays by the government would buildup to about $170 million a year by 2020, a level that would be substantially larger than the proposed donor program. These capital expenditures would, for example, include the $50 million a year being spent on expansion of public irrigation schemes for smallholder farms in 2020. In this scenario, donors would increasingly become cofinancers with the government in these capital works programs, in contrast to the current situation where donors fund a substantial part of the capital works program independent of the government.

Table 6.15: Ongoing Donor Funded Agriculture, Forestry and Fisheries Projects ($ millions)

<table>
<thead>
<tr>
<th>Category</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock</td>
<td>8.294</td>
<td>2.809</td>
<td>1.647</td>
<td>420</td>
<td>13.170</td>
</tr>
<tr>
<td>Fisheries</td>
<td>9.628</td>
<td>1.277</td>
<td>1.753</td>
<td>400</td>
<td>13.057</td>
</tr>
<tr>
<td>Forestry</td>
<td>3.584</td>
<td>400</td>
<td>800</td>
<td>-</td>
<td>7.184</td>
</tr>
<tr>
<td>Crops and other</td>
<td>77.056</td>
<td>61.738</td>
<td>13.708</td>
<td>6.344</td>
<td>158.836</td>
</tr>
<tr>
<td>Total</td>
<td>100.962</td>
<td>66.223</td>
<td>17.908</td>
<td>7.154</td>
<td>192.247</td>
</tr>
</tbody>
</table>

### 6.6 Managing Risks and Uncertainties

The main risks and uncertainties facing the strategy outlined in this report include: (i) doubts about South Sudan’s ability to effectively implement the strategy; (ii) continued insecurity in the country; (iii) uncertainties around land laws; (iv) acute infrastructure shortage, including the cost financing rural connectivity; and, (v) weak entrepreneurship and the lack of skilled labor in South Sudan. These risks must be managed if the strategy is to succeed. The following paragraphs highlight the risks as well as propose some remedial measures to attenuate the risks.

#### 6.6.1 Ensuring Effective Implementation of the Strategy

Key implementation risks include organizational inertia and the lack of implementation and coordination capacity at the national and state levels. The social model, which has impeded development of the livestock sector, illustrates one of the core implementation risks that must be addressed.

To this end, there is a need to rebuild South Sudan's institutional and human/technical capacities, which have been depleted as a result of decades of civil conflicts and wars. Agricultural institutions need to be rehabilitated or rebuilt from scratch. In addition, individuals and organizations must be trained and empowered with skills and knowledge needed to fulfill their roles. Farmers must be trained on modern farming methods, including the acquisition of productivity-enhancing knowledge and skills. Livestock farmers are in need of a transformational mindset change and must, therefore, be trained to see the advantages of and embrace the commercial model. It is also well recognized that South Sudan suffers from a deficit of trust among South Sudanese ethnic/tribal groups, which has been the source of ethnic/tribal tensions, which can very well obstruct the implementation of the strategy. To this end, the government must develop and implement an awareness campaign aimed at promoting peace and good neighborliness among the ethnic groups, particularly at the state and local levels where tolerance and amicable social interaction are desirable for the formation of cohesive cooperatives and other farmer groups.

There is also a need to harness and streamline the wide array of donor and NGO systems in South Sudan, transforming them into a nucleus for strategy implementation. The government should establish a national coordination task force. The task force, to be co-chaired by the Ministers for Commerce and Industry and Investment and the Minister for Agriculture and Forestry, should include representative of states, private sector, donors and NGOs. In addition, the government should convene sector-working groups to drive the implementation of the sector strategies. Already, there exist working groups for Livestock, Cereals and High Value Fruits and Vegetable. Their knowledge and commitment should be harnessed to drive the implementation of the sector strategies.

Furthermore the government should strengthen the South Sudan Investment Authority (SSIA), enabling it play its role of identifying, attracting and supporting the type of foreign direct investors whose commercial interests are aligned with the strategies outlined in this Report. Such investors should also establish dispute settlement mechanisms and arbitration processes that are transparent and viewed as fair and equitable by all potential parties in any dispute.

#### 6.6.2 Insecurity in South Sudan

Even though the war between Sudan and South Sudan was formally declared over by the signature of the CPA-Protocol on Security Arrangements, persistent episodes of violence and insecurity have continued to afflict various parts of the country and continues even after independence. The proliferation of opportunistic militia groups and violent activities by the Lords Resistance Army have made many communities throughout South Sudan vulnerable to effects of violent conflicts - deaths/injury, displacement and destruction of social and economic assets. As a result of the proliferation of small arms, too few productive opportunities for unemployed youth, distrust among many tribes and ethnic groups, and poor and inadequate physical infrastructure, especially in the rural areas, violence and insecurity remain and constitute a source of concern across South Sudan. Criminal cattle raids have become a frequent phenomenon, leading to loss of life and destruction of economic assets.

Insecurity is both a threat to personal safety as well as an impediment to economic transformation and development. The security of and confidence in large-scale and long-term projects are crucial decision variables for foreign investors, which can have far reaching consequences for investment and medium-term development and economic growth. If insecure conditions are threatened by violence, theft, or government expropriation then investors will pull their projects and funding from the country and new investors will be reticent to enter. Investors seek projects with low political risk and strong government support.

Security, peace and good governance are cornerstone pillars of the SSDP. In this regard, the Government is working towards providing a peaceful and stable and economic environment. To assuage potential investors concerns about security of investment, the government should be willing to provide stabilization clauses, ensuring that the regulatory framework governing investment in land are not threatened (i.e., investors do not want the project’s original economic equilibrium to be jeopardized). The Government should also establish dispute settlement mechanisms and arbitration processes that are transparent and viewed as fair and equitable by all potential parties in any dispute.

#### 6.6.3 Unclear Land Tenure and Demarcation

There is a risk that current land acquisition laws may hinder or complicate access to land by a SIAP. This is due to several provisions in the current South Sudan land law, which prohibits foreigners from owning land in South Sudan. Although a recent IDS Academic publication claims that, between 2007 and 2010, at least 10 large-scale investment in agricultural land and 4 in forestry/carbon credit have been concluded, it states that some of the land acquisitions have been conducted under questionable conditions and are being reviewed, risking abrogation.

Arguably, commercial/large scale farming, which is essential for FDI in agricultural development, requires assess to land with unambiguous right to develop the land. Under the 2009 Land Act (i) foreigner are not permitted to own land in South Sudan; they can, however, conditionally lease land (for a maximum of 99 years); (ii) community lands may be allocated for investment purposes but that investment must reflect an “important interest of the community” and contribute to economic and social development of the local community; and (iii) land acquisition of 250 fedans (100 hectares must be approved by state authorities). So South Sudan is to transit from traditional farming to FDI-led commercial farming, then access to land must be equitably liberalized. Having a uniform national land law and a clearly defined and transparent ownership right and obligations will facilitate the decision of potential foreign investors in agricultural land in South Sudan. In addition, given the predominant role that women play in farming in South Sudan, the laws must be gender sensitive and accord women unfeathered rights to their own and develop land. There is, therefore, a need for the government to adopt land development policies that allow potential investors to acquire, develop land and reap the benefits of their investment in commercial agricultural land.

#### 6.6.4 Acute Shortage of Infrastructure

Poor and inadequate physical and soft infrastructure is a binding constraint to economic development in South Sudan. A central assumption of the agricultural transformation strategy outlined in this Report is that alongside investment in agriculture there will be a parallel development of rural infrastructure that will serve as an incentive for smallholder and commercial farmers to increase production knowing that markets are accessible. If rural connectivity is not improved, then the strategy will be in jeopardy. From the analysis undertaken in this Report it is obvious that government must increase its budgetary allocation for rural infrastructure in order to improve rural connectivity. One of the ways of through which allocation to rural roads can be increased is by adopting cost-saving material and technology measures that will reduce the cost and budget allocation to interstate

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**Table 6.15: Ongoing Donor Commitments (In $ millions)**

<table>
<thead>
<tr>
<th>Donor</th>
<th>Amount</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>68.5</td>
<td>35.6</td>
</tr>
<tr>
<td>European Union</td>
<td>49.3</td>
<td>25.6</td>
</tr>
<tr>
<td>Multi-Donor Trust Fund</td>
<td>18.1</td>
<td>9.4</td>
</tr>
<tr>
<td>Canada</td>
<td>15.8</td>
<td>8.2</td>
</tr>
<tr>
<td>Common Humanitarian Fund</td>
<td>13.4</td>
<td>7.0</td>
</tr>
<tr>
<td>World Bank</td>
<td>8.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Other donors (10)</td>
<td>18.6</td>
<td>9.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>192.2</strong></td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: MoFEP, AIMS database.

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70 In early 2009 USAID-funded 2-year land tenure program which is helping the government efforts to develop a new land policy for South Sudan.

71 See “Laws of Southern Sudan: The Land Act, 2009”

72 See IDS Academy, “South Sudan: Food Security and Land Governance Fact Sheet”, 2011 and D. Dong: “Land belongs to the community” Demystifying the ‘global land grab’ in Southern Sudan, a paper presented at IDS conference in April 2011
roads, thus channeling the savings towards the financing of more rural/feeder roads. Another plausible measure will entail shifting part of the cost of enhancing rural connectivity to the SIAP as an integral part of any SIAP agreement. As a general guiding principle, for all public investment in infrastructure, it is important to ensure that government expenditure is used to "crowd in" private investments rather than discourage them.

6.6.5 Weak Entrepreneurship and High Cost of Labor

**Weak entrepreneurship.** The agricultural sector in South Sudan is constrained by weak entrepreneurship base and the absence of commercial orientation: to date agriculture remains a subsistence activity by smallholder farmers using simple implements; the average farm size is small and in the range of 0.4-1.7 hectares. Intensive farming undertaken with little fertilizer application has progressively lowered yields and depleted soils. There are very few cooperatives and little commercial farming and/or the adoption of modern farming technologies. Farming remains primarily rain-fed; irrigation farming is still limited. In addition, livestock farming is dominated by culture and tradition that lack business orientation (cattle, for instance, is still raised for prestige and for dowry payments rather than for meat, milk, hides and other by-products). The private sector is nascent and has weak business management skills. These characteristics must begin to change and change at a fast pace if the transformation of the sector is to gain traction and foster economic growth. To maximize growth in the agriculture sector, the government should encourage the transition to a culture that values innovation, competition and commercial success and create a business environment that welcomes ideas, talent, and capital, regardless of its origin.

**High cost of labor.** The country suffers from an aberration of two twin risks: high labor cost and low labor productivity. Furthermore, given the high cost of living in South Sudan and the experience of other natural resource-dependent countries, it is unlikely that labor wages - the most significant component of total farm production cost - will decline in the short to medium term. Thus, reductions in farm production costs in South Sudan would have to accrue from a combination of increased cropland ushering in economies of scale and labor productivity gains through mechanization of some of the production processes. Sebit (2011) shows that when tractors are used, 16% less labor is used and higher output realized. Further expansion of such practices will have greater productivity impact and lower the unit cost of labor. Furthermore:

- South Sudan should accelerate the pace of formulating an agricultural mechanization policy that will help improve the use and efficiency tools, implements, and machinery in agricultural production and associated value chain operations. In this connection, the government has to recognize that the private sector is better placed to provide mechanization services and should strive to create conditions for self-sustaining development of mechanization with minimal direct government intervention. There is need to build on some of the already existing and successful private sector-driven models in Upper Nile, Unity, and Central Equatoria;

- In tandem with mechanization, South Sudan should pursue other productivity enhancing measures if it is to reduce farm production costs. Key to this will be the use of tradable inputs and the provision of advisory services on technology and other production related activities; and,

- The government should also realize that to achieve yield potentials for improved varieties will necessarily require significant increase in the level of fertilizer use in South Sudan.
7 Transport Infrastructure and Services

7.1 Current Status of Transport Services and Infrastructure

7.1.1 Overview of the Transport Sector

The transport system in South Sudan consists of four modes – road, rail, river and air transport – the largest being road transport. South Sudan’s main access to the sea is through Mombasa in Kenya, which accounts for most of the traffic, Port Sudan and Djibouti ports (see Map 7.1). The Juba-Mombasa link is mainly accessed by road through Uganda or directly to Kenya. The distance from Juba to Mombasa by road is around 1,900 km via Nimule and Gulu in Uganda and 1,800 km through Torit, Nadapal and Lokichogio in Kenya.

Multimodal transport is also possible, and it involves combining road transport from Juba to Kampala or Eldoret and rail transport to Mombasa. South Sudan is connected to Port Sudan by road, rail and multimodal link. Port Sudan connects by road to Malakal (Upper Nile State), Bentiu (Unity State), Aweil (Northern Bahr El Ghazal State) and Wau (Western Bahr El Ghazal State). A railway line links Wau and Aweil to Port Sudan. Between Juba and Port Sudan, the existing infrastructure allows bi-modal transport by river from Juba to Kosti and then by rail or by road from Kosti to Port Sudan. However, multimodal transport is hampered by the poor condition of the existing infrastructure and inadequate connectivity between modes. Malakal is linked to Djibouti by road through Jikou and Addis Ababa. The other possible link is from Juba to Kapoeta - Boma in the South East and then to Djibouti via Ethiopia.

Table 7.1: Paved Road and Railway Indicators in Sub-Saharan Africa

<table>
<thead>
<tr>
<th>Country category</th>
<th>Urban population (%)</th>
<th>Paved road density By area (km/1 000 km²)</th>
<th>Paved road density By population (km/million)</th>
<th>Rail density By area (km/1 000 km²)</th>
<th>Rail density By population (km/million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>34.9</td>
<td>16.8</td>
<td>533.0</td>
<td>2.8</td>
<td>83.1</td>
</tr>
<tr>
<td>Low income fragile states</td>
<td>34.5</td>
<td>9.9</td>
<td>275.0</td>
<td>1.6</td>
<td>45.9</td>
</tr>
<tr>
<td>South Sudan</td>
<td>19.7</td>
<td>0.2</td>
<td>15.0</td>
<td>0.4</td>
<td>25.0</td>
</tr>
</tbody>
</table>

Access to transport infrastructure in the country is poor. Table 7.1 shows that the road density in terms of land area or population in the country is extremely low with 19 km per 1,000 km² or 1.3 km/1,000 persons. The density for paved roads is 0.2 km per 1,000 km², which is much lower than the averages of 16.8 and 9.9 km per 1,000 km² for Sub-Saharan Africa and Low income fragile states respectively.

Institutional arrangements. Prior to independence, the Ministry of Transport and Roads (MTR) was responsible for transport services and infrastructure in the country. At the time, the MTR was divided into the following directorates: Directorate of Roads and Bridges (DRB), Directorate of Road Transport and Safety, Directorate of Railway Transport, Directorate of River Transport, Directorate of Air Transport, and Directorate of Administration and Finance.

Post independence, the MTR was split into two ministries to form the Ministry of Transport (MoT) and the Ministry of Roads and Bridges (MoRB). Additionally, the Ministry of Physical Infrastructure (MoPI) was created and it is in charge of the intrastate transport infrastructure in each of the ten states of South Sudan.
The ministries face considerable difficulties recruiting well qualified technical staff. To address this challenge, training programs have been undertaken, but starting from a low base a large skills gap still persists.

Transport policy. A Transport Sector Policy was developed and passed by South Sudan Legislative Assembly on 3rd October, 2007. The policy framework covers a five year period with a two phase implementation strategy, which included the recovery and development phases between 2007-2008 and 2009-2011 respectively:

The policy paper has twelve objectives, namely to: (i) strengthen the MTR to play an effective coordination and regulation role; (ii) create capacity to meet the transport requirements of the economy; (iii) optimize the allocation of available resources among the various transport modes; (iv) improve mobility in rural areas through the promotion of the use of appropriate means and modes of transport; (v) facilitate the return and settlement of the Internally Displaced People (IDP) and refugees; (vi) encourage and promote increased private sector participation in the provision, management and maintenance of transport infrastructure and services; (vii) contribute to job creation and income generation, and provide equal opportunities for men and women in transport sector; (viii) ensure safety standards in all modes of transport; (ix) ensure coordinated disaster management in all modes of transport by enforcing appropriate protective and control measures; (x) introduce sound management through appropriate policies and institutions in the transport sector that will lead to rapid sustainable development and poverty eradication; (xi) provide links with the states and neighbouring countries; and (xii) recognize and account for environmental concerns in line with the national environmental plan.

Recognizing the negative impact of a poor transport system on the performance of the economy, the new Government of the Republic of South Sudan has reaffirmed its commitment to reform the sector to catalyze the social and economic development process of the country.

The establishment and operation of a new institutional framework is a priority for each transport sub-sector. This framework will guide the functions of a regulator and service providers. Additionally, the country needs to urgently develop a regulatory framework to promote Public Private Partnership (PPP) opportunities. It will therefore be necessary to have a timely decision on whether a single authority will regulate the entire transport sector or various regulatory authorities' will be accorded different regulatory responsibilities for each sub-sector. In the latter case for example, the Civil Aviation Authority (CAA) will regulate the air transport sub-sector as well as own and operate the country’s major airports.

7.2 Road Transport Infrastructure and Services

There is very limited data on the transport sector. Despite its importance for proper development and maintenance planning, the inventory and classification of the road network is incomplete.

7.2.1 Road Network and Condition

According to the Transport Policy document, the country has an estimated road network of 12,642 km; consisting of 7,369 km of Interstate roads, 1,451 km of State primary roads and 3,822 km of State secondary roads (see Map 7.2). The recent World Bank report estimates tertiary road network to be 2,301 km. The Road Authority Provisional Order states that all public roads shall be categorized into classes as shown in Table 7.2.

Table 7.2: Road Classes

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part A - Trunk Roads</td>
<td></td>
</tr>
<tr>
<td>International Roads</td>
<td>International trunk Roads linking centres of international importance and crossing international boundaries or terminating at international ports</td>
</tr>
<tr>
<td>Interstate Roads</td>
<td>National trunk Roads linking nationally important centres</td>
</tr>
<tr>
<td>Part B - State Roads</td>
<td></td>
</tr>
<tr>
<td>Primary Roads</td>
<td>Primary Roads linking State important centres to each other</td>
</tr>
<tr>
<td>Secondary Roads</td>
<td>Secondary Roads linking County important centre to each other, to more important centres or to higher class Roads</td>
</tr>
<tr>
<td>Feeder Roads</td>
<td>Tertiary Roads linking minor centres (Roads other than Inter-State and International Roads other than those inside cities and municipalities)</td>
</tr>
<tr>
<td>Part C - Urban Roads</td>
<td></td>
</tr>
<tr>
<td>UA</td>
<td>Urban Arterials</td>
</tr>
<tr>
<td>UC</td>
<td>Urban Collectors</td>
</tr>
<tr>
<td>UL</td>
<td>Urban local roads</td>
</tr>
</tbody>
</table>

Source: The Southern Sudan Roads Authority Provisional Order, 2011

73 A recent report by the World Bank provides somewhat different estimates for the road network: 2,696 km of interstate primary roads which are those connecting all state capitals and major cross-border corridors; 4,475 km of “other primary roads”; 6,292 km of secondary roads; and 2,301 km of tertiary roads. Excluding the estimate for tertiary roads in the World Bank total, the adjusted length of the national network is 15,663 km compared with the 2006 official estimate of 12,642 km. (see World Bank (2011a)).
South Sudan’s road infrastructure was largely destroyed or left in disrepair during the protracted civil wars. After the signing of the Comprehensive Peace Agreement (CPA) in 2005, significant construction and rehabilitation projects were initiated and implemented including the Emergency Road Repair Program (ERRP) and Sudan Emergency Transport Infrastructure Development Project (SETIDP). The main objective of these projects was to restore and maintain basic links between major towns and regions in the country. As a result, around 5,000 km of trunk roads were constructed/rehabilitated to all-weather gravel roads standard.

However, heavy rains increased levels of traffic; overloaded trucks and inadequate maintenance have often led to the deterioration of the rehabilitated roads in the country. As a result, only 40% of these improved trunk roads are in a good condition, the remaining 60% are deemed to be in a fair condition. The only paved roads are the roads that were recently rehabilitated or upgraded in Juba and a few sections of urban roads in Wau and Malakal. The remaining gravel roads, earth roads and tracks are in a state of disrepair with the majority impassable during the rainy season.

Majority (80%) of the population lives in rural areas and most of these have no access to all-weather roads, the Rural Accessibility Index (RAI), which expresses the percentage of the rural population living within two kilometres of an all-season road, is estimated at 5% for the whole Sudan. This clearly indicates a substantial road infrastructure deficit in the country, both in terms of quantity and quality.

72.2 Institutional Arrangements

The Southern Sudan Roads Authority Provisional Order, 2011, which came into force on 7th January, 2011, established the Southern Sudan Roads Authority (SSRA), an autonomous corporate body responsible for the management, development, rehabilitation and maintenance of all interstate and international roads, and the development of roads in war-affected areas in South Sudan. The functions and duties of the SSRA include development planning, construction, maintenance and preparation of annual road work programs. In addition, the Authority shall ensure adherence by motorists to the rules and guidelines on axle load control, and the quality of works in accordance with the standards in force. It will also monitor and evaluate the use of roads under its control and collect all related data as may be necessary for efficient planning.

The Governing Structures of the SSRA are the Board and the Executive Management. Upon recommendation, the Board members are appointed by a resolution of the Council of Ministers. The Board comprises:

- The Undersecretaries, or their representatives, of the Ministries for (a) Transport and Roads, (b) Environment, (c) Finance and Economic Planning, (d) Commerce and Industry, and (e) Regional Cooperation
- The Executive Director of the SSRA
- Six other persons from civil society associations. One of the members of the Board is appointed by the Minister of Transport and Roads as a Chairperson.

The mandate of the Board is to oversee the general direction and supervision of the Authority. The Board also establishes rules and procedures for appointment, promotion, termination, discipline and terms and conditions of service of staff and approves projects and programs proposed by committees and/or directorates. And finally it proposes and manages budget allocations, monitors and evaluates, through technical and financial audits, the delivery of goods, works and services, and monitors road transport, traffic and safety management.

The Executive Management is the primary implementing authority in charge of the daily transactions and operations of the SSRA. It is headed by the Executive Director (ED) who reports to the Board. The ED has administrative, financial and technical powers to manage the Authority, including but not limited to:

- Developing the operating plan to achieve its objectives;
- Developing an economic, efficient and cost effective internal management structure;
- Designing the organizational chart and internal policies and procedures;
- Appointing staff;
- Drafting policies and framework documents of the Authority;
- Overseeing the use of the funds, and
- Proposing and implementing SSRA’s strategic, business and annual plans.

The SSRA will develop a Road Investment Program (RIP), containing both development and maintenance priorities and submit it to the Minister who shall present it for approval to the Council of Ministers. Notably, annual budgets and work programs shall be based on the RIP. Activities outside these approved work programs will only be undertaken with the concurrence of the Board and approval of the Minister.

The establishment of the SSRA is an important milestone in the implementation of the Transport Sector Policy. Pending the start-up of operations by the SSRA, its functions and responsibilities are handled by the Directorate of Roads and Bridges. The organizational structure of the Directorate is shown below:

74 Double Bituminous Surface Treatment
The Directorate has limited capacity both in terms of numbers and skills. Seven Managers, including the Director General, a Director, three Deputy Directors, and two Chief Engineers, are heading the Directorate and its units. Around five engineers are attached to the departments/units and over 20 Engineers or holders of certificates/diplomas from tertiary education programs are regrouped in a pool and solicited by the units according to their workload. Having said that, over half of these engineers and technicians need to be closely supervised in the course of their duties.

7.2.3 Road Transport Services

Buses and taxis provide urban transport services. Usually, urban transport services are provided by privately owned minibuses and motorcycles taxed boda-boda. There are also sedan car taxis, but they are not commonly used. Interstate and international transport is provided by coaches operated by about a dozen bus companies.

Transport costs in the country are high (Table 7.3). Freight tariffs on trunk roads reach $0.20 per ton km, roughly three and four times the average tariff of Eastern Africa and Southern Africa countries respectively. The poor infrastructure in the country also increases travel times, this coupled with a significant reduction of loads on several trucks for safety reasons substantially raises the transport costs per ton in South Sudan. As articulated in the South Sudan Development Plan (SSDP) 2011-2013, “widespread official and unofficial road checkpoints collecting taxes, fees and charges are also a big disincentive to deliver the products to the markets. This increase in costs inhibits investment and renewed growth.” Additionally, uncertain security situations and the asymmetrical trading patterns between South Sudan and its neighbours’ means that trucks usually return empty from South Sudan and this significantly increases the freight cost per ton. Again at a national level, the poor and inadequate intra-state road network in South Sudan makes domestic transport costs much higher than those in the neighbouring countries. For example the freight rate from Yei to Juba can reach 65 US cents per ton km and as much as 85 US cents per ton km from Malakal to Juba. Compared to the domestic freight rates of about 15-20 US cents per ton km on primary roads in Uganda and Kenya, South Sudan rates are too high.

The recent improvements of roads linking South Sudan to Uganda and Kenya have led to an upsurge in commercial freight traffic using heavily loaded trailers. The lack of effective weighbridge operations on roads to monitor the weights of the trucks is causing rapid deterioration of the upgraded infrastructure in Southern Sudan. To address this, the Government is constructing two weighbridges along Juba-Nimule road and it is also in the process of drafting the traffic act which will guide the traffic control and management in the country.

7.2.4 Vehicle Fleets and Road Safety

The Directorate of Road Transport and Safety is responsible for the implementation of the road transport, traffic management and road safety policy. Its functions and powers include: (i) registration of vehicles and issuance of licenses and permits pursuant to the laws of South Sudan; (ii) establishment of the standards for vehicles so as to comply with road safety standards; (iii) conducting road safety education and sensitization; and (iv) coordination of road safety programs. Presently, this Directorate lacks the human capacity and financial resources to fulfill its mandate.


According to a feasibility study carried out by the Average Daily Traffic (ADT) was below 20 for most rural roads surveyed in 2009.76 However, the Juba-Yei-Kaya road connecting to Uganda, the ADT was approximately 800 vehicles in 2008 and projected to reach 1,600 in 2016 and 4,000 in 2026. The Juba–Gumbo-Torit-Nadapal linking to Kenya, the average figure was slightly lower, 700 in 2008, but with much higher growth projections i.e. 2,300 in 2016 and 5,100 in 2026.

### Table 7.4: Road Accidents and Fatalities in Juba

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of accidents</td>
<td>960</td>
<td>1,073</td>
<td>1,100</td>
<td>1,200</td>
<td>1,304</td>
<td>1,404</td>
</tr>
<tr>
<td>Number of deaths</td>
<td>35</td>
<td>40</td>
<td>65</td>
<td>76</td>
<td>86</td>
<td>92</td>
</tr>
<tr>
<td>Accidents per 100,000 people</td>
<td>587</td>
<td>429</td>
<td>406</td>
<td>421</td>
<td>414</td>
<td>407</td>
</tr>
<tr>
<td>Deaths per 100,000 people</td>
<td>21</td>
<td>16</td>
<td>24</td>
<td>27</td>
<td>27</td>
<td>27</td>
</tr>
</tbody>
</table>

#### 7.2.5 Road Construction Costs

Road construction costs in South Sudan are among the highest on the continent (see Table 7.5). While the average unit cost for a paved standard two lane road is less than US$ 0.5 million per km in most African countries, it exceeds US$ 0.9 million per km as reflected in recent road works in South Sudan. Indeed, the engineer’s cost estimate for an AC standard was at $1.6 million per km for the planned Juba-Yei-Kaya, connecting to Uganda and $1.2 million for Juba-Torit-Nadapal linking to Kenya. The main factors driving up the costs are: (i) inelastic supply in a post-conflict economy due to a limited supply base for construction work; (ii) large costs associated with import of construction materials; (iii) overvalued costs due to lack of or limited local borrowed materials; (iv) limited availability and cost of skilled and unskilled labour; (v) very poor condition of existing roads; (vi) a long rainy season with heavy rainfall; and (vii) insecurity and cost of mine-clearing operations in some areas.77

#### Table 7.3: Comparison of Freight Rates and Road Condition for South Sudan with Other African Countries

<table>
<thead>
<tr>
<th>Indicator</th>
<th>South Sudan</th>
<th>Sudan</th>
<th>West African</th>
<th>Central African</th>
<th>East African</th>
<th>Southern African</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freight tariff (US cents per ton km)</td>
<td>20.0</td>
<td>8.0-10.0</td>
<td>8.0</td>
<td>13.0</td>
<td>7.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Roads in good condition (%)</td>
<td>5</td>
<td>26</td>
<td>72</td>
<td>49</td>
<td>82</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: World Bank (2011a)

76 African and RHS (September 2010). “Feasibility Studies for the Planned Rehabilitation of about 7,800 km of Rural Roads in Southern Sudan – Final Development Plan”
77 On this last point, up to April 2010, 30,884 km were cleared of mines and around 3,240 km of roads were verified. But a report of the United Nations Mine Action Office (UNMAS) dated June 2, 2011, deplores re-mining operations in Unity State that would be associated with militia/ allied operations in conflict areas. It also reports several injuries and deaths due to explosions of landmines on roads from March to June 2011.
Table 7.5: South Sudan - Road Rehabilitation Construction and Maintenance Costs

<table>
<thead>
<tr>
<th>Item No</th>
<th>Road Type</th>
<th>Cost ($/km)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Paved/asphalt road (two lane)</td>
<td>1 100 000 to 1 300 000</td>
<td>Lower margin for DBST</td>
</tr>
<tr>
<td>2</td>
<td>Gravel road (two lane) – gravel road with seal or stabilized</td>
<td>350 000 to 400 000</td>
<td>For staged upgrading of roads to paved road</td>
</tr>
<tr>
<td>3</td>
<td>Gravel road (two lane)</td>
<td>170 000 to 250 000</td>
<td>Lower margin applies to tertiary/feeder roads – Class A feeder roads designed for 50 vehicles per day, with adequate drainage structures and pavement</td>
</tr>
<tr>
<td>4</td>
<td>Class B feeder roads</td>
<td>100 000</td>
<td>Class B for 30 vehicles per day or less, with critical drainage structures, basic surfacing and variable road width. Cost may vary depending on terrain and natural soil type</td>
</tr>
<tr>
<td>5</td>
<td>Class C feeder roads</td>
<td>50 000</td>
<td>Class C for 10 vehicles per day or less, with minor provision of drainage, mainly drifts, and spot improvement along an engineered road alignment. Cost may vary depending on terrain and natural soil type</td>
</tr>
<tr>
<td>6</td>
<td>Road maintenance</td>
<td>30 000</td>
<td>Including spot improvement and repair works. In the case of routine maintenance, cost may go down to $10 000 – 15 000</td>
</tr>
</tbody>
</table>

Source: World Bank Staff

Recent studies indicate that the average unit costs for the upgrading to paved standard of the two international roads are US$1.2 million per km for Juba-Torit-Nadapal and $1.6 million per km for Juba-Yeti-Kaya. To construct or upgrade urban roads to paved standard will cost on the average US$2.6 million per km for Juba and US$1.2 million per km for the other towns.78 To upgrade interstate and urban roads to all-weather condition costs on average of US$ 0.2 million per km and US$0.16 million per km for the rural roads. For comparison, outcomes of a recent African Development Bank (ADB) study are given in Table 7.6.79

Table 7.6: Summary of Unit Rate Statistics for Different Types of Road Investment ($/lane km at 2006 constant prices)

<table>
<thead>
<tr>
<th>Types of Road Infrastructure Investment</th>
<th>Periodic Maintenance of Unpaved Roads</th>
<th>Periodic Maintenance of Paved Roads</th>
<th>Rehabilitation of Paved Roads</th>
<th>Construction and Upgrading of Paved Roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;100 lane km</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quartile 3</td>
<td>10 500</td>
<td>N/A</td>
<td>290 000</td>
<td>425 400</td>
</tr>
<tr>
<td>Median</td>
<td>9 600</td>
<td>N/A</td>
<td>180 300</td>
<td>227 800</td>
</tr>
<tr>
<td>Quartile 1</td>
<td>8 100</td>
<td>N/A</td>
<td>109 800</td>
<td>166 300</td>
</tr>
</tbody>
</table>

78 Juba Urban Transport Infrastructure and Capacity Development Study in the Southern Sudan
79 Study on Infrastructure Costs: Analysis of Unit Cost and Cost Over-run in Road Infrastructure Projects in Africa

The high construction costs are a great concern to the Government and donor community. Therefore the Government has undertaken a number of initiatives to address it and these measures include the adoption of road standards and specifications, and the design manuals of Ethiopia and awarding public contracts in accordance with the Interim Public Procurement and Disposal Regulations published in 2006—despite the weak enforcement.

The country has limited local capacity to provide consultative services, and as a consequence most of the road works contracts are awarded to international firms. To promote the involvement of local contractors, the Government in collaboration with development partners has initiated pilot labour-based maintenance projects. Through these projects, potential small entrepreneurs from each state were selected and trained in labour-based works. After the training, around 30 entrepreneurs under the supervision of qualified technicians were awarded contracts to maintain or open up more than 800km of roads. The results were quite mixed, but the overall performance was satisfactory.

Moving forward, with deeper regional integration it is anticipated that the high construction costs in South Sudan will reduce in the medium-term. The removal of the customs barriers and free movement of people and goods will also foster the country’s access to more dynamic and competitive markets and in so doing enable South Sudan to access lower commodity prices.

The implementation of the Short Term Program (STP) should also yield some outcomes. Particularly, regional and national connectivity improvement should drastically reduce Vehicle Operating Costs (VOC) and travel time, facilitate transit transportation and remove significant non-tariff barriers along the roads. This would significantly reduce the transportation costs. This coupled with improved security and a competitive environment should lead to a significant reduction in construction costs.

In this context, with the exception of Juba, the average unit costs are estimated at US$1 million, US$0.8 million and US$0.6 million per km for the construction/upgrading to paved standard of urban, international and interstate roads respectively. In Juba, urban road development follows the recommendations of the Master Plan study which proposes an average unit cost of US$4 million per km for arterials and collectors. Again, in Juba the proposed costs for the construction or upgrading roads to all-weather conditions are US$0.2 million per km for interstate roads, 0.18 million per km for primary roads and US$0.15 million per km for rural roads.

7.2.6 Overview of Proposed Program for Road Transport

The proposed Action Plan for the road transport sector includes a Short Term Program (STP) for 2011-2015, with specific details and a longer-term program for 2016-2020 that is more general. During the STP, a master plan for the roads sub-sector will be drafted and feasibility studies undertaken to provide information for the design and implementation of the proposed program for the longer-term.

This report has also attempted to provide an evaluation of the medium to long term investment needs in the sub-sector. At this stage, the usual transport demand models, which are very data-intensive, are not suitable. A connectivity approach has been adopted in seeking to identify key geographic and demographic features of the country and determine the transport infrastructure needed to connect these features which are of international interest, like capital cities, deep-water ports, and international borders that provide connectivity across the entire region, and others of national interest such as state capitals and large towns. This approach also considers the population distribution and the productive agricultural land which will be affected by this national road network that will link regions and cities in South Sudan. Because of information gaps, proposals for longer-term are based primarily on rough estimates by the authors using a mix of connectivity and benchmarking approaches.
Table 7.7: Summary of Proposed Road Improvement Program

<table>
<thead>
<tr>
<th>Road category</th>
<th>Total network</th>
<th>Proposed upgrades</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National trunk roads</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interstate trunk roads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paved</td>
<td>193</td>
<td>783</td>
</tr>
<tr>
<td>All-weather standard</td>
<td>4,091</td>
<td>4,946</td>
</tr>
<tr>
<td>Seasonal road</td>
<td>3,085</td>
<td>1,640</td>
</tr>
<tr>
<td>Total</td>
<td>7,369</td>
<td>7,369</td>
</tr>
<tr>
<td><strong>State primary roads</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paved</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>All-weather standard</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Seasonal road</td>
<td>1,451</td>
<td>1,451</td>
</tr>
<tr>
<td>Total</td>
<td>1,451</td>
<td>1,451</td>
</tr>
<tr>
<td><strong>Secondary roads</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All-weather standard</td>
<td>-</td>
<td>1,000</td>
</tr>
<tr>
<td>Seasonal road</td>
<td>3,822</td>
<td>2,822</td>
</tr>
<tr>
<td>Total</td>
<td>3,822</td>
<td>3,822</td>
</tr>
<tr>
<td><strong>Tertiary roads</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All-weather standard</td>
<td>-</td>
<td>1,000</td>
</tr>
<tr>
<td>Seasonal road</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Total</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Urban road network</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paved</td>
<td>70</td>
<td>270</td>
</tr>
<tr>
<td>All-weather standard</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Seasonal road</td>
<td>300</td>
<td>440</td>
</tr>
<tr>
<td>Total</td>
<td>300</td>
<td>440</td>
</tr>
<tr>
<td><strong>Total program</strong></td>
<td>263</td>
<td>1,053</td>
</tr>
<tr>
<td>Paved</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>All-weather standard</td>
<td>3,745</td>
<td>10,906</td>
</tr>
</tbody>
</table>

Source: Directorate of Roads and Bridges and estimates by authors.

Note: All values are given in 2006 USD

Table 7.8: Regional Connectivity - Upgrading to Paved Standard

<table>
<thead>
<tr>
<th>Road Details</th>
<th>Length (km)</th>
<th>Location</th>
<th>Cost ($ million)</th>
<th>Completion date</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juba-Torit</td>
<td>345</td>
<td>CES-EES</td>
<td>420</td>
<td>2015</td>
<td>Link to Kenya and Ethiopia/Djibouti</td>
</tr>
<tr>
<td>Kapoeta-Nadapal</td>
<td>245</td>
<td>CES-EES</td>
<td>395</td>
<td>2016</td>
<td>Link to Uganda and Mombasa</td>
</tr>
<tr>
<td>Total</td>
<td>590</td>
<td></td>
<td>815</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The SSDP anticipated these type of issues as it noted that “many of the costing requires refining”.

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Secondly, feasibility and design studies will be undertaken in preparation for the subsequent upgrade of a total of 965 km of all-weather gravel roads in Upper Nile State (UNS), Jonglei State (JS), Central Equatoria State, Warrap State (WS) and Western Bahr el Ghazal (WBGS) to bitumen standards (Table 7.9). The cost of this project is estimated at $7.7 million.

### Table 7.9: Regional Connectivity - Feasibility Study and Design to Paved Standard

<table>
<thead>
<tr>
<th>Roads Details</th>
<th>Length (km)</th>
<th>Location</th>
<th>Current Road Condition</th>
<th>Cost ($ million)</th>
<th>Completion Date</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malakal-Jikou</td>
<td>270</td>
<td>UNS</td>
<td>All Weather Gravel Road</td>
<td>2.2</td>
<td>2014</td>
<td>Link to Ethiopia and Djibouti</td>
</tr>
<tr>
<td>Malakal-El Renk</td>
<td>300</td>
<td>UNS</td>
<td>All Weather Gravel Road</td>
<td>2.4</td>
<td>2014</td>
<td>Link to Sudan</td>
</tr>
<tr>
<td>Wau-Gogrial-Abeyei</td>
<td>225</td>
<td>WBGS-WS</td>
<td>All Weather Gravel Road</td>
<td>1.8</td>
<td>2015</td>
<td>Link to Sudan</td>
</tr>
<tr>
<td>Kapoeta-Boma</td>
<td>170</td>
<td>EES-JS</td>
<td>Seasonal Road</td>
<td>1.4</td>
<td>2016</td>
<td>Link to Ethiopia and Djibouti</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>965</strong></td>
<td></td>
<td></td>
<td><strong>7.7</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Directorate of Roads and Bridges and Consultant’s Estimates

The total cost of the proposed project to upgrade the regional network to paved standard or all-weather standard is estimated at $829.7 million. The total length of roads in the regional network improved will be 1,125 km. Also at this stage, detailed feasibility studies to upgrade an additional 965 km to paved standard in the medium-term will be finalized.

### Table 7.10: Regional Connectivity - Upgrading to All-Weather Condition

<table>
<thead>
<tr>
<th>Roads Details</th>
<th>Length (km)</th>
<th>Location</th>
<th>Current Road Condition</th>
<th>Cost ($ million)</th>
<th>Completion Date</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kapoeta-Boma</td>
<td>170</td>
<td>EES-JS</td>
<td>Seasonal Road</td>
<td>34</td>
<td>2014</td>
<td>Link to Ethiopia and Djibouti</td>
</tr>
<tr>
<td>Yei-New Lasu</td>
<td>45</td>
<td>CES</td>
<td>Seasonal Road</td>
<td>9</td>
<td>2014</td>
<td>Link to Democratic Republic of Congo</td>
</tr>
<tr>
<td>Juba-Kajo Keji</td>
<td>120</td>
<td>CES</td>
<td>Seasonal Road</td>
<td>24</td>
<td>2014</td>
<td>Link to Uganda</td>
</tr>
<tr>
<td>Raja-Boro-Madina</td>
<td>200</td>
<td>WBGS</td>
<td>Seasonal Road</td>
<td>40</td>
<td>2015</td>
<td>Link to Chad and Sudan</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>335</strong></td>
<td></td>
<td></td>
<td><strong>107</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Directorate of Roads and Bridges and Consultant’s Estimates

Thirdly, the regional network which comprises some 535 km of roads in Eastern Equatoria State, Jonglei State,55 Central Equatoria State and Western Bahr el Ghazal State will be upgraded to all-weather gravel standard in the short-term (see Table 7.10). The cost of this project is estimated at $107 million.

The total cost of the proposed project to upgrade the regional network to paved standard or all-weather standard is estimated at $929.7 million. The total length of roads in the regional network improved will be 1,125 km. Also at this stage, detailed feasibility studies to upgrade an additional 965 km to paved standard in the medium-term will be finalized.

#### Improving regional connectivity in the medium-term

The proposed program for the medium-term (2016-2020) will comprise road works which will be based on feasibility and design studies carried out under the STP and subsequent studies during the medium term to bring regional links to paved standard after 2020 and these will include:

- Upgrading to paved standard of 965 km of roads at a cost of $772 million, and
- Completion of feasibility studies and design of 365 km regional road network to paved standard including: (i) Yei-New Lasu (45 km) linking to DR Congo; (ii) Juba-Kajo Keji (120 km) linking to Uganda; and (iii) Raja-Boro Madina (200 km) linking to Chad. The estimated total cost of the studies is $2.2 million.

### Table 7.11: National Connectivity - Upgrading to All-Weather Condition

<table>
<thead>
<tr>
<th>Roads Details</th>
<th>Length (km)</th>
<th>Location</th>
<th>Current Road Condition</th>
<th>Cost ($ million)</th>
<th>Completion Date</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yeï-Farak Sika Mambe</td>
<td>160</td>
<td>CES-WES</td>
<td>Seasonal Road</td>
<td>32</td>
<td>2015</td>
<td>Connect WES and CES Minerals and Agricultural Potential</td>
</tr>
<tr>
<td>Mogiri-Lafon-Chalamani</td>
<td>160</td>
<td>CES-EES</td>
<td>Seasonal Road</td>
<td>32</td>
<td>2015</td>
<td>Connect WES and CES Minerals and Agricultural Potential</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>320</strong></td>
<td></td>
<td></td>
<td><strong>64</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Directorate of Roads and Bridges and Consultant’s Estimates

Feasibility and design studies will be undertaken to assess the viability of upgrading the remaining 2,410 km of roads linking state capitals from all-weather gravel roads to bitumen. The Bor-Malakal link is a major concern, because this section of the northern corridor linking Juba to Malakal is located in the Sudd with black cotton soils unsuitable for road construction. It will therefore be imperative to conduct a pre-feasibility study that will determine the characteristics of the transport demands on this route and propose optimal solutions to meet these demands, considering all transport modes. The cost of this study is estimated at $0.5 million and the entire cost of all the studies to upgrade the national connectivity is estimated at $19.3 million.

### Table 7.12: National Connectivity - Feasibility Study and Design to Paved Standard

<table>
<thead>
<tr>
<th>Roads Details</th>
<th>Length (km)</th>
<th>Location</th>
<th>Cost ($ million)</th>
<th>Completion Date</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juba-Mundri-Rumbek-</td>
<td>650</td>
<td>CES-WES-LS-WS-WBGS</td>
<td>5.2</td>
<td>2014</td>
<td>Link state capitals with Juba</td>
</tr>
<tr>
<td>Tonj-Wau</td>
<td>710</td>
<td>WES-WBGS</td>
<td>5.7</td>
<td>2015</td>
<td>Link state capitals with Juba</td>
</tr>
<tr>
<td>Mundri-Yambio-</td>
<td>180</td>
<td>CES-JS</td>
<td>1.4</td>
<td>2014</td>
<td>Link state capitals with Juba</td>
</tr>
<tr>
<td>Tambura-Wau</td>
<td>450</td>
<td>CES-LS</td>
<td>3.6</td>
<td>2015</td>
<td>Link state capitals with Juba</td>
</tr>
<tr>
<td>Juba-Bor</td>
<td>270</td>
<td>LS-US</td>
<td>2.2</td>
<td>2014</td>
<td>Link state capitals</td>
</tr>
<tr>
<td>Juba-Tereleka-Rumbek</td>
<td>150</td>
<td>NBGS-WBGS</td>
<td>1.2</td>
<td>2014</td>
<td>Link state capitals</td>
</tr>
<tr>
<td>Rumbek-Maper-Bentui</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wau-Aweil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,410</strong></td>
<td></td>
<td><strong>19.3</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Directorate of Roads and Bridges and Consultant’s Estimates
South Sudan: An Infrastructure Action Plan

Improving national connectivity in the medium-term.

Based on the studies carried out during the STP period, an estimated 2,410 km of interstate roads linking state capitals will be upgraded to paved standard over this period (2016-2020). With the proposed regional connectivity program this will mean that with the exception of urban areas, the country would have upgraded a total of 4,158 km to primary paved road network by 2020. The remaining 3,091 km of interstate and primary roads will also be brought to at least all-weather gravel road condition during 2016-2020 period.

This will essentially result into a road density by population of around 290 km/million which is still well below the prevailing Sub-Saharan African average of 533 km/million people (See Table 7.1). Cumulatively, the total cost for this national connectivity program is estimated at $2.046 billion, with $1.446 billion and $600 million allocated to the construct roads to paved standard and to all-season gravel conditions respectively.

7.2.9 A Program to Strengthen Rural Connectivity

For the purposes of this Report, rural roads refer to the existing secondary and tertiary roads of South Sudan. Currently, the rural road network is 1,223 km and these connect rural communities to the network of trunk roads. These rural roads are meant to open up rural areas and connect farmers and rural communities to markets to facilitate the flow of agricultural inputs/outputs and provide access to basic services. However, in the recent past, minor improvements have been undertaken through labour-based contract works and the vast majority of traceable rural roads are in very poor condition.

Improving rural connectivity in the short-term.

The country needs to develop a rural road network. Between 2009 and 2010, feasibility studies and design of about 7,000 km of rural roads were carried out in the context of the submission of a related Final Development Plan Report (FDPDR) in September 2010. The author of the FDPDR selection and prioritization is based on a combined economic evaluation (EIRR and NPV) and a multi-criteria assessment (MCA) that was based on the following scale: (i) level of agricultural production; (ii) degree of regional integration; (iii) average daily traffic; (iv) number of non-motorized traffic; and (v) level of cost effectiveness. 83 Subsequently, a Feeder Road Technical Committee (FRTC) chaired by the Under Secretary of the Ministry of Roads and Bridges (MoRB) and comprising representatives of development partners and relevant ministries was set up to develop the rural road network. The specific task of the committee is to: (i) liaise with stakeholders to obtain a list of proposed priority roads to develop at National and State level; (ii) design criteria for selection and prioritization of roads to develop; (iii) produce a list of priority roads to develop, and (iv) develop technical standards and specifications, and implementation plans for the roads. A Feeder Road Steering Committee (FRSC), co-chaired by the Ministry of Agriculture and the MoRB approves the prioritization criteria and a list of priority roads. The outputs from the FRTC/FRSC work will serve as reference in aligning government and development partner interventions in the rural road network.

So far, priority lists submitted by states had a total length of 17,000 km of feeder roads. These lists are being reviewed and screened by the FRTC and below are the characteristics of priority areas: (i) high agricultural productivity, including livestock rearing and fisheries; (ii) ability to develop local capacity as well as have county/state agencies that will be trained in maintenance; (iii) less than 100 km from main truck; (iv) access to appropriate materials for construction such as water and gravel sources; (v) consistent and participatory support from local authorities and communities; and (vi) availability of dependable manual labour.

Clearly, a rural road recommended under the FDPDR and validated through the FRTC/FRSC process will most likely qualify for the rural connectivity short-term program. Given the magnitude of the needs, development partners are likely to target roads or areas that have close linkages with their complementary initiatives to deepen synergies in the implementation of the program.

Considering implementation capacity limitations, this Report proposes an ambitious plan to upgrade 2,000 km of rural roads to all-weather status during 2011-2015. The related cost is estimated at US$3.50 million. The assumption is that the experience gained from the short-term program will underpin the design and implementation of a much larger program to upgrade 4,000 km of rural roads to all weather status during 2016-2020. The cost of this is estimated to be $600 million (at 2010 constant prices and exchange rate). Once, the rural road improvement program of 6,000 km is implemented in the decade ahead it will essentially mean that entire rural road network of the country has been upgraded.

In the short-term, the livestock sub-sector is expected to significantly contribute towards the growth and prosperity of South Sudan. 84 Therefore priority livestock markets have been proposed as the major focus of the road sector strategy to allow the farmers’ access the backbone infrastructure. These markets are located in ten areas, i.e. Greater Kapoeta region in EYS; Nyril and Pibor counties in JRS; Nasir, Bailet and Renk in UNS; Panyijar, Mayom and Leer in US; and Terekeka in CES.

7.2.10 Proposed Urban Road Program

The urban population in South Sudan was estimated at 16% in 2008 and is expected to increase steadily to 23% in 2015 and 26% in 2020. At the same time, urban transport infrastructure, including roads, is severely underdeveloped. With less than 70 km of paved urban roads, there are only about 35 meters of paved road per thousand residents in 2011, compared to an average of 128 meters in Sub-Saharan African cities and 700 metres in the low-income countries of the developing world. 85

Upgrading program for the short-term. In collaboration with Japan, a Master Plan for Urban Transport Infrastructure was developed as part of the proposed investment in the backbone of South Sudan. This plan recognized Juba’s rapid expansion and its critical contribution to the development of the country. The study identified the investment requirements to meet the present and future transport demands in Juba and South Sudan. The requirements amount to $510 million for the first period of seven years (2009-2015). The related physical investment will comprise new construction and upgrading to AC standard of about 190 km of streets and a bridge of 560 metres over the Nile. The proposed investment for the 2012-2015 period will include new construction and upgrading to AC standard of about 100 km of urban roads including 20 km of arterial streets and 80 km of collector and local streets.

Going forward, urban transport infrastructure master plans will be developed for major towns, particularly those with a population close to or exceeding one hundred thousand and these include Malakal, Wau, Aweil, Bor, and Yei (See Annex Table 3.1). Furthermore, 100 km of urban roads will be upgraded to all-weather condition and another 100 km will also be upgraded to paved standard in these major towns and the remaining state capitals. Roads that access river ports and airports will be among those upgraded.

The total cost of the urban connectivity during the STP is estimated at $415 million, of this amount $260 million will be used to extend and upgrade 100 km of the urban roads in Juba to AC standard, $140 million will finance the upgrade of 200 km of urban roads in state capitals and major centres, and $15 million will support the development of urban transport infrastructure master plans for four major towns and two other state capitals.

Improving urban connectivity in the medium-term. The medium-term program will provide a continuation of the Juba urban road development program and will also support the implementation of the urban transport master plans. In the medium-term, an additional 140 km of paved roads and two bridges will be built in Juba to bring the total length of paved roads in Juba to about 300 km by 2020. The program proposes the construction of a total of 100 km of urban paved roads in other main cities of the country and another 200 km of urban roads built to all-weather standard. The total cost of this program is estimated at $1.250 million. Given that the total urban population projections of South Sudan are estimated to be 3.7 million in 2020, representing 26% of the total population, the implementation of this urban road program will translate into 135 metres of paved road per thousand residents, which is almost as the current level for Sub-Saharan African cities.

The total cost of the proposed urban connectivity medium-term program amounts to $700 million, of this amount $660 million will be used to construct urban roads to paved standard for and $40 million to upgrade roads to all-weather road condition.

7.2.11 Institutional Development, Capacity Building and Technical Studies

Road safety enhancement. Technical support is required to assist the RSMC and the Directorate of Road Transport and Safety in the formulation and implementation of a

83 Cost-effectiveness analysis (CEA) indicator is defined as the cost of upgrading a particular route divided by the number of people served by the route.

84 OTP Group (March 2011), “Training Innovation and Competencies in South Sudan (TICCS) – Sector Growth Strategic Prepared for Ministry of Commerce and Industry – GOSS.

comprehensive RSP. The RSP will include: (i) review and improvement of RTA management system; (ii) support to emergency services; (iii) support to law enforcement; (iv) support to vehicle inspection activities; (v) promotion of public awareness campaigns; (vi) support to specific programs targeting commercial vehicle drivers; and (vii) introduction of road safety education in schools. The plan estimates that it will cost $6 million to develop and implement road safety programs. This will cover the cost of equipment, workshops, campaigns, surveys, trainings and technical assistance.

Capacity building and institutional support. The proposed program of capacity building and institutional support will support the following:

• Technical assistance (TA). This assistance will complement SSRA capacity to implement the STP as well as support the development of a road maintenance strategy. Essentially technical support will target government agencies to support the handling of the large volume of procurement and financial management. The TA will include procurement experts, financial analysts and civil engineers. Basing on the existing capacity in the Ministry of Roads and Bridges a total of 170 man-months of technical assistance will be required to implement the STP and it is estimated to cost $4.3 million.

• Training for ministry technical staff. The current training of engineers and technicians from MoRP, MoPI and SSRA will continue and going forward, training in planning, contract administration, procurement management, geotechnical, structural and transportation engineering are being planned. This training component is estimated at $3.5 million.

• Support to create a road maintenance fund. A study will be undertaken to prepare for the establishment and initial operation of a Road Maintenance Fund (RMF) and this is estimated to cost $1 million.

These capacity building programs and technical support will continue in the medium-term, including road safety enhancement ($5 million), technical assistance ($5 million), and training ($2.8 million).

Technical studies. A series of studies will be undertaken in the short-term to lay the foundations for expanded levels of support for development of road sector infrastructure and services in the medium- and longer-term. These will include the following:

• National transport master plan. The national master plan will provide input for the development of medium- to long-term strategy (MLTS) of the transport sector. A draft national transport master plan was completed in January 2010; however, there was limited coverage of the requirements for the decade ahead. The new master plan for South Sudan will highlight the characteristics of transport demand; develop projections related to the most likely scenarios; and come up with efficient programs to meet the demand as well as propose a pragmatic and effective institutional framework for the sector.

• Bor-Malakal link. A pre-feasibility study will be undertaken to determine the characteristics of the transport requirements and recommend ways to meet the projected future demand along the Bor-Malakal corridor. This activity is estimated to cost $0.5 million.

• Urban transport master plan. Urban transport infrastructure master plans will be developed for major towns and these plans are estimated cost to $15 million.

• Feasibility and design studies for road upgrades. The plan proposes studies that will lay a foundation to upgrade 965 km of regional network to a paved standard and 2,410 km of national truck road network. The feasibility studies for regional network and national truck road network will cost $7.7 million and 19.3 million respectively and are expected to be completed during 2012-2015 period.

Over the medium and longer term, the estimated costs of the feasibility and design studies to upgrade of 365 km of the regional trunk road network will be $2.2 million and the other road related studies will roughly cost $6.8 million.

7.2.12 Proposed Development Expenditures for Road Transport

Proposed expenditures. The proposed program for road infrastructure development in the decade ahead amounts to about $6.2 billion. Capacity building and technical services account for about $92 million, with capital outlays of road infrastructure accounting for the remaining $6.1 billion. Of this amount ongoing government and donor programs account for about $250 million, and it is proposed that the balance $5.9 billion will be mobilized primarily from government and donor sources.

Sources of funding for the program. During 2009-2011, the average annual donor disbursements for roads programs were $85 million, while Government annual capital outlays for road works amounted to about $165 million. Therefore the average annual level of spending on roads infrastructure and related capacity building and technical studies was $250 million, meaning that the Government's funding accounted for two-thirds of the cost. As Table 7.13 indicates that in 2012 annual disbursements will remain close to the average of the past three years, and thereafter will continue rise annually to reach a little over US$500 million by 2015 and close to $1,030 million a year by 2020. Clearly, mobilizing the resources of such magnitude to finance the road sector is a massive challenge to the Government.

As discussions in Chapters 2 and 3 indicate, the working assumption used in this Report is that the donor community will allocate 25% of total ODA (excluding humanitarian assistance) to the infrastructure program for the decade ahead. In recent years donors have been allocating 7% of their total ODA allocations for road sector infrastructure in South Sudan. The funding arrangement included in Table 7.13 calls for donors to increase their allocation to road infrastructure from 7% to 15% of total ODA by 2013. In this scenario, donors' allocations for roads infrastructure will increase annually by $20 million. However, the Government allocation for the roads program has to increase from the recent annual average of $165 million to $280 million by 2013 and roughly $780 million by 2020. Meaning the Government will fund 68% of the proposed program which was close to its share in 2009-2011.

Table 7.13: Development Expenditure Program for the Roads Sector

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Road safety enhancement</td>
<td>-</td>
<td>-</td>
<td>2 000</td>
<td>2 000</td>
<td>1 000</td>
<td>1 000</td>
<td>1 000</td>
<td>-11 000</td>
</tr>
<tr>
<td>Capacity building for Roads Authority</td>
<td>5 306</td>
<td>4 720</td>
<td>1 574</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-6 294</td>
</tr>
<tr>
<td>Capacity building for road maintenance</td>
<td>-</td>
<td>-</td>
<td>565</td>
<td>1 125</td>
<td>1 125</td>
<td>935</td>
<td>-</td>
<td>-3 750</td>
</tr>
<tr>
<td>Support for road maintenance Fund</td>
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<td>-</td>
<td>-</td>
<td>600</td>
<td>400</td>
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<td>-</td>
<td>-1 000</td>
</tr>
<tr>
<td>Training</td>
<td>-</td>
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Capital expenditures

- Ongoing government road programs 194 640 135 280 - - - - 135 280
- Ongoing donor road programs 62 080 52 615 50 598 5 000 3 255 - - 111 468
- Proposed new road programs
  - Trunk roads - - 63 400 200 500 277 900 385 600 3 804 600
  - Rural roads - - 40 000 80 000 82 500 93 500 150 000 930 000
  - Urban roads - - 88 000 176 000 112 000 24 000 200 000 1 200 000
  - Sub-total - - 191 400 456 500 472 400 503 100 1 054 600 5 934 600
  - Total 256 720 187 895 241 998 486 225 487 690 511 900 1 057 100 6 264 171
- Grand total 262 366 193 830 258 326 486 225 487 690 511 900 1 057 100 6 264 171

Financing arrangements

- Government 194 240 135 280 179 910 345 100 318 500 311 900 747 100 4 286 890
- Donor community 68 126 58 550 78 416 141 125 169 190 200 000 310 000 1 977 281
- Total 262 366 193 830 258 326 486 225 487 690 511 900 1 057 100 6 264 171
- Government share of funding (%) 74.0 69.8 69.6 71.0 65.3 60.9 70.7 68.4

Source: Annex Tables 8.3 and 8.4.
7.2.13 Road Maintenance

Current status of road maintenance. Maintenance activities are currently financed through national budget and donor support. Most of these are handled sporadically without proper planning and coordination. There have been massive demands on the budget which in turn has kept the allocations at the minimum. The 2011 National Budget reported an outlay of about $28 million and $16 million for road maintenance in 2010 and 2011 respectively.

Proposed institutional arrangements for maintenance. South Sudan transport policy recognizes the critical importance of road maintenance and is aware of the need to establish a system that will ensure adequate and consistent funding for this activity. The policy also provides for the creation of a Road Maintenance Fund (RMF) which will raise revenues through user charges, primarily in the form of a fuel levy. RMF resources will finance road agencies’ activities, and these funds will be kept in separate and discrete accounts, and will be used exclusively for road maintenance activities. The study earlier mentioned of the RMF for the proposed program will address the following issues:

- Propose the fees of user charges and find other innovative ways of raising revenues for the fund;
- Design an appropriate system for charging and collecting the revenue;
- Formulate laws to guide the collection of the road user charges; and
- Investigate existing agreements and applicable rates within COMESA regional arrangements and the effects of applying specific rates for South Sudan.

Currently, the road network classification and inventory which is a prerequisite for an effective road maintenance strategy is incomplete and the implementation of the transport policy has also encountered some delays. The Ministry of Roads and Bridges, through the DRB and soon SSRA, is responsible for the planning and execution of maintenance of trunk and state roads and on the other hand MoPI is in charge of other roads.

The DRB has a prepared a document providing recommendations on the consistent and pragmatic road maintenance strategy. The paper proposes that the strategies deployed should be tailored to resources available, this has compelled the Ministry to undertake an in-depth evaluation of the practicalities of adopting the Output and Performance-based Roads Contracts (OPRC) model as the basis for the maintenance strategy for bitumen surfaced roads.

In this model, “the Contractor is not paid directly for inputs or physical works but for achieving specified outputs or service levels, i.e. the construction or rehabilitation of the road to pre-defined standards, followed by the maintenance of certain minimum service levels on the road throughout the period of the contract, all defined by outcomes expressed in the service level criteria.”

Proposed levels of spending on maintenance. The report proposes routine maintenance for roads in relatively good condition. Total maintenance expenditures are projected to be about $960 million for the next decade. The total periodic road maintenance costs are estimated at $500 million with annual outlays increasing steadily from $20 million in 2012 to about $110 million in 2020 as indicated in Table 7.14. Periodic maintenance is projected to be about $460 million for 2012-2020, equivalent to an annual average of about $50 million.

This report proposes that the maintenance expenditures will entirely be financed by the national budget and the RMF. Today’s budget allocation for road maintenance in 2011 is $16 million, the Government will need to quadruple this amount in 2012 so that the roads are kept in good repair. To be able to carry out the same level road maintenance activities, the authorities will need to ensure the increases in the allocations are maintained at the same rate for the successive annual budgets until the RMF is established and is operational. Having said that, potential RMF revenues are closely correlated with the vehicle fleet, including motor cycles, and road traffic densities, however the current projections indicate these resources are unlikely to cover the full cost of maintenance in the short-term. Therefore, road maintenance will also be supported by a significant budgetary allocation during most of the IAP period.

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<th>2012 Cost ($ million)</th>
<th>2015 Length (km)</th>
<th>2015 Cost ($ million)</th>
<th>2018 Length (km)</th>
<th>2018 Cost ($ million)</th>
<th>2020 Length (km)</th>
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Table 7.14: Road Maintenance Expenditures (In $ at 2010 constant prices and exchange rate)

Source: Directorate of Roads and Bridges; Consultant estimate
7.3 River Transport and Infrastructure

7.3.1 The Current Situation

River corridors. As noted in Chapter 5, the White Nile extends from Lake Victoria to Khartoum for nearly 3,700 km. It enters South Sudan at Nimule, flows to Juba and Bor and through the vast swamps of the Sudd, and passes major towns such as Malakal, El Renk and Kosti. The section of the White Nile between Juba, El Renk and border with Sudan is navigable and it is about 1,300 km long.

The Bahari Ghazal River is a tributary of the White Nile. It is navigable all year round from the main route where it joins the White Nile to Meshra Achol and for more than half of the year to Wau. The Sobat River, another tributary, is navigable between Malakal and Abwong all year round. Its stretch from Abyei to Nazir, Akobo and Pibor is navigable for more than six months of the year. The Sobat area and indeed most of the flood-prone areas of Upper Nile Region depend on river transport from June to October during the year.

The navigable part of White Nile and its tributaries crosses six of the ten states of South Sudan. Given the poor road infrastructure, presence of land mines in some areas and huge swampy areas makes river transport a practical and cost effective option to reach communities along the White Nile and its tributaries. It specifically links Malakal the capital of the Upper Nile State to Juba.

Commercial river transport services are fairly regular on the route known as the “Southern reach” of the White Nile, which stretches from Kosti to Juba (1,436 km), through El Renk, Malakal, Shambe, Diam Diam, Bor, Mongala and Juba (see Map 7.3). With the support from Japan, South Sudan has constructed a jetty, offices for port officials and open air storage facilities in Juba Embankment Port. The jetty has a gantry crane arm with a 2.5 tonne metric capacity. A shipyard has been built at the Old Juba Port location which was formerly abandoned because of silting problems. Dredging works will be undertaken to facilitate access of the shipyard. Finally, in collaboration with the Japanese a Juba River Port Expansion Project has been launched and it will transform the Port into a modern well equipped facility with an extended jetty, warehouses and administrative buildings. Currently, Stevenson’s Union has the monopoly to load and offload cargo. Since it is the sole provider it charges high rates and it usually undertakes the activities manually and on average manages to only loading/offloading four barges per day. Occasionally, mobile mechanical lifting equipment is availed on demand. The lack of storage facilities means that fuel is pumped directly from the barges to the waiting tankers. The Port area is also used as a staging point for IDPs returning to the South, en route to their final destination.

New river ports have recently been built in Mongala, Diam Diam and Shambe. The facilities constructed include a jetty, a gantry crane arm and offices. Shambe port is particularly important as it enables access to the Lakes, Warrap and Unity States. Because of the narrow and winding section between Mongala and Juba, pusher convoys are usually dismantled in Mongala. The river port in Bor consists of a natural embankment for offloading fuel and general cargoes. Bor has also privately owned storage facilities. Independent vendors offering mechanized lifting equipment are occasionally available.

Malakal is a primary transit point between Kosti and Juba. It is served by smaller boats that can access the White Nile tributaries. All major private operators call at Malakal to offload fuel, building materials and general cargoes. The port has silt free a pier of about 300 metres. Cargo handling is mostly done manually by private porters. Mobile mechanized lifting equipment can be acquired on demand. Loading/offloading capacity is around 3 barges per day. Fuel is discharged at a privately-owned depot with a storage capacity of 60,000 litres of diesel and 60,000 litres of petrol.

El Renk was known as a loading facility for Dura. Currently majority of private operators also call at El Renk to offload fuel and general cargoes. The port has a functional jetty which is in poor condition. At times, porters do the manual handling at rates cheaper than those charged in Juba. Mobile mechanized lifting equipment is available on demand from private vendors. Privately owned storage facilities are available a few kilometres away from the port.

River operators and traffic. The New River Transport Company (NRTC) and Sudan River Transport Company (SRTC) were created by privatizing Government-owned River Transport Corporation (RTC). The majority shareholder in the new venture is Kuwait Gulf Link (KGL) Group with 51% while GoNU and GoSS hold respectively 20% and 10%. Although they operate with different names, both companies have the same top management and headquarters in Khartoum. They have also created an entity in South Sudan, the Southern Sudan Trans-Nile Company (SSTC) located in Juba. NRTC/SRTC is the largest operator on the White Nile with a large fleet composed of pushers, passenger barges and a mixture of flap top, general cargo and fuel barges. The other major barge operator is the KEER Group which has the same fleet mix except passenger barges. Both operators can transport all types of cargo including containers, fuel, vehicles, construction materials, machinery and food items. Alongside these,
there are a number of smaller private active operators that do not call regularly into the ports. There are also some companies or independent operators with boats of various sizes that operate primarily in the South between Malakal, Bor and Juba and the tributaries in between.

Historically, the traffic volumes reached 300,000 tons per year in the mid-1970s, but by 2008 traffic had fallen way short of 100,000 tons. Despite the lack of compiled data in recent years, it seems unlikely that it will reach the 100,000 ton mark in the near future.

During the first quarter 2011, around 20 NRTC/SRTC trips to and from Juba were registered against an average one per month for KEER. Rates range from US$250 to $300 per metric ton or cubic foot depending on which is larger, from Kosti to Juba. The travel time for cargo barges along this route is around 3-5 weeks excluding loading and off-loading times. The carrying capacity per sail is between 1,200 and 2,000 metric tons. For a return journey from Juba to Kosti, rates are 50% of that for upstream travel and sailing time can drop to one week. For passenger barges, it takes about 10 days.

Short-term. In the short term, the construction of cargo handling facilities will increase the efficiency of some major ports, such as Malakal and Bor. It is also critical to survey and map White Nile River with a special focus on the 45 km section between Mongala and Juba. It is envisaged that these hydrographic surveys will be the basis for all river engineering studies and subsequent works including dredging and installation of navigation aids. Firstly, a bathymetric survey beginning with Mongala-Juba section will provide inputs to determine the requirements for possible dredging operations and appropriate positioning of navigation aids. Further still, given the high cost implications and far reaching consequences on the hydraulic and morphologic behaviour of the river, in depth reviews will be undertaken prior to the implementation of large-scale dredging operations.

Following the independence, South Sudan has taken full responsibility for river transport on the Southern reach of the White Nile, at least from El Benk to Juba. There is a need to establish and implement a new institutional framework, including a River Transport Authority, which will take over from the Khartoum-based IRND. Legislation and regulation for river transport will be consistent with the regional and international regulations on inland water transport. A training program for staff of the river transport institutions will be developed and implemented. Technical assistance will be needed for these assignments.

7.3.3 Expenditure Program and Funding for Water Transport

Total cost of the proposed river transport program is estimated at $67 million for 2011-2020. This estimate includes on-going projects such as Juba River Port development and specific dredging on selected areas. As reflected in Table 7.15, the first four years include significant outlays on capacity building and technical studies, including the establishment and implementation of a new institutional framework, staff training, and hydrographic/bathymetric surveys which will give a solid base of primary data on the physical characteristics of the White Nile River and its tributaries.

Table 7.15: Development Expenditures for the River Services and Ports Program (in $ millions at 2010 constant prices and exchange rate)

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The proposed sources of funding for the river transport program are: (i) national budget for a total amount of $31.7 million, representing 47% of the total cost, (ii) private sector for $15.5 million (23%) and (iii) donors for $19.7 million (30%). For the purposes of this Report, it is assumed that by 2014 the required institutions and entities will be fully operational and traffic levels will have increased significantly. A PPP-type arrangement, either as a concessionaire or a lessee of facilities will then be agreed which will allow significant private sector involvement in the financing of capital expenditures. Afterwards, the private sector will finance installation of navigation aids and contribute to half of dredging costs and donors will mainly be involved in capacity building activities.

7.4 Railways Infrastructure and Services

7.4.1 Current Status of the Railways Network

The only railway line in the country is the southern section of the 446 km Babanusa–Aweil–Wau line, which has been part of the 4,578 km Sudan rail network operated by the Sudan Railway Corporation (SRC). This line connects Wau in South Sudan to Babanusa, Khartoum and Port Sudan in Sudan (see Map 7.4). The total length of the railway line in the country is 248 km, from Wau to the border with Sudan. The single track is narrow gauge (1,067 mm) and is based on steel sleepers. The track condition is considered to be poor. Although the initial design speed was 50 km/h, the current speed is very low.

The country’s portion of the network was not operational for almost two decades. Following some rehabilitation works supported by funding from the United Nations, the line was reopened in March 2010. However, the service is irregular and limited, on average it is operational once a month mainly transporting consumer goods from Khartoum.

The Directorate of Railways of the MoT is responsible for promoting railways in South Sudan. It is headed by a Director General who is currently the only senior staff of the directorate. The functions of the directorate include the development of policy and regulations for railway operations in South Sudan.

7.4.2 Proposed Program for Rail Transport

Ongoing programs and the Southern Sudan Development Plan: According to the Southern Sudan Development Plan (SSDP), on-going efforts in the railway transport sub-sector include: (i) rehabilitation of housing along the Wau–Aweil–Babanusa line; carrying out feasibility study of a proposed extension from Wau to Juba and Nimule; and undertaking a modest program of capacity building for the Directorate of Railways. The 2011 National Budget allocated a total of $1.26 million equivalent of capital outlays for railways. This allocation included $0.630 million for a feasibility study of an extension of the rail line from Wau to Juba and Uganda, and $0.630 million for rehabilitation and maintenance of railway facilities.

The SSDP includes a proposed expenditure of $241 million on the railways sector during 2011-2013. This is to support the creation of a railways regulatory body, purchase equipment for the railways network, and construct the 150 km of new lines in 2013. However, discussions with Directorate of Railways Transport confirmed that there is no on-going project in the sub-sector, contrary to what is indicated in SSDP. Such a huge investment has to be justified by specific pre-investment studies as proposed below.

The working assumption that underpins the proposed Action Plan for the railways is that in the Government, represented by the South Sudan Railway Corporation or some such state owned corporation, will own the national rail infrastructure (track and communications network) and will be responsible for rehabilitation and upgrade of the existing network and any possible future expansion of the network. Subject to further detailed study and dialogue with potential investors, the expectation is that the South Sudan Railway Corporation will enter into a PPP-type partnership with a private concessionaire who will own and operate locomotives and rolling stock. The

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Source: Annex Tables 8.5 and 8.6.

"There have been a number of media reports about a proposed rail line extension from Wau to Nimule. See, for example, Odhiambo, Allen (2011), ‘RVR targets planned Uganda-Sudan railway line.’ (http://www.businessdailyafrica.com/Corporate+News/RVR+targets+planned-Uganda-Sudan+railway-line/-/539700/1213656/-/n6o0bz/-/).

MAP 7.4: Railways Network in South Sudan and Sudan
7.4.3 Development Expenditures Required for the Program

The total estimate of the rail transport program amounts to $87 million. The cost of new rolling stock and locomotives for the provision of services are not included at this stage, pending further analysis of traffic demand for the medium- and longer-term and creation of an appropriate operating environment for the award of contracts to one or more concessionaires who will be responsible for service provision.

The proposed Action Plan for the decade ahead does not include any provision for construction of a line from Wau to Juba neither to the border with Kenya nor Uganda. According to the World Bank (2010), the cost of constructing a single track, non-electrified railway line on relatively flat terrain is at least $1.5 million per km, increasing to $5 million a km in more rugged terrain.

Assuming an extension from Wau to the border with Kenya or Uganda involved about 750 km of a single track line, the capital cost of the extension will be in the range of $2-4 billion (at 2010 constant prices). A substantial number of passengers and a significant amount of freight traffic will be required for the economic and financial justification of a capital outlay of this magnitude. The proposed feasibility studies will address these types of concerns prior to serious negotiations with potential concessionaires that will operate on the track once built.

As Table 7.16 indicates, the Government will most likely fund at least 90% of the proposed expenditures for the railways program. The working assumption in this Report is that the Government will cover most of the capital outlay expenditures and largely collaborate with donor community to provide modest support to capacity building activities for the infrastructure sector.

Table 7.16: Development Expenditure Program for the Railways Sector

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7.5 Air Transport Infrastructure and Services

7.5.1 Current Status of Civil Aviation

Air transport infrastructure. Air Transport infrastructure is composed of an international airport in Juba, a domestic airport in each state capital of the other nine states and around 380 airstrips (see Map 7.4). These airstrips emerged during the civil strife to provide military logistics bases and served later on, as hubs for humanitarian relief supplies by international relief agencies and NGOs. Only Juba and three domestic airports (Rumbe, Wau and Malakal) are manned. Malakal and Wau receive occasional international flights. Juba and Malakal are the only airports with paved runway, measuring 2,400 and 2,000 meters long respectively. The paved runways are in fair condition. Existing airport facilities, are inadequate and lack proper maintenance.

MAP 7.5: Main Airports in South Sudan
The runway and apron at Juba airport have significant problems of pavement deterioration. The passenger terminal is used in a mixed process for domestic and international departures and arrivals. The terminal facilities are inadequate; limited capacity of departure lounge and arrival hall, few rudimentary check-in counters, hand operated balance, no information display for passengers or operators, no stand allocation or planning system, no computer connections to airline reservation systems or to the air traffic control for updated information, no baggage conveyor belts. There were no dedicated cargo facilities despite noticeable cargo traffic. The general aviation uses the same terminal facility as the commercial traffic and passengers. Service facilities are limited to several carts for luggage transport, several services vehicles, few fire fighting vehicles and stockpile of fire extinguishing materials. There is no fuel storage facility which adds another constraint to the aircraft payload.

Institutional arrangements. Prior to Independence, GoSS and GoNU had to cooperate on civil aviation and airports operations in the South. According to ICAO requirements, only one Civil Aviation Authority (CAA) can be established in a country. Therefore, the CAA based in Khartoum assumed responsibility for the development of civil aviation and air transport services in Sudan, including South Sudan. Regulations, Search And Rescue (SAR) functions, international matters and air traffic management operations were under the CAA, while airstrips operations fall under the responsibility of the States. In addition, CAA operates all international and national airports. This can create major conflict of interest and a clear separation of the functions of regulator and service provider is required.

Notwithstanding overlapping responsibilities, GoSS established the Directorate of Air Transport within MTR to provide an institutional framework, the functions of the regulator and the airport service provider is required.

The proposed program for the improvement of civil aviation in South Sudan is carved around a phased approach that includes high priority programs for implementation in the short-term (2011-2015) and in the medium- and longer-term (2016-2020).

Ongoing improvements in civil aviation infrastructure and the short-term program (STP). The STP will consist of five main components: (i) restructure and upgrade institutional arrangements for the civil aviation industry; (ii) complete the ongoing upgrade of Juba domestic and international airport; (iii) upgrade selected airports in state capitals and other locations; (iv) formulate and implement an air transport policy; and (v) design and implement a capacity building and training program for technical staff. Restructure and upgrade institutional arrangements for the civil aviation industry. One of the primary tasks of the Government of South Sudan will be to design and implement a new institutional framework for civil aviation, including the establishment of a Civil Aviation Authority (CAA). Through this framework, the Government will set clear and separate functions performed by central Government, state governments, aviation and airport authorities, air transport operators and other private sector activities. Under the proposed new institutional framework, the functions of the regulator and the airport service providers will be clearly separated and performed by distinct entities. This Report proposes that the new institutional framework and the establishment of the CAA take priority before the rolling out the proposed short-term program. However, South Sudan will remain in the same FIR controlled by the ACC in Khartoum at least for the immediate future. Moreover, the proposed CAA will be responsible for its own financial management and enforcing civil aviation and security standards consistent with the requirements of the ICAO. The authority will be mandated to generate some of its funding requirements from user fees, a charge on departing scheduled passengers and a fuel levy payable by the general aviation industry. Other sources of revenue will include charges for various services, including aircraft registration, examination and registration of pilots, and various licensing activities.

The creation of the CAA will be accompanied by formation of a separate public company, referred to in this Report as the South Sudan Airport Services Company (SSASC). The SSASC will own the airside and some landslide facilities at airports on behalf of the government. It will be essential for the SSASC to begin its operations with a strong set of financial accounts.

The ICAO requires member states to charge aeronautical fees on a cost-recovery and not a profit-making basis. Given this requirement, the profitability of airport operations will depend on the amount of income that can be generated from airport concessions and other services such as car rentals and parking services. The profitability of the continued strong growth in traffic will depend on increasing revenues from airport services such as landing, parking, passenger fees and other usage fees. This will favour a concession PPP type arrangement in which a private company, perhaps in partnership with the SSASC, will manage selected airports, operate services and undertake required rehabilitation or upgrading of infrastructure. For the purposes of this Report, it is assumed that the concession will be operational from 2015. Until then, sources of funding will be the national budget and public institutions which collect air traffic fees.

Juba domestic and international airport. The master plan of Juba Domestic and International Airport, which was completed in 2007, recommended an orderly development in four phases corresponding to four time horizons, i.e., short-term, medium-term, long-term and very long-term. Each phase of development is planned to meet aviation activity forecast needs in compliance with international design standards as prescribed by ICAO.

A high priority will be accorded to completion of the remaining works under phase 1 of Juba Airport Development Master Plan. The works related to the first phase are on-going and consist mainly of the following: (i) extension of a runway from 2,400 m to 3,100 m to meet ICAO 200 ER, (ii) strength pavement and runway edge light system; (iii) extension of the taxiway; (iv) navigation aids to facilitate approaches and permit night operations.

South Sudan: An Infrastructure Action Plan
passenger facilities improvements, including apron and parking extension, and new passenger terminal fully equipped and furnished with distinct areas for domestic and international flights; (v) dedicated cargo facilities, including apron, parking and terminal; (vi) general aviation facilities, including apron, fuel pump, (vii) fuel farm; (viii) fire fighting station; (ix) rehabilitation of the air traffic control tower; (x) aircraft maintenance hangar; (xi) autonomous power supply; (xii) heliport, including helipad, SALIS, helipad light system; and (xiii) perimeter fence. The on-going works which have secured financing shall be completed by end-2011. The remaining works of the phase 1 development, including runway extension and passenger terminal equipment will be part of the proposed short-term program for Air Transport.

Upgrade of airports in state capitals and other locations. The SSDP calls for the upgrade of six state airports during 2011-2013 to meet ICAO standards. Actions on this proposal do not appear to be on-going activity, contrary to the indication in the SSDP matrices. As a first step, this Report proposes a study of the aviation infrastructure to: (i) determine the most viable airports and airstrips; and (ii) design rehabilitation or upgrading works for selected airports and airstrips. The airports selected to be upgraded (or) and extended will depend on the outcome of the study. However, for the purposes of this Report, it is assumed that the Malakal and Wau airports will be upgraded to attract more regional flights. Rough estimates of the costs involved are incorporated for the short-term period. These estimates are substantially lower than those of SSDP.

Formulate and implement an air transport policy. The formulation of this component of the proposed program will need to be developed in close collaboration with the ICAO. It will include proposals for: (i) the design and implementation of a system of airspace surveillance and air traffic management that meets ICAO requirements and ensures a safe navigation and airport security; (ii) establishment of a proper funding framework to support aviation industry growth that includes ICAO guidelines on user charges and cost recovery; and (iii) the development of specific measures needed to achieve a strict alignment with ICAO standards and recommended practices (SARP) in the medium-term. A key objective of the proposed Action Plan is to meet the minimum requirements of the ICAO by 2015 and have South Sudan classified by the Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA) as Category 1.

Capacity building and training. There is an urgent need for personnel training to ensure safe and secure air transport operations. Firstly, working with the ICAO, identify training needs and design an appropriate training program. The next step will be to implement this training program and as may be required send personnel to training facilities elsewhere in the region and also in the interim retaining international personnel with the requisite skills for air traffic surveillance and management and airport security.

Proposed program for the medium- and longer-term. Investments proposed for subsequent phases shall enable the upgrade of Juba airport and others selected in order to meet the required international standards in medium- to long-term. To this end, a periodic update of the Juba Airport master plan is necessary to reflect the notable developments and dynamics in a fast changing environment regarding national and regional traffic demands, as well as technology requirements in the air transport.

Given the rampant expansion of Juba town, the option of relocating the airport well beyond the city outskirts will be considered. The consideration will be to have the existing airport dedicated to serving the domestic and some specific flights and developing a more modern international airport elsewhere. This shall be done before initiating phases two and three of the development program. The new international facility will include a larger runway and substantial capacity for both cargo and passenger terminals.

As Chapter 6 indicates, the proposal is for a major expansion in production of high value fruits and vegetables (HVFV) for the domestic and export markets. Successful development of this industry will require substantial private sector investments in cold chain facilities for the domestic and international market. These facilities will require investment in cold storage facilities. As Map 6.4 in Chapter 6 indicates, the three areas identified for major private investment in irrigation development that will support production of these perishable products suggest that such cold chain facilities will be required in Juba, Wau, Malakal and perhaps Rubem and Yambio.

Potential for private investment in civil aviation. In addition, given the above-mentioned traffic growth prospects for Juba airport and, to a lesser extent, Wau and Malakal airports, there are likely to be good opportunities for the provision of airport services under a PPP-type arrangement in which concessions are awarded to one or more private service providers. The concessionaire will enter into a partnership arrangement with the proposed South Sudan Airport Services Company, owner of airstrips and some landscape assets at the major airports of the country. The proposed Action Plan for civil aviation includes provision for the retention of a transactions advisory team to provide technical support to the government in its negotiations with a potential investor.

7.5.3 Development Expenditures Required for the Program

As indicated in Table 7.17, total development expenditures for the proposed air transport program are estimated at about $222 million, including a provision of around $13 million for the much needed capacity building and technical services. The bulk of the new capital outlays will be for the rehabilitation or upgrading of airports, in particular Juba, Malakal and Wau, and the installation of an air surveillance and air traffic management system that will ensure compliance with ICAO requirements.

The cost of the short-term program for 2011-2015 is projected to be $105.8 million, including around $40 million for remaining works on phase 1 of the Juba Airport development, $2 million for specific HVFV logistics infrastructure, $45 million for rehabilitation or upgrading of Malakal and Wau airports, $15 million for installation of airspace surveillance and air traffic management system, and about $9 million for capacity building and technical services.

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**Capital expenditures**

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**Total expenditures**

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Source: Annex Tables 8.9 and 8.10.

The medium- to longer-term program would comprise: (i) a continuation of the development of Juba airport, phase 2 and 3, subject to clarification about the possible relocation of the international airport; (ii) further improvement of airspace surveillance and the air traffic management system; (iii) rehabilitation or upgrading of selected airports and airstrips as determined under the STP study and (iv) further capacity building through technical assistance and training. The related cost is estimated at $115.9 million, including $1112 million for capital expenditures and $3.9 million for capacity building.
7.6 Development Expenditures and Financing for the Transport Sector

7.6.1 Development Expenditures

As Table 7.18 indicates, total development expenditures for the transport sector program are projected to be $6.55 billion for 2011-2020. These include about $130 million for capacity building, technical support and studies, and $6.42 billion for capital outlays. The road transport sub-sector accounts for 94.3% of these outlays, primarily for creation of a functioning national road network by 2020. Civil aviation accounts for about $220 million, or 3.4% of the total outlays. The river transport and railways account for the remaining 2.3% of the program. Full implementation of the proposed program will mean that capital outlays will build up rapidly in the short-term, rising from a little less than $250 million a year in 2010-11 to $530 million a year by 2015 and almost $1.1 billion a year by 2020. As the discussion in Chapter 4 indicates, the bulk of the capital works associated with these expenditures will be contracted out to the private sector under competitive procurement procedures. As a result, the transport sector program will offer very substantial business opportunities for the private sector, especially in construction activities and supply of construction materials and equipment.

Table 7.18: Total Development Expenditures for the Transport Sector Program

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</table>

Source: Annex Tables 8.9 and 8.10.

The proposed expenditure program for the transport sector differs substantially from that set forth in the SSDP. The latter proposes total development expenditures of $2.8 billion for 2011-2013, including an amount of $1.7 billion for air transport infrastructure. The proposed total development expenditures for the same period under the IAP are $1.03 billion with $55 million for air transport. As discussed in Section 7.5 above, the cost of airport upgrading appear to have been substantially overestimated in SSDP; the need for prior feasibility studies that examine the economic costs and benefits of these investments would defer decisions on some of these SSDP proposals. The latter applies also to the construction of an additional rail line and, to a lesser extent, to the large program of dredging along the Nile. Conversely, as discussed in Section 7.2, the IAP proposes a larger program for the roads sector, particularly for rural and urban roads; moreover, the SSDP appears to underestimate substantially the costs of the major trunk road projects.

7.6.2 Funding Arrangements for the Program

The proposed funding arrangements for the transport sector program are set out in Table 7.19. The proposed program calls for a substantial increase in the allocation of donors funds for the transport sector, and in particular the roads sector as discussed above in Section 7.2. In recent years the donor community has, on average, been funding about 25% of the development expenditures under the ongoing transport development program. The proposed program put forward in this Report calls for the international donor community to fund about 30% of the program during 2011-2020 – equivalent to a total of about $2 billion at 2010 constant prices and exchange rate. The expectation is that donors would fund the bulk of the $130 million of capital building and technical support proposed for the program, and a little less than 30% of the proposed capital works programs for the transport sector, especially in road transport. The areas where donors could perhaps make a major contribution are in support of regional integration, particularly through the upgrade to paved standard of major links to neighbouring countries and the rural roads program of close to $1 billion for the decade ahead.

The expectation is that PPP-type arrangements can be introduced in the civil aviation and river transport sub-sectors by about 2015 after the requisite legal and regulatory frameworks are in place and reliable public partners have been built up in the form of financially sound state enterprises. The amount mobilized from the private sector under these arrangements are likely to be quite modest in the decade ahead, but they will lay the foundations for a substantial enlargement in the provision of private transport services under concession arrangements in the following decade. The position taken in this Report is that the traffic densities on the trunk road network are much too low to be attractive for private investment in toll road arrangements. The rough rule of thumb for these types of arrangements in Sub-Saharan countries is that a traffic flow of at least 15,000 vehicles a day is required for toll road investments that will be attractive to the private sector. Even on the most heavily trafficked routes, South Sudan is a decade or more away from such traffic volumes.

Table 7.19: Funding Arrangements for the Transport Sector Program

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>213.7</td>
<td>154.9</td>
<td>214.7</td>
<td>365.3</td>
<td>342.0</td>
<td>334.2</td>
<td>754.8</td>
<td>5 450.0</td>
</tr>
<tr>
<td>Donors</td>
<td>69.2</td>
<td>60.9</td>
<td>86.7</td>
<td>146.9</td>
<td>175.8</td>
<td>207.4</td>
<td>310.6</td>
<td>2 011.8</td>
</tr>
<tr>
<td>Private sector</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>21.5</td>
<td>88.5</td>
</tr>
<tr>
<td>Total</td>
<td>283.0</td>
<td>215.9</td>
<td>301.4</td>
<td>512.2</td>
<td>517.8</td>
<td>550.6</td>
<td>1 086.9</td>
<td>6 640.3</td>
</tr>
</tbody>
</table>

Source: Tables 7.13, 7.15, 7.16 and 7.17.

The implication is that the Government will have to step up its budget allocations for capital works programs for the transport sector. As Table 7.19 indicates, government outlays for capital works and related development programs are currently running at the equivalent of about $200 million a year. Under the proposed funding arrangement set forth in this Report, government spending on capital works and related activities would rise to about $340 million a year by 2015 and $750 million a year by 2020. If the foregoing proposals for the allocation of donor funding for the transport sector were adopted, the government would assume primary responsibility for the funding of the bulk of urban roads and the rehabilitation and upgrade of the national trunk road network of the country.

7.7 Maintenance of Transport Infrastructure

Lack of maintenance by national and state governments of existing transport infrastructure is an issue of major concern. According to the rough estimates made for the purposes of this Report, the value of transport infrastructure assets was in the range of $950 million at end 2010. Desirable levels of routine maintenance on a public asset of this magnitude would typically call for budget allocations in the range of $30-35 million a year. Budgets records suggest that actual allocations in 2011 were at best half of this level. If this underfunding of
routine maintenance were to persist, rehabilitated and upgraded infrastructure will soon deteriorate and the economy will then face a repeat of the need for much larger capital expenditures on rehabilitation to get the assets back into proper working condition. It is expected that the new institutional arrangements for the sector, as discussed elsewhere in this Chapter, will ensure that much greater attention is given to routine and periodic maintenance of these transport infrastructure assets than has been the case in the past.

### 7.8 Management of Risks and Uncertainties

There are a number of risks and uncertainties associated with the proposed program for the transport sector. The major ones relate to the design, funding and implementation of a program of such magnitude. Design is severely hampered by information gaps. Funding availability is a major uncertainty given the significant build-up in the proposed annual development and maintenance expenditures, as compared to pre-independence years. Weak institutional and human capacities are cross-cutting issues in this new nation and affect particularly the transport sector where key institutions are being built up or are to be established. Thus, key concerns centre on the capacity of National Government and local authorities to oversee the design and implementation of this Action Plan for the development of transport infrastructure needed in the country for sustained strong economic growth. Strengthening these capacities in the public sector will be a major challenge as will be the development of programs to strengthen the capacity of an embryonic domestic private sector to respond to the substantial business opportunities offered by the program.

#### 7.8.1 Design Uncertainties

**Roads.** Very limited data on traffic and vehicle fleet, and lack of inventory and classification of the road network lead to significant uncertainties which affect mainly maintenance and medium- to long-term development programs. For the short-term program, economic importance and current conditions of the proposed roads are well known and the construction/upgrading to paved standard of two international roads and of urban roads in Juba, which represents 63% of the total short-term road capital expenditures program, was the subject of detailed studies.

Completion of the on-going inventory and classification exercise and contractual obligation for the newly established Road Authority to develop a five-year Road Investment Program, including development and maintenance priorities, and to prepare an annual work program, including maintenance, would offer opportunities to reduce uncertainties through proper adjustment of maintenance and the medium- to long-term development program. Moreover, the proposed development of a national transport master plan, which would be completed in the short-term period, would give more light and specificities for the direction ahead.

**Rail, river and air transport.** With regard infrastructures under the Ministry of Transport, limited information is available on existing rail track condition, morphological and hydrographic data on the White Nile River and its tributaries, and current condition of most airports and airstrips. Federal Units based in Khartoum had overall responsibility for air, rail and river transport before South Sudan independence. Limited delegation was given to the GoSS Ministry of Transport and Roads through the Directorates of Rail Transport, River Transport and Air Transport. One of the main and urgent challenges of the new Ministry of Transport is to set up the proposed new institutional framework for these three sub-sectors and make it operational.

Studies and technical assistance are proposed to have a better knowledge of the infrastructure, to deal with legal, institutional and regulatory framework including issues related to infrastructure asset ownership and management, and to explore the prospects for suitable PPP-type arrangements for private provision of services. These actions would help remove major uncertainties and allow timely adjustments to the programs.

#### 7.8.2 Availability of Funding

As discussed above, it is imperative to close the huge gap in transport infrastructure to open up permanently several regions of this wide country, allow access to social services, improve connectivity between markets and potential agricultural lands, reduce significantly transport costs and remove the major impediments that transportation represents in doing business in South Sudan. Against this setting, the proposed Action Plan for transport infrastructure calls for a program of $6.5 billion of development expenditures and $1.1 billion of routine and periodic maintenance expenditures during 2011-2020. Even so, key transport sector indicator for South Sudan in 2020 will still be lower than the current indicators of comparator countries. The exceptional efforts required from the donor community and from the Government have to be put in this context. The proposed financing of the development expenditures for the program calls for about $2 million of donor funding, $4.5 billion of funding by government and public entities, and a very modest amount of private funding under PPP-type arrangements. The program calls for a build-up in donor funding for the transport sector from an average of about $65 million a year to about $220 million a year from 2013. This build-up poses significant challenges for the donor community. In the past few years, donor allocations for infrastructure have accounted for about 7% of total donor disbursements of development assistance (excludes humanitarian assistance). Under the program proposed in this Report the donor allocation for transport infrastructure would rise to about 15% of total development assistance during 2013-2020, after which demands on donor support for infrastructure would decline steadily.

**Funding for maintenance.** There cannot be strong support from the donor community for the transport program without a clear and firm commitment to plan, finance and implement the necessary maintenance to preserve these transport assets. As indicated earlier, for example, a road which is not maintained routinely will cause significant traffic disruptions, increase vehicle operating costs and will have to be rehabilitated at a cost several times higher than the cumulative cost of maintenance. Financing requirements evolve with the length of roads in maintainable condition.

The main source of funding for maintenance is the Government budget. Given the pressing demands on the budget, maintenance works, which have had low political

### Table 7.20: Routine Maintenance Expenditures for Transport Sector Infrastructure (In $ millions at 2010 constant prices and exchange rate)

<table>
<thead>
<tr>
<th>Sub-sector</th>
<th>Capital outlays</th>
<th>Capital stock</th>
<th>Maintenance expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads, waterways &amp; river ports</td>
<td>242</td>
<td>503</td>
<td>726</td>
</tr>
<tr>
<td>Railways</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Civil aviation</td>
<td>1</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>276</td>
<td>534</td>
<td>785</td>
</tr>
</tbody>
</table>

Source: Annex Table 8.11, Table 7.18 and estimates by authors.

As Table 7.20 indicates, if the proposed Action Plan for transport infrastructure is implemented in full in the decade ahead, the replacement value of these assets will be about $7.3 billion in 2020 (at 2010 constant prices and exchange rate). These transport infrastructure assets will be among the most important publicly-owned assets in the country. They will require substantial annual outlays for routine maintenance. Routine maintenance expenditures are projected to be about $30 million in 2012, rising steadily thereafter to about $130 million a year by 2020. For the decade as a whole, outlays on routine maintenance will need to be about $650 million if these assets are to be maintained in good working condition and in that way, support sustained strong economic growth in the country.

As much as possible, maintenance activities should be outsourced to the private sector through multi-contract arrangements. As much as possible, maintenance activities should be outsourced to the private sector through multi-contract arrangements. Financing requirements evolve with the length of roads in maintainable condition.

**Roads.** Very limited data on traffic and vehicle fleet, and lack of inventory and classification of the road network lead to significant uncertainties which affect mainly maintenance and medium- to long-term development programs. For the short-term program, economic importance and current conditions of the proposed roads are well known and the construction/upgrading to paved standard of two international roads and of urban roads in Juba, which represents 63% of the total short-term road capital expenditures program, was the subject of detailed studies.

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Studies and technical assistance are proposed to have a better knowledge of the infrastructure, to deal with legal, institutional and regulatory framework including issues related to infrastructure asset ownership and management, and to explore the prospects for suitable PPP-type arrangements for private provision of services. These actions would help remove major uncertainties and allow timely adjustments to the programs.
and social visibility, were neglected. To ensure a more reliable and consistent source of funding, the transport policy provides for the creation of a Road Maintenance Fund (RMF) with revenue deriving from road user charges. RMF resources should be ring-fenced to prevent use for purposes other than road maintenance. Establishment and start-up of the RMF, following the related study, are essential components of the short-term program and central to mitigate the high risk of under-spending on road maintenance. The key challenge here is to determine fair levels of charges to be applied for the use of the road, given the limited vehicle fleet at this time. There is a need to implement sound public information programs to explain how user fees will generate substantial benefits in improving road maintenance.

There is a similar need to build a maintenance culture in the other sub-sectors and to put it into practice. Maintenance cost recovery from pricing policy, under the primary responsibility of the River Transport Authority, Airport Authority and Rail Operator, would help to ensure that the required funding would be available.

**Funding from government and public entities sources.**

Capital budget for transport was about 9% to 10% of national budget in 2010 and 2011. Relative to non-oil GDP, it stood at around 3%. At this level of spending there is no prospect to close the huge gap in transport capacities; at these levels of spending transportation would remain a major impediment to economic development. The challenge is to transform this vicious circle into a virtuous one which implies a significant increase in spending on maintenance and development of transport infrastructure.

In the proposed financing plan, Government and public entities funding would start at around $1500 million in 2012, which is close to 2011, and increase steadily to about $790 million in 2020. If funding could not be mobilized on the required scale, the implementation period of some components, like the much needed construction/upgrading to of national trunk roads, would have to be extended. This would have implications for the development of domestic and regional markets for agricultural products and hence for incomes, employment and livelihoods.

**Private funding.** Transport services are provided by private operators. All the works and consultancy services in the program will be contracted to the private sector. The program also gives room for the private sector to be involved in the funding for the provision of infrastructure through suitable PPP-type arrangements. The proposed levels of private spending are modest in the decade ahead, but these initiatives would set the stage for a substantial expansion in the role of the private sector in the following decade.

The attractiveness of PPP options is closely linked to traffic volumes. Juba, Wau and Malakal airports offer good prospects of traffic growth. Transaction advisory team services are proposed for the presumed concession arrangements for one or more airports. Current volumes of traffic on rail and river are major concern. It is hoped that, with time, relations with the North would be normalized, enabling significant traffic growths. Planned studies, training and technical assistance in the short term would also help to reduce risks and uncertainties on private funding availability in giving more light and details in the way forward and supporting the implementation of the required actions.

### 7.8.3 Implementation Capacities

The newly established Road Authority, State MoPIs and other new entities that are being set up, will have a central role in building the implementation capacities of line agencies, in particular in the area of procurement and financial oversight during the design and implementation of the program. Multiple specific skills are needed at a time when the country is faced with a general dearth of qualified individuals. There are significant risks of mis-procurement, delays in start-up and completion, and cost overruns. As indicated elsewhere in this Chapter, the program provides for a significant technical support.

In the past, some donors decided to entrust international consultants with the overall management of projects they were funding, instead of going through the established Project Management Team under DRB. Such situations should be avoided in the future. Line agencies and authorities should be backed up in their official roles and responsibilities while providing them with strong institutional support thus, contributing effectively to capacity building.

Support to domestic private sector development would continue through multi-year maintenance contracts, small-scale labour force works and incentives in procurement procedures to encourage international and local joint ventures or sub-contracting. Donors should aim to manage workloads by agreeing on common rules of procedure, implementation modalities and shared reporting.
8.1 Current Status of the Energy Sector

8.1.1 Role of the Energy Sector

The majority of the population in the country uses biomass including fuel-wood, charcoal and grass for lighting and cooking. About 99% and 50% of the population use these resources for cooking and lighting, respectively. Modern energy is solely used for lighting purposes with about 14% of the population using petroleum products and close to 4% of the population using electricity. Biomass will continue to be the dominant source of energy for some time to come. It is necessary to replace biomass energy use gradually by modern energy in order to: (i) promote socio-economic development; (ii) minimize forest degradation which is a cause for global warming; and (iii) reduce the hardship as well as health hazards involved in household activities and hence improve quality of life. In addition, it is essential to use the fuel-wood, which entails deforestation, in a sustainable manner through cost effective resource management and end use efficiency.

The revenues generated from petroleum production constitute a dominant part of the income of the country currently contributing about 98% to the national budget. Although the goal of the government is to develop alternative sources of income and reduce oil sector dependency, the petroleum revenues will continue to dominate the national budget in the medium term. The Government further recognises that petroleum is a non-renewable resource and subject to volatile international market prices, and hence understands the need to manage the resources for the benefit of both the present and future generations while minimizing the strain on the government budget. The Government also intends to implement a Petroleum Stabilization Fund to dampen the impact of volatile oil prices on the budget. The Government has now drafted the National Petroleum Policy (SSNPP) Paper to guide the effective and sustainable management of the petroleum sources in the country. The Petroleum Bill is presently under preparation which will be enacted soon after.

Every productive sector of the economy relies on the provision of electrical energy. Electricity plays a vital role in social and economic development as it is a critical factor of production whose cost directly impacts other services and the competitiveness of enterprises. Consequently, the state of provision of reliable electricity has a direct bearing on the generation of employment and growth in the national income. About 50% of big firms and 70% of small firms reported that electricity was a major constraint on doing business in the country. Hence, electricity supply shortages/interruptions have serious repercussions on any effort to turn around the economy and achieve sustainable economic and social growth. In recognition of the critical role electricity plays in the economy, the Government has adopted the South Sudan National Electricity Policy (SSNEP) Paper (May 2007) that outlines the framework for the development and operation of the Electricity Supply Industry (ESI). Specifically, the Paper defines the Government’s sector priorities and development strategies, and relationships and scope for Public-Private Partnerships (PPPs). The policy provisions have been addressed in the draft Electricity Bill which will be enacted soon.

89 Statistical year book, South Sudan (2010); the electricity use includes private sector generation.
90 AICD, June 2011.
8.1.2 Energy Sources and Infrastructure

Oil and gas. As the discussion in Chapter 2 indicates, the country has significant reserves of oil and gas. These sources are not currently used to meet domestic demand for energy. Exports of petroleum crude are the main source of foreign exchange earnings for the country. The crude is carried by pipeline through Sudan to Port Sudan.

Hydropower. The country is endowed with a number of potential hydropower sites which are all situated on the White Nile River. The following five mega hydropower sites with a cumulative capacity of 2,590 MW have been identified: Bedden (720 MW), Lekki (420 MW), Shukoli (250 MW) and Juba barrage (120 MW). Map 8.1 indicates the location of these sites. Regarding mega hydropower sites, the country has significant reserves of oil and gas.

8.1.3 Energy Consumption

Currently, the energy consumption is mainly from biomass with over 99% of the population using fuel-wood and grass for lighting and cooking. The percentage of population using the various types of national energy sources for lighting and cooking are presented in Table 8.1.

Table 8.1: Type of Fuel Used by Percentage of Population

<table>
<thead>
<tr>
<th>Type of use</th>
<th>Wood or Charcoal</th>
<th>Grass</th>
<th>Cow dung</th>
<th>Electricity</th>
<th>Petroleum product</th>
<th>Candle</th>
<th>No lighting</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting</td>
<td>35.4</td>
<td>14.7</td>
<td>3.9</td>
<td>13.5</td>
<td>5.8</td>
<td>26.9</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Cooking</td>
<td>95.9</td>
<td>3.3</td>
<td>0.1</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>


8.1.4 Present Electricity Supply Situation

Existing supply situation. The power infrastructure in the country is in an embryonic state with its development curtailed by the two civil wars in the past 50 years. Despite the rich hydropower potential, power generation is from expensive diesel generation and the supply is limited to a few towns. The installed generation capacity is around 24 MW or about 3 MW per million people. This is a tenth of what has been installed in the Eastern Africa region. 82

Table 8.2: Regional Comparative Performance Indicators

<table>
<thead>
<tr>
<th>Country</th>
<th>Population (Million)</th>
<th>Installed Capacity (MW)</th>
<th>Per Capita Installed Capacity (MW)</th>
<th>Electrification (%)</th>
<th>Losses (%)</th>
<th>Average Tariff $/kWh</th>
<th>Custo-mer No</th>
<th>Employee No</th>
<th>Custo-mer to Employee Ratio</th>
<th>Debtors Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi</td>
<td>8.3</td>
<td>48.5</td>
<td>5.8</td>
<td>2</td>
<td>20</td>
<td>0.08</td>
<td>44,718</td>
<td>692</td>
<td>47</td>
<td>65</td>
</tr>
<tr>
<td>Djibouti</td>
<td>0.9</td>
<td>123</td>
<td>13.6</td>
<td>50</td>
<td>25</td>
<td>0.35</td>
<td>42,625</td>
<td>917</td>
<td>17</td>
<td>48</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>82.2</td>
<td>1,491</td>
<td>18.1</td>
<td>11</td>
<td>22</td>
<td>0.05</td>
<td>183,000</td>
<td>12,252</td>
<td>108</td>
<td>149</td>
</tr>
<tr>
<td>Kenya</td>
<td>39.1</td>
<td>1,349.3</td>
<td>34.5</td>
<td>22</td>
<td>16</td>
<td>0.18</td>
<td>1,267,198</td>
<td>7,014</td>
<td>181</td>
<td>42.9</td>
</tr>
<tr>
<td>Rwanda</td>
<td>9.9</td>
<td>81</td>
<td>8.2</td>
<td>5</td>
<td>17</td>
<td>0.19</td>
<td>1,687,897</td>
<td>1,657</td>
<td>102</td>
<td>112.0</td>
</tr>
<tr>
<td>Sudan</td>
<td>42.3</td>
<td>2,846</td>
<td>67.3</td>
<td>20</td>
<td>20</td>
<td>0.10</td>
<td>6,711,10</td>
<td>5,257</td>
<td>128</td>
<td>42.9</td>
</tr>
<tr>
<td>Tanzania</td>
<td>43.7</td>
<td>1,008</td>
<td>23.1</td>
<td>11</td>
<td>22</td>
<td>0.10</td>
<td>6,711,10</td>
<td>5,257</td>
<td>128</td>
<td>42.9</td>
</tr>
<tr>
<td>Uganda</td>
<td>30.7</td>
<td>482</td>
<td>15.7</td>
<td>6</td>
<td>36</td>
<td>0.16</td>
<td>31,329,99</td>
<td>1,777</td>
<td>176</td>
<td>42.9</td>
</tr>
<tr>
<td>South</td>
<td>9.5</td>
<td>23.8</td>
<td>2.5</td>
<td>2</td>
<td>25</td>
<td>0.22</td>
<td>19,100</td>
<td>571</td>
<td>33</td>
<td>42.9</td>
</tr>
</tbody>
</table>

Total/ Average 266.6 745.26 28.0 14 23 0.17 4357839 30177 144 180.5

Memo items

2009 figures of all countries except SS of 2010

The majority of the population uses fuel-wood, charcoal and grass for lighting and cooking. As indicated earlier, about 99% and 50% of the population use these resources for cooking and lighting, respectively. Modern energy is solely used for lighting purposes with about 14% of the population using petroleum products and close to 4% of the population using electricity.


82 Eastern Africa Region countries: Burundi, Ethiopia, Kenya, Rwanda, Sudan, South Sudan, Tanzania and Uganda; and Regional Integration Strategic Paper (RISP) for Eastern Africa (Energy), AfDB, September 2010.
As the country's production capacity is well below the minimum efficient scale size of around 200 MW93, it faces high production cost. The ESI in South Sudan is characterized by: (i) main electricity supply provided from captive generation; (ii) low electrification levels of less than 1% based on areas supplied by South Sudan Electricity Corporation (SSEC) with virtually no one in the rural areas having electricity,94 and (iii) supply shortage, and intermittent supply of electricity within SSEC's areas of operations (supply is not available through a full 24-hour period).

SSEC is operating in 3 of the 10 state capitals (Juba, Malakal and Wau) and Renk town. SSEC's distributional losses (technical and non-technical losses) estimated at 25% (2010) were two and half times the hidden operational costs. Although the number of staff requirements of SSEC has been identified to be 745, only 571 positions are filled to date. The customer to staff ratio (35), which is an indication of the effective utilization of staff in power utilities, is much less than the benchmark (150-250)95 for developing countries acceptable to financing institutions. SSEC's financial performance is weak with the utility's operations heavily subsidized by the government (about 75% of operational expenses are subsidized).96 The financial, human capacity and systems constraints in SSEC have also limited its ability to operate, maintain and expand the generation facilities and distribution networks. Present supply and demand. Table 8.3 below presents the installed generation capacities in the operational areas of SSEC.

### Table 8.3: SSEC’s Installed Generation Capacity

<table>
<thead>
<tr>
<th>Location</th>
<th>No. of Units</th>
<th>Unit Capacity (MW)</th>
<th>Total Capacity (Mw)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juba (Wartsila Engine)</td>
<td>8</td>
<td>1.5</td>
<td>12</td>
<td>Operational</td>
</tr>
<tr>
<td>Juba (Cummins Engine)</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>Not Operational</td>
</tr>
<tr>
<td>Malakal</td>
<td>6</td>
<td>0.8</td>
<td>4.8</td>
<td>Operational</td>
</tr>
<tr>
<td>Wau</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>Operational</td>
</tr>
<tr>
<td>Bor</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>Under construction</td>
</tr>
<tr>
<td>Yambio</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>Under construction</td>
</tr>
<tr>
<td>Rumbek</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>Under construction</td>
</tr>
<tr>
<td>Renk</td>
<td></td>
<td>Only 3 MW of 40 MVA (32 MW) used</td>
<td>Interconnection with Sudan</td>
<td></td>
</tr>
</tbody>
</table>

The current demand in SSEC’s supply areas is much higher than the power utility can provide. For instance, based on 2009 SSEC surveys, the assessment estimated the 2010 effective generation demand in Juba and Malakal at 32 MW and 15 MW, respectively. The corresponding SSEC's installed generation capacities (operational) were 12 MW and 4.8 MW. Hence, the supply gap has forced the businesses and high class households to meet their supply deficit from own generation.

In spite of abundant sources for electricity generation (hydro and oil), the present power supply by SSEC is limited to three state capitals (Juba, Malakal and Wau) and Renk town. The state capitals are supplied from diesel power generators (installed capacity 23.8 MW), while Renk town is supplied from import from Sudan. Although South Sudan is interconnected with the Sudan to import 40 MW (about 32 MW) of power, the import is limited to about 3 MW (supply to Renk town) since the commercial agricultural development projects envisaged around Renk have not been realized and/or the network has not been extended to supply other major load centers. Presently, SSEC is installing 2 MW each diesel generators and the associated distribution networks to supply three state capitals (Bor, Yambio and Rumbek) which are expected to be commissioned in 2012. This program is funded by the Government of Egypt.

Outside SSEC supply area, the townships of Yeis, Maridi and Kapoeta are supplied with electricity from USAID funded diesel power plants run by local cooperatives. The installed capacities of the diesel generators in these towns are 1.2 MW, 0.8 MW and 0.8 MW, respectively. The corresponding customers are 1,100; 250 and 85. Given that the cooperatives had to recover the full cost of supply, the tariffs in the towns (average tariff of 53 US cents/kWh) have more than double that of SSEC's average tariff of 22 US cents/kWh. The high tariffs have become constraints to connecting significant number of household customers.

### 8.1.5 Institutional Arrangements

Until the recent past, the energy sector was the responsibility of the Ministry of Energy and Mines (MEM). Following independence, a restructuring of the public institutions was implemented; as a result, MEM was divided into two ministries, namely, MoED and Ministry of Petroleum and Mining (MoPM). The other main players in the energy sector are SSEC and Nile Petroleum Corporation (Nilepet) dealing with electricity and oil, respectively. The former parastatal reports to MoED while the latter reports to MoPM. It is expected that an Electricity Regulatory Agency and Petroleum Regulatory Agency will be established following the enactment of the respective Bill. The institution structure for the ESI is provided in Figure 8.1 below.

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93 AIECS, June 2011.
94 SSEC used 2008 census data for the 2010 population: the number of households connected in 2010 was 19,388 of which 70% is domestic; the end 2010 population was put at 9,494,000 and average national household size in the same year was estimated at 5.9.
95 Sudan's Infrastructure: A Country Perspective by Africa Infrastructure Country Diagnostic (AICD).
97 Revenue from sales of Bills (2010) amounted to SDG 13,064,300 while the operational expenses in the same year were SDG 50,083,555.

---

**Figure 8.1: Institution Structure of the Electricity Sector**

It is further expected that until a revised mandates are put in place, the newly formed energy institutions will operate on the basis of the mandates given to the energy sector operations before the restructuring. Based on the mandates of the energy institutions before transformation, the mandates and responsibilities of the restructured energy institutions as relates to energy are described below.

**Ministry of Electricity and Dams (MoED):** MoED is responsible for ESI including the development of hydro dams for multipurpose use counting hydropower generation. It is also responsible for the development of renewable energies. MoED is responsible for the formulation of the necessary legislation and regulation for the management, development and maintenance of the ESI and hyro dams as well as development and implementation of GoRSS policies and strategies on power generation and distribution. Specifically, MoED is mandated to: (i) formulate and develop policies, regulations and strategies on management and development of the ESI and hydro dams; (ii) oversee the compliance of the various actors to the relevant Acts in their operation as relates to the development of ESI and hydro dam development; (iii) set tariffs, identify electricity sources and facilitate their exploitation; and (iv) identify potential commercial partners and facilitate their participation in energy sector development. The Minister of MoED is assisted by Deputy...
Minister, Undersecretary and six Directorate, including: Director General (DG) Projects; DG Dam Planning, Construction, & Maintenance, DG Renewable Energies; DG Social & Environmental; DG Data Collection and Processing; and DG Administration & Finance.

Ministry of Petroleum and Mining (MoPM): The Ministry in charge of petroleum and gas is the policy implementing body of the government with respect to petroleum affairs. The functions of the Ministry include the following:

- formulate strategies and programs for the development and management of the petroleum and gas sector;
- develop the necessary technical cadres for the petroleum and gas sector;
- initiate legislation, rules, and regulations regarding the petroleum and gas sector;
- manage the relations of the government with petroleum and gas companies operating in South Sudan;
- negotiate all oil contracts for the exploration and development of oil, and ensuring that they are consistent with its principles, policies and guidelines;
- sign contracts on behalf of the government upon the approval of SSEC; and
- manage the relations of the government with petroleum and gas producing states (including Oil-rich regions).

South Sudan Electricity Corporation (SSEC): SSEC was established on 19 December 2006 vide Council of Ministers Order No. 30/2006. A draft Electricity Corporate Bill has been drafted towards giving legal entity to SSEC. According to the draft Bill, SSEC will be an independent government corporation responsible for generating and transmitting electricity to distributors. It will also have the mandate to purchase power from IPPs and promote electricity interconnection with neighboring countries. Presently, SSEC is generating and distributing electricity in four operational areas of Juba, Malakal, Wau and Renk.

National Petroleum and Gas Council: The National Petroleum and Gas Council is a policy making body with respect to petroleum and gas resources reporting to the Council of Ministers. The National Petroleum and Gas Council shall consist of relevant national Ministers, representatives of oil-producing states and institutions as approved and licensed by MoED/Regulating Authority. It is expected to operate on a commercial basis.

The government has recognized that development of a hydroelectric power plant of such scale would require a large investment which would be difficult to raise fully from internal and multilateral/bilateral sources. The Electricity Policy Paper therefore stipulates that the development and operation of the generation and transmission of electricity would be the responsibility of the government. As SSEC is still dealing with the existing Sudan-South Sudan interconnection, it is expected that the mandate for developing interconnections will be entrusted on SSEC. The Bill gives the responsibility of development and operation of distribution networks to the State governments, cooperatives and communities with support to be provided by the Ministry. Given that SSEC has been running the distribution networks in South Sudan for the last five years it is well placed to support the local mainstream distribution activities. It is therefore worthwhile to consider involving SSEC in the mainstream distribution activities. The Bill also provides the Ministry the responsibility of dealing with rural electrification. As rural electrification is a non-profit operation, it is understandable that the development and operation of rural electrification are dealt with by the Ministry until such time that a Rural Electrification Agency is established.

The relevant policy and regulation papers available for review include South Sudan Investment Promotion Act (2007)/ Draft South Sudan Electricity Bill (2010). It is expected that draft Policy Papers will be adopted and Bills enacted in the 1st quarter of 2012. The Bill limits the responsibility of SSEC to deal with the development and operation of generation and transmission networks within South Sudan. The Bill is silent on who will be responsible for transmission network development outside South Sudan (interconnections). As SSEC is still dealing with the existing Sudan-South Sudan interconnection, it is expected that the mandate for developing interconnections will be entrusted on SSEC. The Bill gives the responsibility of development and operation of distribution networks to the State governments, cooperatives and communities with support to be provided by the Ministry. Given that SSEC has been running the distribution networks in South Sudan for the last five years it is well placed to support the local mainstream distribution activities. It is therefore worthwhile to consider involving SSEC in the mainstream distribution activities. The Bill also provides the Ministry the responsibility of dealing with rural electrification. As rural electrification is a non-profit operation, it is understandable that the development and operation of rural electrification are dealt with by the Ministry until such time that a Rural Electrification Agency is established.
commercial functions of the State, such as the State equity held by Nilepet, shall be separate from the institutions charged with policy or regulatory functions. It further indicates that the regulatory body may be organized as a Directorate under the MoPM or as an Authority under the same Ministry. The Regulator is further entrusted with the responsibility of regulating and controlling the activities and operations carried out by oil and service companies. The regulatory body acts on behalf of the Ministry of Labour on health and safety matters and on behalf of the Ministry of Environment on environmental regulations.

As indicated earlier, the Policy Paper and Bill are expected to be put in place soon (by end of 1st quarter 2012). It is critical that the Regulator be independent in order to attract investment from oil and service companies. Assigning the regulatory functions to a Directorate in the Ministry might compromise the independence of the regulatory body. It is therefore advisable to establish the Regulator as an entity detached from the Ministry.

South Sudan National Environment Policy Paper (2010)/ South Sudan National Environmental Bill (2010). The South Sudan National Environment Policy Paper and South Sudan National Environmental Bill exist in draft form. The South Sudan National Environment Policy aims at ensuring protection and conservation of the environment and sustainable management of renewable natural resources in order to meet the present population and future generation needs. Towards this end, the policy calls for: (i) enacting legislations and regulations on the management of the environment to implement this policy; (ii) defining the responsibilities at different levels of governance including those of private sector institutions; (iii) ensuring that environmental legal frameworks developed at different levels of the government are consistent with each other and with sound environmental management; (iv) ensuring that sectoral environmental legal frameworks are in conformity with the requirements of environmental management; (v) incorporating in domestic legislation the critical that the Regulator be independent in order to attract investment from oil and service companies. Assigning the regulatory functions to a Directorate in the Ministry might compromise the independence of the regulatory body. It is therefore advisable to establish the Regulator as an entity detached from the Ministry.

The existing Ministry of Environment is the lead institution for the protection and management of the environment. It is responsible for environmental protection and conservation of the environment and sustainable management of renewable natural resources in order to meet the present population and future generation needs. Towards this end, the policy calls for: (i) enacting legislations and regulations on the management of the environment to implement this policy; (ii) defining the responsibilities at different levels of governance including those of private sector institutions; (iii) ensuring that environmental legal frameworks developed at different levels of the government are consistent with each other and with sound environmental management; (iv) ensuring that sectoral environmental legal frameworks are in conformity with the requirements of environmental management; (v) incorporating in domestic legislation the provisions of multi-lateral agreements that are relevant to South Sudan, and (vi) setting up environmental standards, guidelines and indicators.

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The proposed Action Plan for the power sector includes a program to address the electricity supply constraints in the short- and medium- to long-term. Given the time constraints, the electricity supply in the short to medium term can be improved through rehabilitation of the existing supply systems, installation of reliable diesel and small hydropower plants; and strengthening interconnection with the neighbouring countries. The interconnection supply will involve more import from Sudan through the existing interconnector and supply from Ethiopia by constructing new interconnector. In the medium- to long-term, the assessment proposes for the government to focus on augmenting the development of South Sudan’s hydropower potential and strengthening interconnections with the neighbouring countries by constructing Uganda-South Sudan, Kenya-South Sudan and additional Ethiopia-South Sudan interconnectors. Such strategy will make available cheap, reliable and environmentally clean electricity for socio-economic growth in South Sudan and provide an opportunity for the country to export its surplus power to the regional countries. As the country’s demand may not justifi the development of the hydropower plants in a significant way, GoRSS should target the regional market to create the necessary economies of scale to justify the investment.

8.2.2 Building Institutional Capacities in the Sector

One of the most urgent challenges is to build institutional capacity within Ministry of Electricity and Dams (MoED) and SSEC to implement the short- and medium-term programs and improve the operational performance of the ministry and the power utility. To address this challenge, the short-term program will build institutional capacity within the energy institutions. The capacity building will involve developing human capacity as well as improving the operational system within the ESI. The human capacity building will comprise providing on job training with support of Technical Assistance (TA) and attaching of staff to energy institutions/power utilities. The institutional capacity building will also introduce in SSEC the best operational systems practiced in the industry.

8.2.3 Funding Arrangements for the Program

The other major challenge is to mobilize the financial resources required for the program. The magnitude of the funding requirements in the near-term as well as for the medium and longer-term is likely to exceed the current funding capacities of the Government and donor community. The Government will have to target the private sector for investment in the development of the major projects. In the short-term, the program proposes Private Sector Participation (PSP) in a big way in the development of the diesel power plants and Fula SHP. To this end, GoRSS will give priority to putting in place the necessary legislation and regulatory frameworks in order to attract private sector investment for the short- to medium-term program.

8.3 Demand Forecast and Electrification

8.3.1 Electrification in South Sudan

The proposed electrification program covers the period 2011-2025. The program for the short-term (2011-2015) is detailed and proposes concrete projects. It has not been possible to propose an elaborate program at this point in time for the medium- to long-term (2016-2025) as detailed studies would be required for the development of the major projects including the mega hydropower plants, interconnectors and a nation grid. The short term program has included studies of those major projects to be implemented in the medium- to long-term. The proposed medium- to long-term program should therefore be taken as indicative only at this point in time and they will be concretized when their studies are complete.

The Electricity Policy Paper gives priority to electrification of the state capitals in the short term. Accordingly, the NDP has considered the electrification of the state capitals as part of the infrastructure development areas. The short-term program has been designed in line with the NDP except the implementation period has been extended from 2011-2013 to 2011-2015. The short-term investment program will involve primarily a three-pronged approach: (i) electrification of the state capitals from the existing Sudan-South Sudan interconnection to Malakal; (ii) installation of reliable diesel generators in each state capital; and (iii) development of Fula SHP. The short-term program will also strengthen the supply condition in towns supplied by cooperatives (Yei, Maridi and Kajoitoa). It also involves the immediate rehabilitation/ expansion of the existing supply systems in order to connect more customers and improve the efficiency, quality and reliability of supply.

8.3.2 Demand Forecasts

There has not been any standard load forecast carried out in the past for any of the states except for a few studies in certain townships as a part of localised electrification projects under various donors. In addition to mismatch between installed capacities and power demand, the generation from SSEC’s existing installation has been intermittent due to low availability of the plants. For instance, in 2010, the effective demand in Juba was estimated at 32 MW (based on SSEC’s surveys) while the available installed capacity was 10 MW (over 50,000 MWh). As can be seen in Table 8.4 below, in Juba supply area the energy sold in 2010 was 10,000 MWh which is a tenth of the yearly potential generation capacity.

<table>
<thead>
<tr>
<th>Year</th>
<th>Energy Sold (MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>10,000</td>
</tr>
</tbody>
</table>
South Sudan: An Infrastructure Action Plan

Table 8.4: SSEC’s Juba Supply Area: Historical Sales and Customers Growth Rate

<table>
<thead>
<tr>
<th>Category</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Percentage Distribution (2010)</th>
<th>Annual Average Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>8871425</td>
<td>5597958</td>
<td>23472220</td>
<td>5488482</td>
<td>56</td>
<td>(14.7)</td>
</tr>
<tr>
<td>Commercial</td>
<td>3815999</td>
<td>5676761</td>
<td>3583235</td>
<td>3921472</td>
<td>40</td>
<td>0.9</td>
</tr>
<tr>
<td>Governmental</td>
<td>4770367</td>
<td>1379633</td>
<td>27792588</td>
<td>3208846</td>
<td>3</td>
<td>(59.0)</td>
</tr>
<tr>
<td>Total</td>
<td>17457791</td>
<td>12654352</td>
<td>5484044</td>
<td>9730800</td>
<td>100</td>
<td>(17.5)</td>
</tr>
</tbody>
</table>

Number of Customers

<table>
<thead>
<tr>
<th>Category</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Percentage Distribution (2010)</th>
<th>Annual Average Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>4190</td>
<td>4521</td>
<td>5192</td>
<td>6288</td>
<td>70</td>
<td>14.3</td>
</tr>
<tr>
<td>Commercial</td>
<td>1216</td>
<td>1436</td>
<td>1808</td>
<td>2309</td>
<td>26</td>
<td>23.6</td>
</tr>
<tr>
<td>Governmental</td>
<td>243</td>
<td>263</td>
<td>278</td>
<td>346</td>
<td>4</td>
<td>12.4</td>
</tr>
<tr>
<td>Total</td>
<td>5649</td>
<td>6220</td>
<td>7278</td>
<td>8943</td>
<td>100</td>
<td>16.4</td>
</tr>
</tbody>
</table>

Consumption per account (kWh)

<table>
<thead>
<tr>
<th>Category</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Percentage Distribution (2010)</th>
<th>Annual Average Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>2117</td>
<td>1238</td>
<td>4521</td>
<td>873</td>
<td>25.4</td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>3138</td>
<td>3953</td>
<td>1982</td>
<td>1698</td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>19631</td>
<td>5246</td>
<td>99973</td>
<td>927</td>
<td>63.5</td>
<td></td>
</tr>
</tbody>
</table>

Source: SSEC.

The demand forecast prepared for this Report covers the period 2011-2025. It relates to demand of the state capitals and towns which are to be electrified under the short-term program. The forecast considers the power supply constraints in the supply centres. The demand growth in the short-term (2011-2015) is estimated based on the historical demand growth trend in SSEC. Even though SSEC’s provides electricity in Juba, Malakal, Wau and Renk, the historical breakdown of customers and consumption was available only for Juba supply centre during the field mission. Therefore, breakdown and consumption was available only for Juba supply area.

Furthermore, in the period 2011-2015, the number of customers and consumption in these towns are projected to grow at the average historical growth rate in Juba supply area.

The demand forecast for the medium- to long-term (2016-2025) has been prepared based on consumption by customer and tariff category including domestic/household, commercial and government. Given supply constraints, the consumption (consumption/account) in SSEC’s system does not reflect the true electricity demand. It would therefore be misleading to project the demand on the basis of the existing SSEC’s sales per account and tariff category. Hence, the consumption per account and tariff category was estimated based on the potential demand of Juba and Malakal collected in field surveys undertaken by SSEC. Accordingly, the consumption/customer for domestic and commercial customers was estimated at 3,125 kWh/customer and 2,117 kWh/customer, respectively. The consumption/customer for government was estimated at 1,428 kWh/customer. These estimates are conservative given supply constraints, particularly for rural areas. Hence, the consumption by account and tariff category including domestic/household, commercial and government. Given supply constraints, the consumption (consumption/account) in SSEC’s system is expected to grow at the average historical growth rate in Juba supply area.
The number of customers by tariff category was projected on the basis of the following considerations:

- **Domestic/household customers:** Initially, a target is set for electrification rate of the capitals and selected towns in 2020 and 2025. Accordingly, the proposed target is for 60% of the households of these urban centres to have electricity by 2020. Based on this target, the households to be connected and the corresponding consumption were determined for the period 2016-2020. The demand forecast for the period 2021-2025 was forecast using the same methodology but targeting an electrification rate of 80% in the urban centres by 2025.

- **Commercial customers:** Although continuous supply has not been provided by SSEC, all the commercial customers are connected to SSEC’s supply systems. It is therefore assumed that the existing SSEC’s commercial customers will continue to be supplied from improved generation when the new supply system is put in place in 2016. All commercial customers will then get sufficient and reliable supplies in 2016 and beyond. Considering increased reliability of supply and competitiveness of electricity prices, as a result of hydropower development and regional interconnections, it is further assumed that the number of commercial customers will grow at an average growth rate of 10% a year during 2016-2025. This growth rate is comparable with the economic growth of 9% a year (in real terms) projected for the medium- and longer-term.

- **Government customers:** The assumption and methodology of the commercial demand forecast was adopted in forecasting the government customers and the corresponding demand. However, the government demand is projected to grow at an average growth rate of 6% a year during 2016-2025. Figures 8.2 and 8.3 present at a glance the trend of demand growth.

**Figure 8.2: Energy Demand Forecast (Sent Out Energy)**

![Graph showing energy demand forecast](source: Annex Figures 8.2a)

**Figure 8.3: Peak Demand Forecast (Sent Out Peak)**

![Graph showing peak demand forecast](source: Annex Figure 8.2 b)

The forecast shows that the generation demand for the whole supply centres in 2010 (321 GWh) is projected to grow at an average rate of 18% a year over the period 2011-2025 reaching 934 GWh in 2015, 2,312 GWh 2020 and 3605 GWh in 2025. This translates into generation peak capacity of 158 MW (2015), 377 MW (2020) and 568 MW (2025) and corresponds to an average growth rate of 17% a year from the 2010 peak demand of 56 MW.

**8.3.3 Supply-Demand Balance**

In the short-to-medium term, two regional grids will be formed with one centred in Juba (hereafter called “Juba Regional Grid”) and the other centred in Malakal (hereafter called “Malakal Regional Grid”). Except those connected to one of the regional grids, all centres will be supplied from isolated diesel generating stations. Therefore the supply-demand balance is prepared separately for each regional grid as well as for each of the other centres supplied from isolated diesel plants.
Malakal regional grid: Malakal Regional Grid will be supplied from the existing diesel plants in the short term, and increased supply from enhanced diesel generation and interconnections (Sudan-South Sudan Interconnector and Ethiopia-South Sudan Interconnector) in the medium-to-long term. Table 8.7 below presents the supply-demand balance for the Malakal Regional Grid. The existing supply deficit will continue until the planned Sudan-South Sudan interconnector extension to Malakal is complete and put in service in 2016. It is expected that the import from Sudan will be increased to 100 MW with a revised Power Purchase Agreement (PPA) planned to be negotiated soon. The increased power import from Sudan will fully meet the demand in the regional grid in the medium term. It is also expected that about 100 MW power will be available to the Regional Grid when Ethiopia-South Sudan Interconnector is in operation in 2020. The interconnection with the two sources of supply will improve reliability of supply and create competition to reduce the price of imported power. With such arrangement, the supply in the regional grid will be sufficient to meet the demand up to 2025. In addition, 20 MW diesel plant will be installed in the state capital in order to improve the technical performance of the regional grid and mitigate the risk of power import interruptions.

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<tbody>
<tr>
<td>Demand Consumption (GWh)</td>
<td>136</td>
<td>159</td>
<td>186</td>
<td>217</td>
<td>255</td>
<td>299</td>
<td>352</td>
<td>406</td>
<td>461</td>
<td>517</td>
<td>574</td>
<td>633</td>
<td>693</td>
<td>754</td>
<td>818</td>
<td>882</td>
</tr>
<tr>
<td>Generation (GWh)</td>
<td>182</td>
<td>209</td>
<td>241</td>
<td>279</td>
<td>322</td>
<td>374</td>
<td>435</td>
<td>495</td>
<td>555</td>
<td>615</td>
<td>676</td>
<td>736</td>
<td>796</td>
<td>857</td>
<td>929</td>
<td>1005</td>
</tr>
<tr>
<td>Generation (MW)</td>
<td>31.9</td>
<td>36.4</td>
<td>41.7</td>
<td>47.8</td>
<td>54.9</td>
<td>63.3</td>
<td>75.6</td>
<td>82.5</td>
<td>91.9</td>
<td>101.1</td>
<td>110.2</td>
<td>119.2</td>
<td>128.1</td>
<td>136.9</td>
<td>147.3</td>
<td>157.9</td>
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<tr>
<td>Installed/Import Supply (MW)</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
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<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Hydropower (Fula/Lekki/Shukoli)</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
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<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Potential Import from Uganda</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>520</td>
<td>520</td>
<td>520</td>
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<td>520</td>
</tr>
<tr>
<td>Dependable Capacity (MW)</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
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Source: Annex Table 8.7.

Table 8.6: Juba Regional Grid: Supply-Demand Balance

Juba regional grid: In the short term, the demand in Juba Regional Grid will be partially met through supply from the existing diesel generators. In the medium term, it will be supplied from the enhanced diesel generation and Fula SHP. In the long term, the supply will be strengthened through development of mega hydropower plant (possibly Lekki hydropower plant) and interconnection with Uganda. Table 8.6 below provides the supply-demand balance for Juba Regional Grid. As can be seen in the table, there will be increased supply deficit both in energy and peak demand until 2016 when the planned diesel generators (80 MW) and Fula SHP (40 MW) are erected; and these will accommodate the demand until 2020. It is envisaged that Lekki Hydropower Plant and the Uganda-South Sudan Interconnector will be put in service in 2021 to supply 300 MW and 100 MW, respectively. The supply in the Juba Regional Grid will thus be sufficient to meet the demand until 2025.

98 The prefeasibility Study undertaken by SMEC (October 2009) recommended the Lekki Hydropower Plant for initial development.
Table 8.7: Malakal Regional Grid: Supply-Demand Balance

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Other supply centres: Presently, Wau is supplied by SSEC. In the short-term, the three state capitals (Bor, Yambio and Rumbek) will be supplied from diesel generation when the plants under erection are in operation in 2012. Yi, Maridi and Kapoeta, which are supplied from generation run by cooperatives (put in service in 2011), will continue to be supplied under the present arrangement until the supply from SSEC is available in 2016. In the medium- to long-term, all the supply centres outside Juba and Malakal regional grids will continue to be supplied from isolated diesel generation. As can be seen in Table 8.8, Wau, Bor, Rumbek, Yambio will experience supply deficit in the short-term. The supply in the three supply centres (Yei, Maridi and Kapoeta) will be sufficient enough to accommodate the demand in the short-term. The diesels installed under the short-term program will meet the demand of all towns in the period 2016-2020. Additional diesel generators will be installed in the medium-term to meet the demand in the long-term.

Table 8.8: Eleven Supply Centre: Supply-Demand Balance

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For the purposes of this Report, the timeframe for meeting the energy infrastructure targets set out in the NDP has been extended to 2015. The financial resources for most of the energy projects identified under NDP have not been committed. In the event that the projects are funded with participation of donors and/or private sector, it is estimated that the process from preparation of the project document up to commissioning of the project would take about 36 months. With project implementation formally initiated at the beginning of 2012, the implementation of front-end activities (preparation of project documents, ToRs and bid documents) will be completed by the 2nd quarter of 2012. With the funding secured and the Project Engineer/Study Consultant appointed by the 3rd quarter 2012, the contract award for all investment projects will be completed by the 3rd quarter of 2013. All studies will be completed by the 3rd quarter of 2014 while the capacity building and investment projects will be completed by the end of 2015.

The Action Plan proposed in this Report therefore consists of three phases: programs for the short-term (2011–2015), the medium-term (2016–2020) and the long-term (2021–2025). A key objective for the medium- and longer-term is to expand access to a national power grid and to improve the reliability of power supply. The proposed targets for electrification for 2011–2025 are set out in Table 8.9. During the planning period about 573,000 new customers will be connected to SSEC’s network. Of these customers, about 38,000 will be connected in the short-term, about 266,000 in the medium-term and about 270,000 in the long-term. The development program will increase the national electrification level from 1% in 2010 to 4% in 2016, 12% in 2020 and 20% in 2025.

### Table 8.9: Customer Accounts and Electrification Rate

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Source: Annex Table 9.A

The proposed program will involve a large amount of capital investment. It is expected that GoRSS will finance the program in partnership with donors and the private sector. Specifically, the private sector is expected to participate in financing the major generation projects.

### 8.4.2 Program for the Short-term (2012–2015)

The projects identified under NDP will be implemented during 2012–2015. In the short-term, along with the rehabilitation of the existing SSECs networks and developing new and renewable energies (NREs), new networks (generation, transmission and distribution networks) will be constructed to meet the demand in the medium-term. In addition, studies will be prepared for projects that will be implemented in the medium- to long-term and institution capacity building needs in SSEC, and MoED will be identified. Furthermore, institutional capacities will be built in SSEC and MoED to improve their operational performance and project management skills.

#### Expansion of generation capacity in the short-term

The proposed program for the short-term includes the following: (i) the existing generation facilities will be rehabilitated; (ii) new diesel power plants (336 MW) will be installed in 13 towns; and (iii) the Fula SHP (40 MW) will be constructed to supply the Juba Regional Grid. The generation projects will be commissioned by the end of 2015 and put in service at the beginning of 2016. The capacities of the newly installed diesel generating plants are designed to meet the generation demand for five years beyond the project commissioning date of 2015. Furthermore, the ongoing erection of 2 MW each in Bor, Rumbeek and Yambio diesel generators will be commissioned during the short-term.

#### Expansion of the transmission grid in the short-term

Two regional grids will be formed in the short-term. The southern regional grid (hereafter called “Juba Regional Grid”) will initially be fed from Fula SHP and diesel generators to supply Juba and the neighboring towns. The northern grid (hereafter called “Malakal Regional Grid”) will be fed from interconnection supplies and diesel generators to supply Malakal and the surrounding towns. As the demand in the country grows, these grids will be expanded to form a national grid. In the short-term, a 132 kV transmission network will be constructed to transport the power generated at Fula SHP to Juba. Construction of the transmission network related to the development of Fula SHP will entail installation of 170 km of 132 kV line and erection of 2 of 132 kV substations (switchyard station at generation site substation in Juba). Furthermore, the existing 220 kV Sudan-South Sudan Interconnector will be extended to supply Malakal and the immediately located towns of Jahlak and Melut. The extension of Sudan-South Sudan Interconnector will involve construction of 320 km of 220 kV line (D/S) and erection of 3 of 220 kV substations. Map 8.2 provides a picture of the regional grids on completion of the short-term program.

Strengthening the distribution network in the near-term. Electricity supply in Juba, Malakal and Wau is distributed in 11 kV and 0.415/0.230 kV networks. The existing distribution networks suffer from a number of deficiencies: (i) there is high load factor and unacceptably long time to accommodate new customers; (ii) energy meters malfunction; and (iii) the distribution networks have high technical and non-technical losses. SSEC intends to introduce a 33 kV distribution network in order to increase the capacity of the networks to supply more customers, including those far away from the generation centres, and reduce the network losses. In the short-term, the existing distribution networks will be strengthened and expanded to enable SSEC to effectively distribute the generation from the existing plants and connect more customers. Accordingly, 40 km of 33/11kV line, 70 km of 11 kV line, 60 transformer stations (10 of 33/11 kV and 50 of 11/0.415/0.230 kV transformers), 130 km of 0.415/0.230 kV line and 22,000 pre-paid energy meters will be installed in the existing supply centres (Juba, Malakal and Wau). In addition to those indicated above, new distribution networks will be constructed as part of the installation of diesel generators in all the supply centres.
Design of the short-term program and related uncertainties. The financing requirements for the short-term program are large ($980 million). Close attention will therefore have to be given to the prioritization of the proposed programs within the overall funding envelope. The projects earmarked for implementation in the short-term are categorized into three packages and will be implemented on priority basis. These are referred to as Package 1, Package 2, and Package 3. Package 1 includes high priority interventions that need to proceed as soon as possible. Package 2 is a high growth scenario aligned to the strong economic growth outlook discussed in Chapters 2, 3 and 4. As that discussion indicates, there are major uncertainties about the pace at which economic growth in South Sudan will accelerate. These are linked to implementation and financing capacities in the economy at large. Package 3 for the power sector would be implemented in the event that the economic recovery in the economy is slower than planned. A summary of capital outlays under these options is given in Table 8.8. Detailed work breakdown and corresponding refined cost estimates would be prepared during preparation and/or appraisal of these projects.

Package 1 includes the following: (i) the rehabilitation of the existing networks and dissemination of rural energy technologies; (ii) analytical studies; and (iii) implementation of institutional capacity building projects. The first priority will be given to these projects as they would generate immediate benefits (quick-wins). It is expected that the rehabilitation of the existing networks will immediately improve SSEC’s technical performance and allow connection of more customers. The development and dissemination of rural technologies will provide rural communities with immediate access to renewable energies and efficient cooking stoves. The proposed studies would facilitate the mobilization of resources for short- to medium-term investment projects. The institutional capacity building projects would create capacity in MoED and SSEC to implement the short- to medium-term programs and improve the operational performance of the energy institutions.

Table 8.10: Priority of Short term Investment (In Million $ at 2010 Constant Prices)

<table>
<thead>
<tr>
<th>Priority 1 Program (Immediate Priority)</th>
<th>Priority 2 Program (Low Priority)</th>
<th>Priority 3 program (High/Base Scenario)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Expenditure</td>
<td>Project Expenditure</td>
<td>Project Expenditure</td>
</tr>
<tr>
<td>Rehabilitation and extension of distribution networks in Juba, Malakal and Wau</td>
<td>36.5</td>
<td>70.5</td>
</tr>
<tr>
<td>1. Development of Fula Small Hydropower Plant</td>
<td>1. Development of Fula Small Hydropower Plant</td>
<td></td>
</tr>
<tr>
<td>Rural Energy</td>
<td>41.2</td>
<td>444.3</td>
</tr>
<tr>
<td>2. Installation of diesel generators in state capitals</td>
<td>2. Installation of diesel generators in state capitals</td>
<td></td>
</tr>
<tr>
<td>Analytical studies: mega hydropower transmission and distribution master plan, regional interconnections</td>
<td>12.3</td>
<td>153.7</td>
</tr>
<tr>
<td>3. Renk-Malakal transmission line</td>
<td>3. Renk-Malakal transmission line</td>
<td></td>
</tr>
<tr>
<td>Institutional study and capacity building in MoED and SSEC</td>
<td>15.7</td>
<td>53.3</td>
</tr>
<tr>
<td>Distribution for new diesel plants</td>
<td>151.1</td>
<td>203.7</td>
</tr>
<tr>
<td>Total</td>
<td>105.8</td>
<td>873.7</td>
</tr>
<tr>
<td>Grand Total</td>
<td>Total</td>
<td>1077.1</td>
</tr>
</tbody>
</table>

Table 8.11: Expenditure Schedule of Short Term Program (In Millions $ at 2010 Constant Prices)

<table>
<thead>
<tr>
<th>Projects</th>
<th>Total</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Generation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation of diesel generators</td>
<td>596.0</td>
<td>8.32</td>
<td>178.79</td>
<td>234.23</td>
<td>174.64</td>
</tr>
<tr>
<td>Development of Fula Hydropower Plant</td>
<td>70.5</td>
<td>0.98</td>
<td>21.14</td>
<td>24.42</td>
<td>23.93</td>
</tr>
<tr>
<td>Total</td>
<td>666.5</td>
<td>9.3</td>
<td>199.9</td>
<td>258.7</td>
<td>198.6</td>
</tr>
<tr>
<td>2. Transmission Networks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction of Renk-Malakal line</td>
<td>153.7</td>
<td>1.46</td>
<td>31.47</td>
<td>75.37</td>
<td>45.37</td>
</tr>
<tr>
<td>Construction of Fula-Juba line</td>
<td>53.3</td>
<td>0.40</td>
<td>16.0</td>
<td>18.5</td>
<td>18.3</td>
</tr>
<tr>
<td>Total</td>
<td>207.0</td>
<td>1.9</td>
<td>47.5</td>
<td>93.9</td>
<td>63.7</td>
</tr>
<tr>
<td>3. Distribution Networks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution for new diesel plants</td>
<td>203.7</td>
<td>1.94</td>
<td>61.12</td>
<td>80.53</td>
<td>60.15</td>
</tr>
<tr>
<td>Rehabilitation of Juba, Malakal and Wau networks</td>
<td>36.5</td>
<td>14.60</td>
<td>10.96</td>
<td>10.96</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>240.3</td>
<td>16.5</td>
<td>72.1</td>
<td>91.5</td>
<td>60.2</td>
</tr>
<tr>
<td>4. Rural Energy</td>
<td>41.2</td>
<td>6.10</td>
<td>11.70</td>
<td>11.70</td>
<td>11.70</td>
</tr>
<tr>
<td>5. Total Analytical Studies</td>
<td>12.3</td>
<td>2.18</td>
<td>4.90</td>
<td>5.05</td>
<td></td>
</tr>
<tr>
<td>6. Total Capacity Building</td>
<td>15.7</td>
<td>3.81</td>
<td>4.71</td>
<td>4.16</td>
<td>3.06</td>
</tr>
<tr>
<td>Grand Total</td>
<td>1182.93</td>
<td>39.99</td>
<td>340.79</td>
<td>464.96</td>
<td>337.19</td>
</tr>
</tbody>
</table>

Source: Annex Table 8.16.
The initial expenditure in 2012 of 3% of the budget relates to: (i) advance payments to consultants, transaction advisors and contractors/suppliers of the distribution networks rehabilitation; and (ii) activity-based payments for the initial stage of the rural energy development and dissemination program. The expenditure in 2013 of 29% of the capital outlays is mainly to make advance payment to contractors of the major projects of the program. The bulk of the outlays (39%) will be disbursed in 2014 when most of the materials are delivered and significant work is implemented on site. The final expenditure of 29% relates to payment for the finishing work and settlement of final payments.

### Table 8.12: Generation Expansion Plan

<table>
<thead>
<tr>
<th>Supply Centers</th>
<th>2020</th>
<th>2025</th>
<th>Diesel Set No. x MW</th>
<th>Hydropower</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torit</td>
<td>8.7</td>
<td>5.6</td>
<td>6x3</td>
<td>2x3</td>
<td>115</td>
</tr>
<tr>
<td>Yas</td>
<td>28.8</td>
<td>16.9</td>
<td>7x5</td>
<td>3x7+1x2</td>
<td>415</td>
</tr>
<tr>
<td>Maridi</td>
<td>14.2</td>
<td>9.2</td>
<td>6x5</td>
<td>2x7</td>
<td>31</td>
</tr>
<tr>
<td>Kapoeta</td>
<td>5.4</td>
<td>2.1</td>
<td>5x2</td>
<td>2x1.5</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>377.1</td>
<td>190.5</td>
<td>336</td>
<td>40</td>
<td>376</td>
</tr>
</tbody>
</table>

Memo item

263 MW diesel generators will be erected in Bor, Rumbok and Yambio in 2012.

Source: Annex Table 9.17.

**Figure 8.4: Expenditure Schedule for Short-Term Program**

- Generation
- Transmission Networks
- Distribution Networks
- Rural Energy
- Analytical Studies
- Capacity Building

**Package 3 projects** are those identified under a lower case scenario for supply and demand. The program would provide sufficient and reliable supply to customers projected under a lower growth scenario. The details for this scenario are outlined below in the section on the management of risks and uncertainties.

It includes the following: (i) installation of a scaled down program of thermal power plants and related distribution networks; (ii) installation of Fula SHP and related transmission network; and (iii) extension of Sudan-South Sudan Interconnector to Malakal town.

### 8.4.3 Program for the Medium-Term (2016-2020) and Long-Term (2021-2025)

In the medium-term, in addition to the continued preparation of studies for future projects, capacity building in the energy institutions and dissemination of NREs, the projects prepared in the short-term will be implemented to meet the demand in the long term.

**Expansion of generation capacities.** The generation capacities in all the supply centres outside Juba and Malakal grids will be strengthened by installing additional diesel units (115 MW) in order to meet demands in the long term. It is also expected that part of the mega hydropower potential (possibly Lekki 300 MW Hydropower Plant) will be developed in the medium-term to supply the Juba Regional Grid. Table 8.2 provides the summary of the generation expansion plan. In the long-term, the activities to be implemented are relatively limited and involve connecting new customers, preparation of analytical studies, capacity building in the energy institutions, and dissemination of NREs.

**Expansion of the transmission network.** In the medium term, it is expected that the interconnection with the neighboring countries will expand with the Ethiopia-South Sudan (220 kV D/S) and Uganda-South Sudan Interconnectors (220 kV D/S) commissioned by the end of 2019 and 2020, respectively. The Ethiopia-South Sudan Interconnector will provide about 100 MW to Malakal Regional Grid while the Uganda-South Sudan Interconnector will supply about 100 MW to Juba Regional Grid. Domestic generation combined with interconnection supply will make available relatively cheap power to the regional grids. It is expected that some of the surrounding towns will be connected to the regional grids during this period. In such event, the government could either keep the diesel generators at the existing sites to serve as a backup supply or move them to supply other un-electrified towns. Map 8.3 the location of the transmission grid on completion of the medium-term program.

In the period 2015-2025, the generation demand will be met through imports from the Sudan, installation of diesel generators in the supply centres, development of Fula SHP, and imports from Ethiopia and Uganda. Therefore, major transmission networks will not be developed during this period to form a meaningful national grid. Beyond 2025, as the economy grows, it is envisaged that a critical mass demand will be created to justify the formation of a national grid. The national grid will be formed through the development of the hydropower resources; expansion of the national transmission network; and strengthening the interconnection with the neighboring countries. Map 8.4 provides an indicative/preliminary development plan beyond 2025. Accordingly, the north and southern part of South Sudan will be connected in 400/500 kV networks and the remaining major load centres in the country will be supplied in 220/132 kV networks. The interconnection with the neighboring countries will be strengthened through interconnecting the central part of the grid with Ethiopia and southern grid with Kenya. The 500 kV Tepi substation (Ethiopia), which will be constructed as part of the Renaissance Dam (5,250 MW) and commissioned in the next decade, will serve as a take-off point for major interconnection (interconnection in 400/500 kV) with South Sudan. The proposed Transmission and Distribution Master Plan will determine the final shape of the national grid.

### Table 8.12: Generation Expansion Plan

<table>
<thead>
<tr>
<th>Supply Centers</th>
<th>2020</th>
<th>2025 (Incremental)</th>
<th>Diesel Set No. x MW</th>
<th>Hydropower</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malakal</td>
<td>86.7</td>
<td>33</td>
<td>4x5</td>
<td>3x4</td>
<td>115</td>
</tr>
<tr>
<td>Bor</td>
<td>19.7</td>
<td>11.2</td>
<td>5x5</td>
<td>2x4</td>
<td>34</td>
</tr>
<tr>
<td>Borita</td>
<td>11.2</td>
<td>8.1</td>
<td>4x4</td>
<td>2x4</td>
<td>28</td>
</tr>
<tr>
<td>Rumbek</td>
<td>12.7</td>
<td>7.5</td>
<td>6x5</td>
<td>3x5+1x2</td>
<td>26</td>
</tr>
<tr>
<td>Aweil</td>
<td>20.7</td>
<td>13.1</td>
<td>6x5+1x2</td>
<td>3x5+1x2</td>
<td>55</td>
</tr>
<tr>
<td>Wau</td>
<td>30.2</td>
<td>16.8</td>
<td>7x5</td>
<td>2x5</td>
<td>50</td>
</tr>
<tr>
<td>Rumbok</td>
<td>15.1</td>
<td>9.4</td>
<td>4x5</td>
<td>2x5</td>
<td>25</td>
</tr>
<tr>
<td>Yambio</td>
<td>15.5</td>
<td>9.9</td>
<td>5x4</td>
<td>2x5</td>
<td>25</td>
</tr>
<tr>
<td>Juba</td>
<td>110.2</td>
<td>47.7</td>
<td>4x10+8x5</td>
<td>3x4</td>
<td>150</td>
</tr>
</tbody>
</table>
In the medium-to-long term, the distribution networks will further be developed to evacuate the power from the various substations and connect new customers.

8.4.4 Rural Energy Supply

The rural communities reside in widely dispersed areas which makes it costly to supply them power through grid extension and/or building cost effective diesel generators. Consequently, it is expected that the energy consumption in the rural areas will be derived mainly from biomass for some time to come. As such, it is necessary to promote appropriate technologies, including efficient cooking stoves, biogas and solar energies, to supply clean and effective energy to the rural population. As far as biomass utilization is concerned, the proposed program included the development and dissemination of efficient cooking stoves and biogas digesters for effective utilization of the biomass resources. The program will also develop and disseminate photovoltaic (PV) electricity supply systems to the households and social services. The program to be implemented is summarized in Table 8.13.
South Sudan: An Infrastructure Action Plan

During 2012-2025, 1,350,000 improved cooking stoves; 74,300 biogas digesters; 202,500 solar home electricity; 6,800 institutional solar electricity; 6,800 small thermal water heaters; 6,800 solar irrigation pumps (each irrigating a quarter of hectare) will be disseminated in the rural areas. On completion of the short- to medium- to long-term programs, access of rural households to improved cooking stoves, biogas digesters and solar electricity will be close to 67%, 4% and 10%, respectively.

8.5 Capacity Building and Technical Studies

8.5.1 Capacity Building

In the short-term program, private sector participation is proposed in the development of Fula SHP and construction of diesel generators in the 13 supply centres. In the short-term, studies will be undertaken to determine the sequence of expansion of generation plants, and transmission and distribution networks. A feasibility study will also be carried out for projects to be developed in the medium- to long-term. Furthermore, an institutional study will also be prepared to identify the capacity building needs in the energy institutions and to establish an implementation action plan. In the medium- to long-term, it is expected additional studies will be identified and implemented.

8.5.2 Technical Studies

In the short-term, studies will be undertaken to determine the sequence of expansion of generation plants, and transmission and distribution networks. A feasibility study will also be carried out for projects to be developed in the medium- to long-term. Furthermore, an institutional study will also be prepared to identify the capacity building needs in the energy institutions and to establish an implementation action plan.

8.6 Program Implementation

8.6.1 Implementation Schedule

The proposed program implementation would be formally initiated in 2012 with appointment of an individual consultant who will assist in the implementation of the front-end activities and supervision of the overall project. The implementation of most of the front-end activities (project document, ToRs and bid documents) would be completed by the 2nd quarter of 2012. With funding secured and the Project Engineer/Study Consultant/Transaction Advisor put in place by the end of the 3rd quarter of 2012, the contracts for investment projects will be awarded by the 3rd quarter of 2013. All studies will be completed by the 3rd quarter of 2014 while the capacity building and investment projects will be completed by the end of 2015 Commissioning of new plants would then follow.

8.6.2 Packaging and Implementation Arrangements

The Action Plan proposes that a project implementation unit (PIU) be established to deal with the overall implementation of the short-term program. The PIU would be staffed by relevant SSEC’s staff and supported by an individual consultant with extensive experience in procurement and supervision of projects. Specifically, the PIU will be responsible for the procurement and supervision of the distribution networks rehabilitation project; selection of consultants to assist in the implementation of the other projects of the program; and implementation coordination of the various projects. Sufficient counterpart staff will be attached to the PIU as well as to the projects to get on the job training in the various disciplines.

and from the northern part of Kenya to Juba via Torit. Feasibility studies of these projects will be undertaken in the short-to-medium term and implemented in the medium-to-long term.

- Preparation of transmission and distribution master plan: A Master Plan will be prepared to establish the staged development of the transmission and distribution networks in the medium-to-long term. The transmission component of the study will provide a strategy and program for the development of a national grid in the medium-to-long term.

- Institutional study: The study will identify the human and institutional capacity building needs in SSEC and MoED and prepare an action plan for the implementation of the study recommendations.
### Table 8.14: Implementation Schedule for Short-Term Program

<table>
<thead>
<tr>
<th>Activity</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Individual Consultant Preparation of ToR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Distribution Networks Rehabilitation Preparation of tender and bid document</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Institution Study</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Preparatory work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Sourcing of funds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Fula Small Hydropower Plant Erection of Fula SHP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Fula-Juba Transmission Line Construction, commissioning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Rural energy development: Rehabilitation of the existing networks: Preparation of project documents, ToR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Distribution in State Capitals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Wind energy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Village energy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Off-grid DMS power plants, network access provision</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The implementation arrangements for the various projects are described below:

- **Erection of diesel generators:** Under the short-term program, 13 diesel power stations, 69 medium/slow diesel generators of aggregate capacity of 366 MW will be installed. The power stations, which is estimated to cost about $596 million (6% of short-term investment), will be constructed in two years after commencement of work. Considering the large investment requirements, the short implementation period and extensive skills requirements for the development and operation & maintenance, it is proposed that the hydropower plant is developed with PSP under IPP arrangements. The ongoing study funded by the Government of Norway is expected to produce detailed design and bid documents for the project. An engineering firm would be appointed to assist in the tendering process and supervision of the project. A multidisciplinary transaction advisor group would also be appointed to assist in negotiations of the concession.

- **Renk-Malakal transmission networks:** The project will involve construction of 320 km 220 kV line, erection of three of 220 kV substations. The project is estimated to cost about $ 154 million (13% of short term investment). The project, which will be constructed by international contractors, will be completed in two and half years after award of contract. The project will be contracted in two packages including transmission and substations. These arrangements will help in getting competitive contract prices and ensuring the timely completion of the project. An engineering firm will be appointed to assist in the preparation of detailed design, tendering process, and supervision and commissioning of the project. SSEC’s staff will be appointed to assist in the tendering process to get on the job trainings in order to develop capacity within the utility to effectively manage the project during its operation.

- **Erection of Fula SHP:** Under the short-term program, a 40 MW Fula SHP will be constructed. The project is estimated to cost about $70 million (6% of short-term investment) will be implemented in two and half years after commencement of work. Considering the significant investment requirements, the short implementation period and extensive skills requirements for the development and operation & maintenance, it is proposed that the hydropower plant is developed with PSP under IPP arrangements. The ongoing study funded by the Government of Norway is expected to produce detailed design and bid documents for the project. An engineering firm would be appointed to assist in the preparation of detailed design and bid document, the tendering process and supervision and commissioning of the project. SSEC’s staff will be appointed to assist in the tendering process to get on the job in order to develop capacity within the utility to effectively manage the project during operation.

- **Rural energy development:** In the short-term, the distribution networks and generating stations in Juba, Malakal and Wau will be rehabilitated. The project will involve the following: procurement of distribution materials (312 km medium voltage and 140 km of low voltage lines; 56 distribution transformers; 21,000 energy meters; materials to connect 17,000 customers; 3,000 street light poles with fixtures) and diesel generator spare parts. The project is estimated to cost $36.5 million which is about 3% of the short-term investment. SSEC may not have sufficient capacity to complete such large works within the planned construction period of 2 year. In the event of such capacity constraints, SSEC will have to outsource the services of the international contractor to construct the distribution networks and overhaul the diesel generators.

- **Distribution networks for evacuating power from power plants:** The distribution networks in state capitals, which will be constructed along with the diesel generators, involves putting medium voltage (33 kV and 11 kV) networks, low voltage (415/240 Volts) networks. The cost of the project is estimated at $204 million (17% of short term investment). An engineering firm will be appointed to assist in the preparation of detailed design and bid document, the tendering process, and supervision and commissioning of the project. The project, which will be constructed by an international contractor, will be completed in two years after contract award. Given that the volume of work is big and the implementation period short, SSEC needs to consider packaging the project into lots and award them to different contractors to ensure the completion of the work within the specified time frame.

### Connection of new customers: It is expected that 266,000 customers (53,200 customers per annum) will be connected in the medium-term. The cost of the project is estimated at $93 million. Given that historically SSEC was connecting less than 5,000 customers every year, it would not have sufficient capacity (number of technicians and logistics) in the short-term to connect 53,200 customers per year during 2016-2020. It is therefore proposed to consider subcontracting the work to local or regional companies in order complete the project on schedule and attain the targeted connections/ electrification level by 2020.

### Technical studies: The studies include preparation of least cost development plan for mega hydropower; feasibility.
study of regional interconnectors; preparation of transmission and distribution master plan and institutional study. The studies, which cost about $12 million (1%), will be completed in two years after commencement of work. The studies will be carried out by international consultants with each study separately contracted. As the capacity building in the energy institutions will be based on the outcome of the institutional study, the consultant who prepares the study will be retained to implement the institutional capacity building project.

Capacity building: The short-term capacity building program will be implemented based on the recommendations of an institutional study. The capacity building, which costs $16 million (1.4%), will be implemented by the consultant who prepares the institutional study. The project will be implemented in 33 months.

8.7 Development and Maintenance Costs and Financing

8.7.1 Development Costs

The cost estimates have been prepared separately for the short term (2011-2015), medium term (2016-2020) and long term (2021-2025) programs. The cost estimates have been prepared for the generation, transmission, distribution, rural energy, analytical studies and capacity building projects. Summary of the cost estimates are provided in Table 8.15.

<table>
<thead>
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<th></th>
<th></th>
<th></th>
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<td></td>
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<td>480</td>
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<tr>
<td>1.3</td>
<td>Fula Small Hydropower Plant</td>
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<td>2</td>
<td>Transmission Networks</td>
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<td></td>
<td></td>
<td></td>
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<td>Renk-Malakal line</td>
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<td>101.7</td>
<td>153.7</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>Fula-Juba line</td>
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<td>53</td>
<td>53.3</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Lekki-Juba line</td>
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<td>53</td>
<td>53.8</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>Ethiopia-SS Interconnector</td>
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<td>101.7</td>
<td></td>
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<td>2.5</td>
<td>Uganda-SS Interconnector</td>
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<td>208.6</td>
<td>415.5</td>
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<td>3</td>
<td>Distribution Networks</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Distribution for new diesel plants</td>
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<td>69.7</td>
<td>273.4</td>
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<tr>
<td>3.2</td>
<td>Juba, Malakal and Wau rehabilitation</td>
<td>36.5</td>
<td>93.0</td>
<td>187.3</td>
<td></td>
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<tr>
<td>3.3</td>
<td>Customer connections</td>
<td>94.3</td>
<td>94.3</td>
<td>187.3</td>
<td></td>
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<td>3.4</td>
<td>Subtotal</td>
<td>240.2</td>
<td>162.7</td>
<td>402.9</td>
<td></td>
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<td>4</td>
<td>Rural Energy</td>
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<td>58.7</td>
<td>58.7</td>
<td>158.6</td>
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<td>5</td>
<td>Soft Projects</td>
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<td></td>
<td></td>
</tr>
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<td>Analytical Studies</td>
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<td>15</td>
<td>15</td>
<td>42.3</td>
</tr>
<tr>
<td>5.2</td>
<td>Capacity Building</td>
<td>15.7</td>
<td>15</td>
<td>15</td>
<td>45.7</td>
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<tr>
<td>5.3</td>
<td>Subtotal</td>
<td>28.0</td>
<td>30</td>
<td>30</td>
<td>88.0</td>
</tr>
<tr>
<td>Total</td>
<td>1182.9</td>
<td>1143.8</td>
<td>183.0</td>
<td>2510</td>
<td></td>
</tr>
</tbody>
</table>

Memo items

Cost estimates for Ethiopia-SS and Uganda-SS include the South Sudan part only

Average drop line (connection) Costs US$ 350/connection

The proposed development program for the power sector will involve total outlays in the range of $2.5 billion during 2011-2025. The major part of the outlays will be invested in the short-term ($1,183 million) and medium-term ($1,144 million), mainly to build the trunk networks to accommodate the demand until 2025. The long-term outlay amounting to $183 million is targeted at connecting new customers; expanding the capacity building program and rural energy supply; and undertaking additional studies.

Generation program: In the period 2011-2025, Fula SHP, diesel generators and Lekki hydropower will be constructed. The projects take a significant portion of the power infrastructure investment, which is valued at $1.35 billion (equivalent to 54% of the investment cost). The generation projects will be funded by private investors through PSP under IPP arrangements. The private sector could build the power plants under various models of concession agreement including BOT (Build Operate and Transfer), BOO (Build, Operate and Own), etc. Given that the power market in the country has not matured, it is envisaged that the developer will construct the plant under a single buyer off-take arrangement with payment to be settled on take or pay contractual agreement. It is therefore necessary that SSEC operate on sound business principles to generate the revenue required to regularly settle the bill for power purchased from the private developer. Normally, implementation delays of project developed through PSP often result from delays in establishing up front the necessary policy, legislation and regulatory frameworks to encourage private sector investment. It is therefore necessary to put in place appropriate legislation and regulatory frameworks as soon as possible in order to attract private investment at favorable concession to the government resulting in bulk power supply at competitive prices.

Transmission networks: In the period 2011-2025, Renk-Malakal transmission network, Fula-Juba transmission network, Ethiopia-South Sudan Interconnector and Uganda-South Sudan Interconnector will be constructed. Total funding requirements for the transmission program is estimated at $416 million which is equivalent to 17% of the investment cost. Considering the transmission grid as a strategic asset, it is expected that the asset will remain under the ownership of the government during the planning period. It is therefore expected that the transmission networks will be funded by the government in partnership with multilateral and bilateral financiers.

Distribution networks: In the period 2011-2025, distribution networks will be constructed to improve the supply conditions of the existing supply centers, and in state capitals to evacuate the power generated from the new power plants. It is also expected to connect about 573,000 new customers (57,300 customers per annum) to the distribution networks. The investment for the distribution expansion program amounts to $497 million corresponding to 20% of the investment cost. It is expected that the distribution networks, which fall under the government ownership, will be funded by the government in partnership with bilateral and multilateral financiers.

Rural energy: The rural energy program (2011-2025) will develop and disseminate energy efficiency technologies and renewable energies (efficient biomass stoves, biogas digesters and solar energy technologies) in the rural areas to provide clean and quality energy to the rural communities. The program is estimated to cost $159 million (equivalent to 6% of the investment cost). The program will contribute to the mitigation of climate change by reducing greenhouse gas emissions through the use of efficient biomass stoves and dissemination of biogas and solar technologies. Hence, the program can benefit from the various funding mechanisms established to support the development of environmentally clean energies. The program will therefore be funded by the government with support from establishments which support clean energy development including Global Environmental Facility (GEF).

Technical studies and capacity building: Various studies will be undertaken to generate projects that will be implemented during the program period. The studies to be carried out include: least cost development plan for mega hydropower plants, feasibility study of regional interconnectors, transmission and distribution master plan, interconnectors and institutional study. A capacity building program will also be implemented to develop capacity in SSEC and MoED in order to develop capacity to implement project and improve the operational performance the institutions. The studies and capacity building program will cost $28 million which is about 1% of the total investment. Past trends indicate that funding for capacity building can easily be mobilized from donors in the form of grant. It is therefore expected that the government will implement the studies and capacity building projects with support from donors.

8.7.2 Maintenance Programs

With the proposed major expansion in the physical assets of the power sector and substantial increase in allocations for routine and periodic maintenance of these facilities will be essential to ensure reliable performance and service delivery. The absence or deficiency in routine maintenance on infrastructure would reduce its economic life and affect the level and quality of service provision. The proposed Action Plan takes into account the cost of routine maintenance as part of the infrastructure development program to allow the optimal use of the these assets.
For the purpose of this Report, the yearly cost of routine maintenance of infrastructure is estimated as a percentage of the capital stock at 2010 constant prices. Given that most of the assets were either destroyed during the civil war, mined, or were in very poor condition at the time of the CPA in 2005, the starting value of the capital stock is quite small. The starting point in determining the capital stock was to make a very rough estimate of the capital stock at end 2006. The value of these assets in 2006 was put at $1 million. To these estimates of the value of the capital stock at end 2006, is then added the new spending on capital rehabilitation and new assets for 2007-2010. This then gives an estimate of the value of the capital stock at the end of 2010. The replacement value of assets at end 2010 was put at $8 million. To this estimate is then added the capital expenditures proposed for 2011-2025 to get the value of the capital stock at the end of 2025 (at 2010 constant prices). For each of the capital stock estimates is then applied a particular percentage to obtain the required amount of annual spending on routine maintenance. It is expected that there will not be major investment on power infrastructure outside the proposed program except for the remaining approximately 1% of the budget is required for maintaining the rural energy facilities which will be covered by the rural communities.

### 8.7.3 Sources of Finance

**Ongoing donor support** Since the CPA, several donors have been active in supporting the power sector in South Sudan. The USAID funded the preparation of the Electricity Policy Paper and the Electricity Act, the assessment of South Sudan’s hydropower potential (pre-feasibility level), and electrification of three towns (Yei, Maridi and Kapoeta) which are being run under cooperative arrangements. The Government of Egypt has supported the ESI by funding the Fula-Juba T. Line but the financial closure of the project has not been realized as yet. It is expected that these donors will continue to support the ESI, including the short-term programs.

**Sources of Finance for the proposed program.** The power infrastructure investment in the period (2011-2025) is estimated at $2.5 billion. It is expected that the overall program will be funded from the National Budget, the donor community and private investors. The realization of the program partly depends on how successful the government is in mobilizing the respective financial resources. The success of mobilizing the investment from different financiers will depend on a sustainable and investment friendly environment in South Sudan. Donors’ contributions to such investment may be limited considering the large requirements for various sectors in the country. It is therefore necessary to target private investment for the major projects of the program. The government would therefore need to put in place the necessary investment policy and regulatory frameworks with a view to demonstrating to financiers that a sustainable investment climate exists in the country.

To implement the short-term program, GoRSS will need to mobilize $1.183 million in new funding. At this stage, an important objective is to mobilize the $106 million of funding required for the short-term program with focus on the Priority 1 Program. It is expected that the short-term program will be funded from public budget, Official Development Assistance (ODA) from OECD partners on a bilateral basis, loans (concessionary and non-concessionary) and grants from international and regional financial institutions (World Bank, AfDB, etc.), official loans from non-OECD financiers including the BRCs (Brazil, Russia, India and China), and equity contribution from the private sector. The private sector has the financial resources and capacity to implement projects. Hence, it is worthwhile to consider raising the funds for the generation projects from the private sector under PPP arrangements. The financial needs and indicative sources of finance for the short-term program are provided in Table 8.17 below.

### Table 8.16: Routine Maintenance Expenditure (In Million $ at 2010 Constant Prices)

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost of Routine Maintenance</th>
<th>Total</th>
<th>%</th>
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<tr>
<td>Private Developer</td>
<td>26.7</td>
<td>160.7</td>
<td>270.1</td>
</tr>
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<td>GoRSS</td>
<td>27.3</td>
<td>116.0</td>
<td>156.5</td>
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<tr>
<td>Rural Communities</td>
<td>1.7</td>
<td>2.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Total</td>
<td>55.6</td>
<td>279.0</td>
<td>428.9</td>
</tr>
<tr>
<td>%</td>
<td>7.3</td>
<td>36.5</td>
<td>56.2</td>
</tr>
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</table>

Source: Annex Table 8.11.

### Table 8.17: Indicative Sources of Finance for Short Term Program

<table>
<thead>
<tr>
<th>Sources of Financing %</th>
<th>Project</th>
<th>Total Cost</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Diesel Plants</td>
<td>Private</td>
<td>590.6</td>
<td>8.3</td>
<td>178.8</td>
<td>234.2</td>
<td>174.6</td>
</tr>
<tr>
<td></td>
<td>595.9</td>
<td>8.3</td>
<td>178.8</td>
<td>234.2</td>
<td>174.6</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>2. Fula Small Hydropower Plant</td>
<td>70.5</td>
<td>1.0</td>
<td>21.1</td>
<td>24.4</td>
<td>23.9</td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td>70.5</td>
<td>1.0</td>
<td>21.1</td>
<td>24.4</td>
<td>23.9</td>
</tr>
<tr>
<td>100</td>
<td>3. Renk-Malakal T. Line</td>
<td>153.7</td>
<td>1.5</td>
<td>31.5</td>
<td>75.4</td>
<td>45.4</td>
</tr>
<tr>
<td></td>
<td>GoRSS</td>
<td>153.7</td>
<td>1.5</td>
<td>31.5</td>
<td>75.4</td>
<td>45.4</td>
</tr>
<tr>
<td>100</td>
<td>4. Fula-Juba T. Line</td>
<td>53.3</td>
<td>0.4</td>
<td>16</td>
<td>18.5</td>
<td>18.3</td>
</tr>
<tr>
<td></td>
<td>GoRSS</td>
<td>10.7</td>
<td>0.1</td>
<td>3.7</td>
<td>3.7</td>
<td>3.7</td>
</tr>
<tr>
<td>20</td>
<td>5. Distribution for New Diesel plants</td>
<td>42.6</td>
<td>0.3</td>
<td>12.8</td>
<td>14.8</td>
<td>14.7</td>
</tr>
<tr>
<td></td>
<td>GoRSS</td>
<td>40.7</td>
<td>0.4</td>
<td>12</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>80</td>
<td>6. Distribution Rehabilitation</td>
<td>163.0</td>
<td>2</td>
<td>61</td>
<td>80.5</td>
<td>60.2</td>
</tr>
<tr>
<td></td>
<td>GoRSS</td>
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<td>0.4</td>
<td>12</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>80</td>
<td>7. Rural Energy</td>
<td>36.5</td>
<td>1.5</td>
<td>10.96</td>
<td>10.96</td>
<td>11.7</td>
</tr>
<tr>
<td></td>
<td>Donors</td>
<td>32.9</td>
<td>1.3</td>
<td>11.7</td>
<td>11.7</td>
<td>11.7</td>
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<tr>
<td>10</td>
<td>8. Analytical Studies</td>
<td>12.33</td>
<td>2.38</td>
<td>4.9</td>
<td>5.05</td>
<td>5.05</td>
</tr>
<tr>
<td></td>
<td>GoRSS</td>
<td>10.2</td>
<td>0.2</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
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<td>10</td>
<td>9. Capacity Building</td>
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<td>2.1</td>
<td>4.4</td>
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<td></td>
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<tr>
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<td>Donors</td>
<td>15.74</td>
<td>3.81</td>
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<td>3.06</td>
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<td>10</td>
<td></td>
<td>1.6</td>
<td>0.4</td>
<td>0.5</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>160</td>
<td></td>
<td>14.2</td>
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<td>4.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1182.9</td>
<td>40.0</td>
<td>340.8</td>
<td>465.0</td>
<td>337.2</td>
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</tbody>
</table>

Source: Estimates by authors.
Early implementation of the short-term capacity building program is critical to improving the operation of SSEC and putting in place the necessary studies and institutional capacity to assist in the implementation of the program over the medium-term. Therefore, GoRSS needs to give priority to mobilization of financing for the capacity building program. Past trends indicate that funding for analytical studies and capacity building can be mobilized from donors in the form of grants.

The development of the new generation projects will require substantial amounts of capital investment. It will be difficult to raise the full amount from internal and multilateral and/or bilateral sources. Therefore, the government will have to target at mobilizing the major part from the private sector. Towards this end, GoRSS has to put in place the needed policy and regulatory frameworks and good governance to create confidence in the private sector to attract investment.

Considering the transmission grid a strategic asset, it is expected that the asset will remain under the ownership of the government during the planning period. The short-term distribution expansion and rehabilitation program is unlikely to be attractive for private sector investment. It is therefore expected that the transmission expansion program and distribution network rehabilitation will be financed by GoRSS in partnership with multilateral and bilateral financiers. In the near-term, at least, the financial position of the public utility is such that it will not be in a position to generate operating surpluses that will allow it to contribute to the capital cost of the public power sector program. Allocations for the program will therefore have to come from the National Budget for some years to come.

8.8 Management of Risks and Uncertainties

8.8.1 Major Risks that Confront the Program

The risks related to the program implementation can be categorized into political, economic, institutional and financial.

**Funding constraints.** The working assumption that underpins this Report is that stability in the region will be maintained with efforts of the regional countries and support of the international communities and hence mitigate this potential risk to the program. However, political and economic instability in the region may restrict the oil revenue and force the government to allocate a substantial portion of its budget to deal with security-related issues. This will limit the amount that the government could contribute to power sector development. Furthermore, instability in the region could discourage foreign investment in the country. Inability of the government to provide financial support for the power program and limitation in foreign direct investment are risks that could have negative impact on the realization of the short-term program.

At present, SSEC does not generate sufficient revenue to cover its operation and maintenance costs let alone to generate additional funds for investment. SSEC is therefore heavily subsidized by the government which compromised the government’s support to the other sectors. Furthermore, the existing low tariff would discourage PSP in power infrastructure development as such low tariff would not cover the return on investment expected by the private investors. It is therefore critical to adjust tariff to cost reflective tariff for SSEC’s sustainable performance and promote power infrastructure development in the country. However, the Regulator should ensure that the power utility operates efficiently so that the costs of its operational inefficiencies are not embedded in the pricing of supply.

It is also critical to bring down the cost reflective tariff to a minimum level possible through the efficient operation of the ESI in order for electricity become affordable to the household customers and competitive to promote businesses. Unless tariffs become affordable the planned household connections may not be realized to achieve the target electrification rates. Lessons could be learnt from the supply provided by cooperatives in Yei, Maridi and Kapoeta. It has been observed that the level of household connections in these supply centres has been very low because of high tariff (average tariff of 53 US cents/kWh). It is expected that the cost reflective tariff in SSEC will become comparable to those with diesel thermal generation dominated supply system (in the range of 20 US cents per kWh), when the operational efficiency of SSEC is improved and the proposed large diesel generators are installed.

**Weak operating environment for private investment.**

The short-term program will be implemented by GoRSS in partnership with donors and private investors. There is a risk of limiting the mobilization of the co-financing for the program unless a conducive climate for investment is created in the country. It is therefore imperative to adopt the necessary policies and enact the relevant laws in order to create confidence among donors and investors to support the short term program. To this end, the Electricity Bills, and Environmental Bill and amended Investment Bill should be enacted and operationalized. In order to promote investment, it is critical to maintain the autonomy of the Regulator to be established to be considered by investors as a fair arbitrator in conflict resolution in the ESI.

Capacity limitations in government entities. Lack of institutional capacities in the energy institutions would negatively affect their operational performance and project implementation capacities. The non-viable operations in the institutions would further compromise the credibility of the institutions to co-sponsor the program. This will affect the implementation of the short term program in terms of mobilizing resources and completing the program on schedule. The short-term program has identified the basic institutional capacity needs in the energy institutions and designed a program to address them. The short-term capacity building program would involve undertaking institutional study, and implementing reform and training based the study recommendations. The expeditious implementation of the institutional capacity program is therefore critical for the realization of the short-term program.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Base/High Scenario</th>
<th>Low Scenario</th>
<th>Variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Customers Connected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>282959</td>
<td>531438</td>
<td>151485</td>
</tr>
<tr>
<td>Commercial Government</td>
<td>36288</td>
<td>56137</td>
<td>31495</td>
</tr>
<tr>
<td>Total</td>
<td>3389</td>
<td>4524</td>
<td>3389</td>
</tr>
<tr>
<td>2. Electrification Rate (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban Rural National</td>
<td>52</td>
<td>75</td>
<td>28</td>
</tr>
<tr>
<td>3. Demand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GWh MW</td>
<td>2312 377</td>
<td>3605 568</td>
<td>1708 279</td>
</tr>
</tbody>
</table>

Source: Annex 12 (a-c).

8.8.2 A Low Case Investment Scenario

In the event that some combination of limited funding and implementation capacities were to persist for a number of years, the result would be a smaller investment program for the power sector. This Section outlines briefly such a low case scenario. The projection of demand has been scaled down on the assumption that there will be some combination of the following: (i) a reduced electrification rate resulting from financial constraints and/or lack of implementation capacity and/or affordability of electricity prices; (ii) low business activities/slow economic growth resulting from unattractive investment climate. The electrification rate in the supply centres has been reduced from 60% to 30% in 2020 and from 80% to 50% in 2025. In addition, the average growth rate of the commercial sector has been reduced from 10% to 5% during 2016-2025, consistent with the projected growth in non-oil GDP for the low case. Table 8.18 above compares customers, demands and electrification rates of the high and low scenarios.
## Table 8.19: Investments for Short-To-Medium-To and Long Term Programs (Low Scenario) (In Million $ at 2010 Constant Prices)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Generation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>New Diesel Generator</td>
<td>444.32</td>
<td>146.33</td>
<td>590.7</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Fula Small Hydropower Plant</td>
<td>70.5</td>
<td>70.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Lekki Hydropower Plant</td>
<td>480</td>
<td>480</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Subtotal</strong></td>
<td>514.8</td>
<td>266.3</td>
<td>1141.1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><strong>Transmission Networks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Renk-Malakal line</td>
<td>153.7</td>
<td>53.8</td>
<td>153.7</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>Fula-Juba line</td>
<td>36.5</td>
<td>101.7</td>
<td>101.7</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Lekki-Juba line</td>
<td>36.5</td>
<td>101.7</td>
<td>101.7</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>Ethiopia-South Sudan Interconnector</td>
<td></td>
<td>53.0</td>
<td>53.0</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>Uganda-South Sudan Interconnector</td>
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<td>53.0</td>
<td>53.0</td>
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<tr>
<td></td>
<td><strong>Subtotal</strong></td>
<td>207.0</td>
<td>155.5</td>
<td>415.5</td>
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<tr>
<td>3</td>
<td><strong>Distribution Networks</strong></td>
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<tr>
<td>3.1</td>
<td>Distribution for new diesel plants</td>
<td>151.90</td>
<td>50.03</td>
<td>201.9</td>
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<tr>
<td>3.2</td>
<td>Juba, Malakal and Wau rehabilitation</td>
<td>36.5</td>
<td>45.3</td>
<td>81.8</td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>Customer connections</td>
<td>188.4</td>
<td>95.34</td>
<td>283.7</td>
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<tr>
<td></td>
<td><strong>Subtotal</strong></td>
<td>412.8</td>
<td>191.68</td>
<td>495.5</td>
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<tr>
<td>4</td>
<td><strong>Rural Energy</strong></td>
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<tr>
<td>4.1</td>
<td><strong>Soft Projects</strong></td>
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<td></td>
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</tr>
<tr>
<td>4.2</td>
<td>Analytical Studies</td>
<td>28.0</td>
<td>30.0</td>
<td>58.0</td>
<td></td>
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<tr>
<td></td>
<td><strong>Capacity Building</strong></td>
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<td></td>
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<tr>
<td></td>
<td><strong>Subtotal</strong></td>
<td>28.0</td>
<td>30.0</td>
<td>58.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Memo Items</strong></td>
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<td></td>
</tr>
</tbody>
</table>

Source: Annex Table 13 (a & b).

## Table 8.20: Routine Maintenance Expenditure (Low Scenario) (In Million $ at 2010 Constant Prices)

<table>
<thead>
<tr>
<th>Category</th>
<th>2011-2015</th>
<th>2016-2020</th>
<th>2021-2025</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Developer</td>
<td>20.6</td>
<td>128.0</td>
<td>228.2</td>
<td>376.8</td>
<td>57.7</td>
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<tr>
<td>GoRSS</td>
<td>25.2</td>
<td>102.9</td>
<td>141.3</td>
<td>269.4</td>
<td>41.3</td>
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<tr>
<td>Rural Communities</td>
<td>1.7</td>
<td>2.3</td>
<td>2.3</td>
<td>6.3</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>47.5</td>
<td>233.2</td>
<td>371.8</td>
<td>652.5</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td>7.3</td>
<td>35.7</td>
<td>57.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Annex Table 8.14.

The low case scenario will also result in the reduction of the routine maintenance of the power infrastructure. Accordingly, the routine maintenance will cost $653 million in the period 2020-2025, which is about 17% less than the cost ($763 million) in the high case scenario.

Cost estimates for Ethiopia-South Sudan and Uganda-South Sudan include the South Sudan part only.

Average drop line (connection) Costs $ 350/connection.
9.1 Current Status of Water Supply and Sanitation Services

9.1.1 The Setting

Despite the availability of abundant surface and ground water resources, millions of South Sudanese suffer from lack of access to improved water supply and sanitation services. Evidence suggests that two in three people do not have access to improved water supply services. Even worse, more than eight out of ten people do not have access to improved sanitation services. This situation implies that more than six million people are deprived of access to improved water supply services and about eight million people lack access to improved sanitation services. In addition to these, about 1,200 schools representing 50% of the total number of schools in the country do not have water supply and sanitation facilities.

The low levels of access to improved water supply and sanitation services coupled with poor hygiene awareness has been the principal cause of water related diseases such as diarrhea, cholera and guinea worm. The country is home to the largest incidence of guinea worm in the world that is transmitted through drinking contaminated and stagnant water. As discussed in subsequent chapters, the sectoral challenges are further exacerbated by weak institutional capacity and increase in number of returnees and internally displaced persons that continue to exert insurmountable pressure on the already feeble water supply and sanitation facilities. These drawbacks stem from decades of war and conflict that resulted in the destruction of several water infrastructure facilities and further impeded the flow of investment to the sector.

Notwithstanding these constraints, the Government has taken encouraging steps towards labeling the water supply and sanitation sector as an extreme high priority and a key entry point to its development objectives. This has been manifested by classifying the sector as one of the top six expenditure priorities and enunciating it in all of its key strategic documents. In addition to articulating a comprehensive South Sudan Development Plan (SSDP) spanning 2011-2013, the Government has established key sectoral institutions and further taken commendable strides in formulating and adopting a water policy and a water, sanitation and hygiene strategic framework. These instruments generated a positive dynamic towards the sustainable development of the water sector, a necessary pre-requisite for alleviating poverty and spurring economic growth in the country.

9.1.2 Policy Framework and Institutional Arrangements

Policy framework: The principal document guiding the country’s water and sanitation sector is the Water Policy.99 Developed through an extensive consultation involving multitude stakeholders and adopted in 2007, the policy recognizes that access to improved water supply and sanitation services positively impacts the reduction of poverty and boosts economic growth. It underpins that provision of sufficient quantity and quality of water is considered a human right and shall be accorded highest priority. The policy highlights that investments in rural water supply and sanitation shall be targeted to those areas which are currently not served and/or experience acute water shortages. Underscoring the importance of separating regulatory and service delivery functions in rural water supply and sanitation services, it concurs with devolution of these responsibilities to the lowest appropriate level. The policy highlights that planning and development of piped water supply and waste disposal infrastructure shall be carried out in an integrated manner. It proposes the establishment of semi-autonomous institutions to conduct operation and maintenance of urban water supply and sanitation services.

In 2011, the Government adopted the water, sanitation and hygiene strategic framework.100 The strategy has been crafted to translate the water policy into action and aims at serving as a road map towards attaining the objectives of the policy. In addition to discussing water resources
management, rural and urban water supply subsectors, the strategic framework explicitly addresses sanitation and hygiene issues. A key element of the framework dwells on speeding up rehabilitation and construction of water supply and sanitation schemes to ensure universal access of services to the people of South Sudan. It recognizes the low level of access to improved sanitation and hygiene services and proposes a reversal of the situation through techniques such as Community Led Total Sanitation (CLTS). It recognizes the challenges pertaining to institutional fragmentation in the water and sanitation sector and calls for streamlining responsibilities of all relevant institutions. The strategic framework recommends formulation of a Water Council to provide advisory services at the highest level as well as a Water Supply and Sanitation Regulatory Board to develop and enforce regulations for the water supply and sanitation services.

Whilst these initial steps are commendable, it is critical for the sector to formulate a Water Legislation (Act). The Act will assist in establishing a legal framework for the management of the water sector. Further, concerted efforts are necessary to improve the overall water governance in the country.

Institutional Arrangements: The lead ministry in the water sector is the Ministry of Water Resources and Irrigation (MWRI). The Ministry amongst other things is mandated to (i) develop policies, guidelines and master plans (ii) oversee the operation of the South Sudan Urban Water Corporation (iii) set tariffs for the sale of water to be used for various purposes (iv) implement ground-water supplies of drinking water for the rural population until States and local governments assume such responsibilities and (v) advise, support and build the capacity of State and Local governments in charge of water services. As depicted in Figure 9.1, the MWRI contains six major directorates as well as other support providing units. Key directorates in the sector include the rural water supply and sanitation as well as the planning and programming directorates, the latter entrusted with overseeing the performance of urban water provision.

South Sudan has not designated a single lead Ministry responsible for sanitation. However, the provision of services to sewage disposal and treatment in urban areas is entrusted to the Ministry of Housing and Physical Planning (MHPP). The Ministry discharges these responsibilities through its directorate for urban sanitation. The Ministry of Health (MoH) is responsible for raising awareness on health problems that arise due to lack of adequate sanitation and hygiene services. MoH is also responsible for ensuring newly constructed as well as renovated health facilities have adequate water and sanitation facilities. No institution has been designated to coordinate the provision of sanitation services in schools.

A Provisional Order (PO) passed in 2008 created the Southern Sudan Urban Water Corporation (SSUWC) as a semi-autonomous institution and made it responsible for operating urban water facilities. Given its limited capacity, the corporation so far manages the urban water supply system of Juba, Aweil, Malakal and Renk towns. The latter entrusted with overseeing the performance of urban water provision.

South Sudan has not designated a single lead Ministry responsible for sanitation. However, the provision of schemes for sewage disposal and treatment in urban areas is entrusted to the Ministry of Housing and Physical Planning (MHPP). The Ministry discharges these responsibilities through its directorate for urban sanitation. The Ministry of Health (MoH) is responsible for raising awareness on health problems that arise due to lack of adequate sanitation and hygiene services. MoH is also responsible for ensuring newly constructed as well as renovated health facilities have adequate water and sanitation facilities. No institution has been designated to coordinate the provision of sanitation services in schools.

Figure 9.1: Organizational Chart Of The MWRI 2011

<table>
<thead>
<tr>
<th>Figure 9.1: Organizational Chart Of The MWRI 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Council of States</td>
</tr>
<tr>
<td>Urban Water Corporation</td>
</tr>
<tr>
<td>Undersecretary</td>
</tr>
<tr>
<td>Technical Assistance and Consultants</td>
</tr>
<tr>
<td>Dept. of Rural Water Supply &amp; Sanitation</td>
</tr>
<tr>
<td>Deputy Director of Planning, Engineering and Management</td>
</tr>
<tr>
<td>Director of Water Reserves and Hydrology</td>
</tr>
<tr>
<td>Director of Water Resources and Irrigation</td>
</tr>
<tr>
<td>Director of Water Reserves and Hydrology and Survey</td>
</tr>
<tr>
<td>Legal Services</td>
</tr>
<tr>
<td>Internal Audit</td>
</tr>
</tbody>
</table>

| Legend: Reporting | Consultation | Advisory Services |

In seven out of ten states, water and sanitation activities are coordinated under the State Ministry of Physical Infrastructure. In Eastern Equatoria State, the State Ministry of Housing and Public Utilities; in Unity State, the State Ministry of Environment and Natural Resources and in Warrap State, the State Ministry of Cooperatives and Rural Development hold responsibilities for coordinating water and sanitation activities. There are water and sanitation directorates as well as departments operating under the state ministries. The directorates are responsible for the implementation of the MWRI policies and strategies. While the budget for the services working in the water departments of the states is channelled from the MWRI, the state ministries are in charge of administrative duties. It has been learned that this is a temporary arrangement pending the capacity building of the states to handle such responsibilities. As discussed later, inadequate numbers of staff, coupled with lack of office equipment and transportation facilities, are severe constraints central to all state water and sanitation directorates.

At the county level there are water and sanitation departments supervised by an Assistant Commissioner. The departments are mandated to plan and implement water supply, sanitation and hygiene promotion programs.

Stafs at county and Payam levels are working as unpaid volunteers in anticipation of being offered the permanent position when they become available. In addition, where rural water supply programs are implemented, water management committee comprised of 6-10 members manage the facilities. While the committee is responsible for ensuring sustainable operation of the schemes, limited training coupled with no backstopping services from states and counties has hampered smooth performance of the schemes. There are also a number of Private Service Providers (PSPs) that are active in transportation of water and sewage services in the urban towns.

In the absence of a Water Act, responsibilities of service delivery as well as regulatory functions are characterized by gaps and sometimes with overlaps.

9.1.3 Pricing Policy for Water Supply Services

The water policy states that in rural areas, communities can be expected to contribute towards the cost of operation and maintenance (O&M) of water supply services. It also states that in urban areas, the costs of managing and supplying services shall be progressively introduced to promote financial sustainability. While these guiding principles are laid out in the policy, currently applied water tariffs in rural as well as urban areas have not been backed by any analytical studies and are generally set on an ad-hoc basis.

In rural areas, where new water supply facilities are constructed, users generally contribute an estimated $0.35 to $1 per household per month. While in some areas users contribute $2 per household when equipment needs to be repaired, payment in kind has also been reported in many cases. User fees collected from communities is generally kept with the treasurer and its usage is determined by community management members. Surveys carried out in rural areas indicate that in general, the Consumers' Willingness to Pay (CWP) as well as to charge is too low. A KAP survey conducted in South Sudan in 2009 indicated that only 28% of the population contributed towards O&M of their water supply system.102 Differences are also noted across states as in Warrap State, communities don’t contribute any fees for water use. A major contributing factor has been the lack of sufficient community awareness training and mobilisation while implementing rural water supply programs.

In urban areas various institutions are responsible for setting water tariffs, which complicates decision-making...
on this important issue. According to the Presidential decree 2011, where the SSUWC is responsible for operation of urban water supply systems, the general manager of the corporation, the board of directors of the corporation, the Minister of MWRI and the Ministry of Finance and Economic Planning have all got stakes in setting and approval of water tariffs. This is in contrast to the practice in neighboring countries where tariff setting and approval usually rests with boards of directors and/or regulatory bodies.

### Table 9.1: SSUWC water charges for treated water

<table>
<thead>
<tr>
<th>Customer type</th>
<th>Juba ($/month)</th>
<th>Wau ($/month)</th>
<th>Malakal ($/month)</th>
<th>Renk ($/month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class I - III</td>
<td>3 - 6</td>
<td>6.6</td>
<td>5</td>
<td>6.67</td>
</tr>
<tr>
<td>Stand pipes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ordinary - Large</td>
<td>33 - 333</td>
<td>6.6</td>
<td>_</td>
<td>6.67</td>
</tr>
<tr>
<td>Hotels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small - Large</td>
<td>260 - 480</td>
<td>6.6</td>
<td>5</td>
<td>6.67</td>
</tr>
<tr>
<td>Government units</td>
<td>100</td>
<td>6.6</td>
<td>20.3</td>
<td>16.67</td>
</tr>
<tr>
<td>Companies</td>
<td>233</td>
<td>6.6</td>
<td>5</td>
<td>6.67</td>
</tr>
<tr>
<td>Schools</td>
<td>83.3</td>
<td>6.6</td>
<td>5</td>
<td>6.67</td>
</tr>
</tbody>
</table>


In Juba, domestic users pay an average of $8 per month (about $1 per cubic meter) while government offices and business units pay monthly fees ranging from $60 to $300. A fixed connection fee of $100 is also applied on new customers. Table 9.1 indicates average water tariffs currently applied in Juba, Wau Malakal and Renk towns. Having been in effect since October 10, 2010, most of the tariff rates set by the Juba water station saw increments ranging from 60% -700%. On the other hand, PSPs buy water from stand pipes at $0.83 per cubic meters and sell it at about ten times the purchase costs resulting in about $8.30 per cubic meters. Setting water tariff rates is a long process and takes approval of several government entities.

As on-site sanitation dominates the technology type in both rural and urban areas, there are no fees applied for such services. However, in Juba, PSPs charge about $120 per ten cubic meters ($12/m³) to empty septic tanks and transport refuse to waste stabilization ponds.

#### 9.1.4 Water Supply Situation

The country is endowed with abundant surface and ground water potential but access to water supply services is among the lowest in Africa. Surveys suggest that an estimated 10,000 water points are available in the rural areas of the country of which 30-50% are non-operational at any time in each state.104 Over the last few years, a surge in the number of new water points mainly driven by NGOs as emergency measures has not been balanced with ensuring sustainability. While comprehensive studies have not been undertaken to determine per capita water consumption levels, surveys carried out by PACT in Eastern Equatoria and Jonglei states indicate average consumption levels of 16.4 liters/capita/day following completion of new rural water supply projects.105 The lack of proper design and supervision during implementation of rural water schemes has been a major concern. This coupled with lack of spare parts and essential maintenance tools, sustainability of rural water supply schemes will pose severe challenges in the country. Operation and maintenance is generally carried out by NGOs or volunteer technicians located in Counties and Payams. The private operators in the sector are non-existent and spare parts much needed for rural water supply equipment such as hand pumps are generally supplied at no cost to communities presenting a challenge of sustainability of maintaining rural water supply schemes.


105 PACT (2010), Assessment of water & sanitation projects in Magwi and Akeyo counties in Eastern Equatoria State.
Wells/boreholes are the most important source of water supply, accounting for 65% of the total supply. Other water supply sources include sub-surface dams, halfirs and ponds. As indicated in Table 9.2, only 2% of the country’s population has access to piped water supply against an average of 33% for Sub-Saharan African countries. While the country’s suitable hydrogeological formation will continue to favour wells/boreholes, alternative sources need to be explored as some areas have been found suitable for preferred sources such as springs and long range gravity schemes. The Ikotos gravity flow water system in Eastern Equatoria State is an example of such an alternative scheme where more than 28,000 people from four villages and Ikotos town are served from a single gravity fed system. Further, the country’s low population density particularly in rural areas necessitates the use of other low cost systems such as improved dug wells which are complemented by locally manufactured pumps. It is also worth considering, the country’s predominant lifestyle of agro-pastoralism while planning for new water supply schemes, given the significant percentage of the rural population that moves seasonally in search of water and grazing for livestock.

Most of the urban water supply systems in the country are dilapidated and unreliable. The major urban towns that are also state capitals comprise of Juba, Wau, Malakal, Rumbek, Yambo, Torit, Bor, Aweil, Kuajok and Bentiu. The SSUWC is currently managing the water supply systems of Juba, Wau, Malakal and Renk as well as in part the water supply systems of Bor and Mardidi towns. However, long years of neglect coupled with poor maintenance practices have undermined the performance of these facilities.

To assist the country, in 2007 and 2009, USAID and MDTF supported the construction of treatment plants, booster stations and tanker truck refilling stations in Juba and Wau towns. With these interventions, capacity of the treatment plants in Juba and Wau increased from 3,500m³/day to 7,200m³/day and from 2,000m³/day to 6,000m³/day respectively. As indicated in Table 9.3, the three major towns currently produce an estimated 15,000m³/day to meet the demands of an estimated 678,700 people.

Going forward, it will be essential to collect well data and conduct routine water quality tests to safeguard the public against adverse health effects. Proper registration of these water sources will also serve as key input to ground water monitoring studies and analysis. Juba, Wau, Malakal and Renk water supply systems serve a total of 8,800 house connections, but services are not metered and the water stations apply monthly flat rates on all their customers. Mainly, Juba’s aged distribution network has been the cause of water leakage and losses, estimated to reach 50%.

Further to this, the influx of IDPs to the town meant that the system couldn’t cope with the increase in demand. Today, JICA is supporting capacity building activities for the town’s water supply station and is also planning to carry out design and construction works for a new system with the intention of commissioning it after 2015.

The country’s water sector could draw valuable lessons from the water supply system of Malakal town which has undergone a series of major rehabilitation works but the system has experienced major setbacks. It was originally built in 1937 and rehabilitated in 1984, 2003 and recently in 2009. This system uses an intake structure, clarifiers and rapid sand filters as principal modes of water treatment mechanisms. However, the poor design and construction supervision works during its successive rehabilitation works led to clogging of the core components of the system. This clogged of the intake structure and damaged the water tank, both of which forced consumers to revert back to untreated water sources. Additionally, the use of advanced membrane filtration system of treatment which is too sophisticated to be operated by the staff implies that careful planning in technology choice will be required in developing new water supply systems in the country.

Urban water supply systems in the remaining seven state capitals (Rumbek, Bor, Torit, Yambo, Aweil, Kuajok and Bentiu) and 70 small towns are mostly serviced by drilled wells fitted with hand pumps and water yards consisting of mechanized boreholes, storage tanks and stand pipes. Generally, the water supply is unreliable and it also of poor quality. Lack of capacity to operate and maintain the facilities and shortage of spare parts have contributed to mal-functioning of most of the facilities. To address these challenges, the MDTF is funding studies and detail design works for the seven towns and it is projected that the studies will be completed by late 2012.

### 9.1.5 Sanitation and Hygiene Services

Global studies reveal that improved sanitation and hygiene practices are key ingredients for sustaining human health and enhancing poverty alleviation. It has also been demonstrated that consistent use of latrines can reduce incidence of diarrhea by up to 40% and hand washing with soap at key junctures by up to 50%.

However, available statistics in South Sudan show that more than 50% of the schools don’t have any sanitation facilities impacting school attendance and level of attained education. Some of the reasons attributing to the low levels of sanitation and hygiene practices are (i) low priority in the development agenda (ii) burden of carrying costs on households (iii) absence of a single lead ministry and (iv) resistance to behaviour changes. Apart from a few NGOs and development partners implementing sanitation projects, there is no dedicated budget towards improving sanitation and hygiene services.

Estimates suggest that diarrhea constituted as the second major reason for people’s consultation in health facilities in South Sudan, superseded by only malaria. The country’s very high child mortality rate (102 per 1000) and frequency of deadly diseases such as cholera, acute respiratory infections, and typhoid is a manifestation of the low (15%) access levels to improved sanitation services. Compelling evidence-based analysis shows that hygiene and sanitation are among the most cost effective public health interventions to reduce childhood mortality.

Table 9.3: Capacity of major urban water supply systems (2011)

<table>
<thead>
<tr>
<th>TOWN</th>
<th>Population</th>
<th>Production capacity (m³/day)</th>
<th>Estimated daily production (m³/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juba</td>
<td>372,400</td>
<td>7,200</td>
<td>5,400</td>
</tr>
<tr>
<td>Wau</td>
<td>151,300</td>
<td>6,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Malakal</td>
<td>155,000</td>
<td>5,000</td>
<td>1,875</td>
</tr>
<tr>
<td>Total</td>
<td>678,700</td>
<td>16,080</td>
<td>10,275</td>
</tr>
</tbody>
</table>


106 Can Africa afford to miss the sanitation MDG target? CARO/SDF, ADB, World Bank, WSP, 2008
107 Ministry of Health (2011), Health sector development program (Draft), South Sudan.
108 UN-Water, 2008
also concerns on the quality of effluent from the ponds as proper regulation and monitoring is not carried out which endangers the environment and communities living in the area. The MHPP has been in charge of coordinating the design and construction works of the stabilization ponds. Privately owned and operated vacuum tankers collect and dispose waste water generated from septic tanks and other holding structures. The MWRI and state water and sanitation directorates coordinate the construction of public latrines in market places, health centers, schools and other public gathering places. The Government’s strategy places high priority towards construction of public (institutional) latrines as a means of reaching out to larger groups and alleviating problems in small towns and congested areas.

### Table 9.4: Types of Sanitation Facilities

<table>
<thead>
<tr>
<th>Facility</th>
<th>Access (%)</th>
<th>Population with access (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>Flush toilet</td>
<td>9.3</td>
<td>2.9</td>
</tr>
<tr>
<td>VIP latrines</td>
<td>8.1</td>
<td>1.2</td>
</tr>
<tr>
<td>Pit latrine with slab</td>
<td>20.5</td>
<td>5</td>
</tr>
<tr>
<td>Composting toilet</td>
<td>0.7</td>
<td>0.2</td>
</tr>
<tr>
<td>Unimproved including</td>
<td>61.4</td>
<td>90.7</td>
</tr>
<tr>
<td>open defecation</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: South Sudan Health and Household Survey, 2010

9.2 Major Challenges in the Water Supply and Sanitation Sector

9.2.1 Water Supply

The lack of improved water supply and sanitation services exacts a heavy toll on the health and economic productivity of South Sudan. The country’s limited existing water facilities are also in danger of ceasing operation due to neglect and poor operation and maintenance practices. Hence, concerted efforts are necessary at national, state and county levels to properly maintain existing facilities and accelerate service delivery. It is also essential to demonstrate strong political commitment and address policy and regulatory issues. Key issues that need to be addressed include: (i) institutional capacity; (ii) supply chains of goods and services in the water sector; and (iii) reforms on urban water entities.

**Institutional capacity:** A central conundrum for accelerating the country’s delivery of improved water supply services lies in how the sector builds its institutional capacity. While some efforts have been made to build water facilities in the rural and urban areas, very little has been done in availing adequate human resources and strengthening sectorial institutions. In particular, the states and counties institutions will require capacity building as well as upgrading the skills of the professionals. As depicted in Table 9.5, only 3-5 medium level professionals are available in each of the two state water and sanitation directorates. The staff have been entrusted to oversee the planning and management of an estimated 1200-2000 water supply schemes as well as to monitor sanitation and hygiene programs. However, the MWRI and SSUWC lack senior professionals such as engineers, geologists, financial analysts and treatment plant specialists.

As a result of this imbalance, implementers of water supply projects, mainly NGOs have been forced to "go it alone" posing serious challenges on the overall sustainability management of the water supply systems. The key to the success of program management and ensuring sustainability lies in building the capacities of state water and sanitation directorates.

Additionally, the current institutional arrangements in the water sector are also characterized by overlaps and often lack of clarity. Particularly, problems of duplication in service provision and regulatory responsibilities have been reported between the MWRI, SSUWC and local government councils. For example both Local Government councils as well as SSUWC are responsible for the provision of water supply services in urban areas. In addition to this, the current role played by these entities in asset ownership has not been clearly defined and again water tariff setting has been masked with overlaps between SSUWC and Local Governments. While a clear delineation of institutional responsibilities is crucial, this Report recommends that formal responsibility for water supply service provision and asset ownership in the State capitals be transferred to the SSUWC and formal responsibility for asset ownership and service provision in urban areas, outside of the State capitals be transferred to the respective State Governments. Further, it is recommended that rural water supply service provision as well as asset ownership also be transferred into State Governments. As the MWRI is heavily engaged in providing technical backstopping services to the states, crucial tasks such as regulatory activities have not been adequately undertaken. Hence a Water and Sewerage Authority entrusted with regulatory functions and positioned within the MWRI need to be established and made functional.

As discussed in subsequent chapters, the large number of water supply schemes that are going to be implemented will continue to pose significant strain on the already weak institutional capacity. Further, lack of adequate office spaces, IT network, equipment and transportation facilities impact the working environment and disrupt much needed field works. M&E is almost non-existent and procurement and contract administration practices are generally weak. While the steps taken in establishing a data center, WIMS is commendable, much support is required to strengthen its capacity through training staffs and availing the necessary software and related equipment.

**Supply chains of goods and services:** Supply chains of goods and services in the water sector are major challenges in South Sudan. Central to the issues are: weak private sector, lack of clear guidelines and standards, poor infrastructure facilities, untargeted subsidies by some project implementers and low level of community awareness.

Local contractors and manufacturers specializing in water and sanitation activities are still few in the country meaning that the contract awarding is less competitive. Well drilling and sanitation activities are still few in the country meaning that the contract awarding is less competitive. Well drilling and sanitation activities are still few in the country meaning that the contract awarding is less competitive. Well drilling and sanitation activities are still few in the country meaning that the contract awarding is less competitive. Well drilling and sanitation activities are still few in the country meaning that the contract awarding is less competitive. Well drilling and sanitation activities are still few in the country meaning that the contract awarding is less competitive.

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have firm presence in the country constraining follow-up activities. The same holds true with consulting companies. As a result, design and construction supervision works particularly in rural areas is being undertaken by construction companies, compromising the quality of works and further affecting sustainability of schemes. As discussed in subsequent chapters, the large investment envisaged in the program ahead requires adequate number of drilling, civil construction and consulting companies. While every effort should be made and incentives designed to encourage the private sector to engage in these activities, this report recommends building local design and construction capacity to undertake major responsibilities. As demonstrated in neighboring countries, establishment of semi autonomous enterprises typically under a PPP arrangement has not only filled the gaps in securing large number of companies, but they also provide practical training to junior staffs coming out of academic centers. Given the prevailing situation in South Sudan, the country can benefit much from similar initiatives.

Most water supply schemes in the rural areas will continue to depend on wells/boreholes equipped with pumps as a major means of sources of water supply systems. Water lifting devices such as India mark II, Afridev, Duba and other makes have been installed in rural areas frequently encountering breakdowns due to lack of spare parts. Owing to the limitations in spare parts provision and lack of trained technicians, it is essential to limit the types of pumps to those that have been effective in the country.

Majority of spare parts provided by NGOs and UN agencies are delivered free of charge to Counties and Payams. Such arrangements often done with good intention to provide subsidies to communities managing rural water supply systems, these measures do not always meet the intended purpose. Evidence has shown that untargeted subsidies create a sense of dependency on external support and lead to the perception that water facilities provision is the responsibility of the government and donors109. While the private sector should be encouraged to play an active role in supply of spare parts through incentives and other mechanisms, this report suggests the establishment of Operation and Maintenance Support Units (OMSUs). These units will be positioned in strategic locations within states and avail spare parts; undertake major maintenance works and even supply pumps and other electro-mechanical items on cost recovery basis. The units will be fully managed by the private sector once such capacity is established in the states.

**Improving the performance of urban water institutions:**

The major entity entrusted with operation of urban water systems is the SSUWC. Although the Corporation has been established to function as a semi-autonomous entity, it runs as a civil service institution. Staff are guided by civil service regulations and in most cases don't have clear job descriptions. Bills are manually prepared on a monthly basis and reflect a high volume of arrears. Revenue generated from sales of water is not ring-fenced and is reverted back to the central treasury. Contrary to good practices of a double entry accounting system as practiced in many countries, the corporation and its entities still use single entry system. Customer connections are not metered making it difficult to monitor consumption particularly among high end users. An average of 40 to 50% of the produced water is lost as unaccounted in Juba, Wau, Malakal and Renk towns. According to information obtained from the Corporation, there are close to 9,800 registered customer connections. Only 20% of the revenue is retained by the water stations and the balance 80% is transferred to the national treasury. Average collection ratios for piped and tanker supply at 85% is low compared to the average for Africa at 90%. Asset ownership still rests with the government. The corporations' four branch systems is the SSUWC. Although the Corporation has been fully managed by the private sector once such capacity is envisaged in the program ahead requires adequate number of employees. The units will be positioned in strategic locations within states and avail spare parts; undertake major maintenance works and even supply pumps and other electro-mechanical items on cost recovery basis. The units will be fully managed by the private sector once such capacity is established in the states.

**Table 9.6: Revenues and Operating Cost of SSUWC (2011)**

<table>
<thead>
<tr>
<th>Particulars</th>
<th>SSUWC</th>
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<tbody>
<tr>
<td><strong>Operating Revenues</strong></td>
<td></td>
</tr>
<tr>
<td>Billed Revenues - Piped Supply</td>
<td>359 061</td>
</tr>
<tr>
<td>Billed Revenues - Water Tanker Supply</td>
<td>960 000</td>
</tr>
<tr>
<td>Total Billed Revenues</td>
<td>1 319 061</td>
</tr>
<tr>
<td>Collection Efficiency on Piped Supply</td>
<td>46%</td>
</tr>
<tr>
<td>Collected Water Revenues</td>
<td>1 123 814</td>
</tr>
</tbody>
</table>

NB: Capital Cost Assumed Covered by GOSS, State and Local Government
Source: SSUWC + SSUWC Juba November 2010

There are no performance contracts entered into between the Government and the Corporation resulting in poor regulation of activities. While some investment has been made in rehabilitating treatment plants in the major towns, less than 10% of the investment made so far has been allocated towards expansion and improvement of distribution systems.

A key challenge for the SSUWC is to transform itself into an efficient and good financial standing entity. This report recommends undertaking the following measures to enable it attain these goals in the next 3-4 years:

- Members of the Board of Directors have been designated but the board has not yet been made functional. It is urgent for it to assume its duties. Also, the list of nominated board members doesn't include representatives from the private sector which needs to be addressed.
South Sudan: An Infrastructure Action Plan

• The Water, sanitation and hygiene strategic document proposes establishment of a ‘Water Supply and Sanitation Regulatory Board’. As regulatory functions are essential, the Government needs to nominate staff to work and enable it operate accordingly.

• The SSUWC should recruit seasoned professionals to fill vacant positions. Also recommended in this report is recruitment of high caliber technical assistants much needed for supporting the activities of the Corporation.

• The distribution systems in Juba, Wa, and Malakal seek urgent rehabilitation measures. In particular, Juba’s old asbestos cement pipe needs to be replaced. Leakage and losses will be reduced and service delivery improved. In addition, metering systems should be introduced in the major towns. Illegal customer connections need to be identified and registered. Asset valuation study needs to be carried out.

• Introduction of performance targets and improvements in bill collection is critical. It is also recommended that double entry accounting systems be introduced.

• There is a need to agree and set deadline period for water station rehabilitation to avoid overlaps from the urban and water stations. Indicators for Juba water station demonstrate that with improvement measures discussed above and ring fencing revenue, the station can sustain itself without any subsidy from the Government. Similar approaches can be used in other towns need to follow in other water stations.

9.2.2 Issues in Sanitation and Hygiene Practices

Some of the major issues that need to be addressed to accelerate the access to improved sanitation services include: (i) resistance to behavioral changes (ii) securing funding for sanitation facilities and (iii) fragmentation of institutional responsibilities

Behavioral changes. Construction of sanitation facilities by itself will not bring in anticipated changes unless awareness is created on the proper usage of such facilities. Evidence has shown that behavioral changes are instrumental in stimulating demand and serving as catalyst for improved usage of sanitation facilities. Similar with most other developing countries, the level of hygiene awareness in the country is low. Surveys conducted by PACT in two states of South Sudan demonstrate that while 50% of the population washed their hands before preparing a meal, only 15% did so after latrine usage. In South Sudan, a number of traditional beliefs impede the implementation of latrine usage. In many areas, people also see digging a pit latrine as a degrading job. More studies are also required to understand what motivates behavioural changes as a number of factors attribute towards it. The MWRI, UNICEF along with few NGOs has recently launched the Community Led Total Sanitation (CLTS) program in the country. According to reports by SNV, a capacity development organization active in South Sudan, encouraging results has been obtained in stimulating discussions among community members on the benefits of improved sanitation services in Northern Bahr el Ghazal State through application of CLTS. As more works are necessary in behavioral practices, this report recommends rolling out such techniques in other States too. In addition, targeting schools, market places and informal settlements across media should all be utilized to generate demand for such essential services.

Cost of sanitation facilities. The water policy as well as the strategic framework document emphasize that households need to construct their own sanitation facilities. It is also stated that support provided by Government and development partners will focus on promotion of hygiene education and awareness program. However, these principles have not been put into practice in rural areas of South Sudan. In some States, program implementers cover the full expenses for construction of household latrines and in others subsidies like slab panels, digging tools and construction materials are provided freely to communities. In some states, communities meet the full expenses of constructing sanitation facilities. The basic principles of CLTS don’t encourage provision of subsidies towards construction of household latrines. While further studies are necessary to understand communities ability and willingness to pay for such facilities, this report suggests that consideration of targeted subsidies be made for the poor in rural areas. The current high construction cost in the country also hampers progress in construction of sanitation facilities. The costs of construction materials are too high as compared to other African countries. Surveys indicate that in urban areas of the country, construction costs for a simple household latrine ranges from $1,500 to $3,000 which is too high for many individual households. In neighboring countries, these costs are typically in the range of $500 to $800. Overall, technology selection is a key component for optimizing usage as well as for ensuring cost-effectiveness. It is thus critical to prepare alternative design of facilities which are cost effective and suited to the local conditions of South Sudan.

Institutional responsibilities. The country has not designated a lead ministry for sanitation. Formal responsibilities for sanitation service provision and regulatory functions are vested with MHPP and local governments. As discussed elsewhere in this report, the MHPP is entrusted with provision of sanitation services in urban areas. There is no institution mandated with provision of sanitation services and hygiene education in schools. NGOs are key implementers in rural areas with almost no regulation and monitoring by the state water and sanitation directorates mainly due to lack of professional staffs in the States. Critics have long argued that responsibilities of water and sanitation are best discharged through one organization. In addition, almost all major water supply projects incorporate sanitation components further justifying the need to merge responsibilities of these sectors under one umbrella entity. There is an urgent need to streamline responsibilities and avoid overlaps and bridge gaps. Experience from the region indicates that the National Water and Sewerage Corporation (Uganda), Nairobi Water and Sewerage Company (Kenya) and ONEA, National Office of Water and Sanitation (Burkina Faso) are exemplary entities that have transformed themselves from being weak debt ridden and inefficient service providers into efficient service providing entities. Key to these achievements is strong political commitment by their respective governments as well as support by development partners in building institutional capacity and provision of investment for service expansion. The position taken in this report and the approach best suited to South Sudan’s needs is to assign formal responsibility for each of the State capitals to the Urban Water Corporation (transforming it into Urban Water and Sewerage Corporation) and assign formal responsibility to the state governments for provision of sanitation services to other urban communities within each state. It is also suggested that regulatory functions be undertaken by the Water Supply and Sewerage Authority to be positioned within the MWRI.

9.3 Expanding Access to Water Supply Services

The country lacks reliable data on access to improved sources of water supply in rural as well as in urban areas. Key to the problem is the lack of strong capacity much needed to monitor the water and sanitation sector. As discussed in subsequent parts, reliable access data is a key parameter for robust planning and financing of the water sector. Whilst much work lies ahead, the South Sudan Health and Household Survey (SSHHS 2010) gathered information on household water and sanitation status across the ten states and the MWRI’s Water Information Management System (WIMS) collects and maps out physical water source data. Table 9.7 indicates summary of access data obtained from different sources.

Table 9.7: South Sudan Access to Improved Sources of Water Supply

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural water supply</td>
<td>30%</td>
<td>67.9%</td>
<td>33.4%</td>
</tr>
<tr>
<td>Urban water supply</td>
<td>14%</td>
<td>67.0%</td>
<td>48.9%</td>
</tr>
<tr>
<td>TOTAL water supply</td>
<td>27%</td>
<td>67.7%</td>
<td>35.9%</td>
</tr>
</tbody>
</table>

*Without consideration of time to fetch water ** After consideration of 30 minutes to fetch water Source: MWRI, 2011

As shown in Table 9.7, assuming a threshold round trip fetching time of 30 minutes, the household survey (2010) estimates access levels in rural areas to be 33.4%. Also, following a series of discussions held between development partners active in the water sector in South Sudan and the MWRI, consensus has been reached on the stated access level of 34%. With an estimated rural population of 7.56 million in 2010, the implication is that only 2.6 million people had access to improved water supply services. While further studies are necessary to determine reliable access levels, a baseline figure of 34% has been used in developing the rural water supply component of this action plan. Table 9.8 shows access levels of rural and urban water services in comparator countries.
The South Sudan Local Government Act defines an urban area to be one where more than sixty percent of its economic activities are non-agricultural with considerable level of urban infrastructure and public utilities. Estimates suggest that by 2010, about 1.74 million people lived in urban areas. For the purposes of this report, all state capitals, county headquarters and growing small towns are classified as urban areas. The 2010 Health and Household Survey (Table 9.2) estimated access levels to improved water sources in urban areas to be 67%. The stated level is widely disputed as almost all urban water systems are dysfunctional and majority of the population continue to rely on poor quality and often intermittent services. On the other hand, estimates made by MDTF suggest that in 2009, access levels in urban areas were limited to only 14%. Analysis undertaken for this report indicates that access levels in Juba, Wau and Malakal varied from 13% to 20% in 2010. In addition, anecdotal evidence suggests that the situation in most small/peri-urban towns at best is similar to the conditions in the major towns. While it is essential to conduct detailed studies to determine reliable access levels, it is assumed for the purposes of this report that by 2010, an estimated 15% of the urban population had access to improved water supply services.

9.3.2 Targets for Access to Improved Sources of Water

Non-functionality of rural water supply schemes will also be reduced from the current level of 40% to 30% and 20% by 2015 and 2020. As shown in Figure 9.2, the planned intervention is expected to increase access levels in the rural areas to 49% and 65% by 2015 and 2020 respectively. In the decade ahead, access to improved water supply services in rural areas will also grow at an average rate of 3% per year. As indicated in Figure 9.3, by the end of 2020, the total number of people with access to improved sources of water supply in the rural areas is estimated to reach 6.8 million.

9.3.3 Rehabilitation and New Construction for Rural and Urban Water Supply

Rural water supply schemes. As discussed elsewhere in this report, an estimated 4,000 water points are not functional in the rural areas. This coupled with a lack of the much needed periodic maintenance is expected to shorten the economic life of most functioning facilities. In the absence of any meaningful asset valuation study and for the purposes of this report, rehabilitation and replacement requirements for rural water systems is put at $90 million.

An estimated 600-800 rural water schemes will also be rehabilitated and/or replaced each year to decrease non-functionality rates of rural water supply schemes from 40% to 20% by 2020. Therefore, there is an urgent need

### Table 9.8: Water Supply Access Levels in Selected Comparator Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Urban (%)</th>
<th>Rural (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkina Faso</td>
<td>2008</td>
<td>95</td>
<td>72</td>
<td>76</td>
</tr>
<tr>
<td>Burundi</td>
<td>2008</td>
<td>83</td>
<td>71</td>
<td>72</td>
</tr>
<tr>
<td>Eritrea</td>
<td>2008</td>
<td>74</td>
<td>57</td>
<td>61</td>
</tr>
<tr>
<td>Malawi</td>
<td>2008</td>
<td>95</td>
<td>77</td>
<td>80</td>
</tr>
<tr>
<td>Niger</td>
<td>2008</td>
<td>96</td>
<td>39</td>
<td>48</td>
</tr>
<tr>
<td>Rwanda</td>
<td>2008</td>
<td>77</td>
<td>62</td>
<td>65</td>
</tr>
<tr>
<td>South Sudan</td>
<td>2010</td>
<td>15</td>
<td>34</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: WHO-UNICEF (2010), Progress on sanitation and drinking water, and estimate by authors.

Source: Estimate by authors

![Figure 9.2: Water Supply Access Levels in Selected Comparator Countries](image)

![Figure 9.3: Population with access to improved sources of water supply in rural areas](image)
It is expected that Juba, Wau and Malakal towns will rely on surface sources. The proposed Suw multi-purpose dam project would become the primary source of the water for the town of Wau. Engineering studies and design works are underway for the remaining seven towns and it is estimated that at least four of the seven towns will depend on surface sources. The rest will depend on underground sources. The total demand for the ten towns will not cause major strain to the available water sources. As the proposed construction works in the major urban towns will only be completed towards the end of the program period, the assumptions used in this Report is an estimated 70% of a given towns’ population will use services from the new system. As is the practice in many countries, it will take some time to attain 100% access levels even after completing the construction of new water supply schemes. These assumptions are also in line with the studies conducted for Juba water supply system.

This Report strongly recommends that concerted efforts are undertaken to enable all state capitals have access to improved water supply services prior to 2020. It is expected that JICA’s support will enable the Juba water supply system to be commissioned before the end of the program period. Detailed studies and design works have been recommended under this program for Wau and Malakal towns planned to start in 2013. In addition, the planned Juba water supply construction project supported by JICA will be completed by 2015. As recently recommended to start no later than 2014 and completed in 2018-2019 with on-going studies and tendering works due for completion in 2012-13. It is also assumed that the planned Juba water supply construction project is not sufficient to meet the demands of the increasing population, studies and design works for long term solutions are proposed to start in 2015. Further, design and construction works for fifty small towns will be undertaken in the planning period. It is expected that these interventions will increase access levels in the urban areas to 70% by 2020.
As indicated in Table 9.11, rehabilitation costs for rural and urban areas are put at $90 million and $43 million respectively at 2010 constant prices. Inclusive of the ongoing programs, the total cost of the proposed water supply investment program is estimated at $1.1 billion at 2010 constant prices. Owing to the long rainy season in the country, preparatory works such as procurement and contract negotiations should be undertaken in the rainy season with mobilization early in the dry season. It should be noted that successful implementation of the program strongly will depend on the implementation of institutional capacity recommendations suggested in this report.

<table>
<thead>
<tr>
<th>Table 9.11: South Sudan Capital cost of water supply program (In $ ’000 at 2010 constant prices)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population with access (’000)</td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Access to improved water (%)</td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>New systems</td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Rehabilitation ($’000)</td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>On-going ($’000)</td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Total expenditure ($’000)</td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

9.4 Expanding Access to Sanitation Services

9.4.1 Current Access to Sanitation Services

The 2010 Health and Household Survey estimates access levels to improved sanitation services to be 9.3% and 36.8% in rural and urban areas respectively. With a national access level of 14.6% in 2010, more than 8 million people were without improved sanitation facilities. Also, the same surveys indicate that an estimated 65% of the total citizenry practiced open defecation causing serious concerns on the overall health conditions of the population.

As shown in Table 9.12, with an estimated access level of 9.3% in the rural areas, about 1.2 million households lack access to improved sanitation services. In the urban areas, with an access level of 36.8%, about 165,000 households did not have access to improved sanitation services. Hygiene awareness is also low with an estimated 11.4% practicing hand washing after usage of toilet facilities.

<table>
<thead>
<tr>
<th>Table 9.12: Access levels on improved sanitation services in South Sudan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural sanitation</td>
</tr>
<tr>
<td>Urban sanitation</td>
</tr>
<tr>
<td>Total sanitation</td>
</tr>
</tbody>
</table>

Source: MWRI, 2011

While further studies are deemed necessary, access to improved sanitation services of 9.3% and 36.8% have been assumed for the purposes of this report in rural and urban areas respectively.

Source: WHO-UNICEF (2010), Progress on sanitation and drinking water, and estimate by authors.
9.4.2 Targets for Access to Improved Sanitation

In 2010, accesses to improved sanitation were 9.3% and 36.8% in rural and urban areas respectively. The Government has not yet set any official target levels on access to improved sanitation services. It is assumed that coupled with strong political commitment, newly introduced mechanisms such as the Community Led Total Sanitation Program (CLTS) is expected to accelerate access to improved sanitation services. Over the last two years, the government along with the support of development partners launched CLTS to create an open defecation-free society. It is assumed this methodology will be rolled out in the decade ahead in most other states. This program recommends a bold initiative of implementing extensive hygiene awareness program targeting media outlets, schools and other public gathering places.

Table 9.13: Estimates on capital costs of sanitation program

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Population with access (millions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>752</td>
<td>870</td>
<td>1 000</td>
<td>1 127</td>
<td>1 251</td>
<td>2 196</td>
<td>2 200</td>
</tr>
<tr>
<td>Rural</td>
<td>888</td>
<td>1 088</td>
<td>1 302</td>
<td>1 525</td>
<td>1 848</td>
<td>4 168</td>
<td>4 170</td>
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<td>Total</td>
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<td>1 958</td>
<td>2 302</td>
<td>2 652</td>
<td>3 099</td>
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<td>6 370</td>
</tr>
<tr>
<td>Access to improved sanitation (%)</td>
<td></td>
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<tr>
<td>Urban</td>
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<td>16</td>
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<td>21</td>
<td>23</td>
<td>26</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Urban</td>
<td>-</td>
<td>28 739</td>
<td>32 022</td>
<td>30 919</td>
<td>30 478</td>
<td>33 434</td>
<td>353 682</td>
</tr>
<tr>
<td>Rural</td>
<td>-</td>
<td>7 014</td>
<td>7 487</td>
<td>7 802</td>
<td>11 309</td>
<td>21 053</td>
<td>114 811</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>35 753</td>
<td>39 508</td>
<td>38 721</td>
<td>41 787</td>
<td>74 487</td>
<td>468 493</td>
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<td>90 000</td>
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<tr>
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<td>16 000</td>
<td>16 000</td>
<td>18 000</td>
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<td>1 105</td>
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<td>1 608</td>
<td>539</td>
<td>120</td>
<td>5 051</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>4 421</td>
<td>6 495</td>
<td>3 751</td>
<td>1 259</td>
<td>280</td>
<td>11 785</td>
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<tr>
<td>Total</td>
<td>5 526</td>
<td>9 278</td>
<td>5 359</td>
<td>1 798</td>
<td>400</td>
<td>16 835</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>1 105</td>
<td>2 783</td>
<td>40 346</td>
<td>42 561</td>
<td>41 039</td>
<td>40 478</td>
<td>63 434</td>
</tr>
<tr>
<td>Rural</td>
<td>4 421</td>
<td>6 495</td>
<td>14 765</td>
<td>12 745</td>
<td>14 082</td>
<td>17 309</td>
<td>29 053</td>
</tr>
<tr>
<td>Institutional sanitation facilities</td>
<td></td>
<td>1 000</td>
<td>1 000</td>
<td>1 000</td>
<td>2 000</td>
<td>2 000</td>
<td>15 000</td>
</tr>
<tr>
<td>Waste water facilities in 10 towns</td>
<td></td>
<td>3 000</td>
<td>5 000</td>
<td></td>
<td></td>
<td></td>
<td>3 500</td>
</tr>
<tr>
<td>Grand Total</td>
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<td>9 278</td>
<td>56 112</td>
<td>59 306</td>
<td>61 121</td>
<td>59 787</td>
<td>703 333</td>
</tr>
</tbody>
</table>

Source: Estimate by authors

As depicted in Figure 9.6, access to improved sanitation services in rural and urban areas is projected to grow at an average rate of 2.5% per annum in the decade ahead. As a result, access levels to improved sanitation services in rural areas will grow from 9.3% to 40% by 2020. Hence an estimated 720,000 households will have improved services in the rural areas by the end of the program period. In the urban areas, access will increase from 36.8% to 60% by 2020. This will enable an estimated 328,000 urban households to have access to improved sanitation services by 2020. Further, this program suggests construction of institutional latrines to be used in health posts and in urban areas. Construction of sanitation facilities in schools coupled with incorporating hygiene courses in school curriculum needs to be prioritized as young students can play a major role in changing household behaviour. Surveys indicate that about 1,570 schools are without any sanitation facilities.111 An important initial step for the Government would be designating an institution to coordinate sanitation activities in schools.

9.4.3 Rehabilitation and New Construction of Sanitation Facilities

In the absence of detailed estimates on rehabilitation costs for sanitation services, this report assumes that a substantial part of the urban and rural sanitation facilities will require rehabilitation and/or replacement. In the absence of any asset valuation study, this program puts the cost of replacement at $58 million in rural areas and at $90 million in urban areas.

New construction in the rural and urban areas is estimated to cost about $115 million and $354 million respectively. In addition, an estimated $15 million for institutional sanitation facilities to be constructed in urban towns as well as about $55 million for low cost waste treatment facilities in the state capitals is allocated in the program period. Inclusive of ongoing programs, Table 9.13 shows estimates of the total cost of the sanitation program and amounts to about $703 million.

111 Statistical yearbook for Southern Sudan, 2010
9.5 Strengthening Capacity for Service Delivery and Implementation

As discussed in previous chapters, South Sudan’s water sector faces chronic and severe capacity challenges in terms of human resources, technical skills, facilities and services. Institutional capacity building is also the single top priority intervention among all others to ensure sustainable delivery of water supply and sanitation services. Given the expected large investment estimated at US$ 1.8 billion, several measures have been proposed to improve the policy environment and build capacity of the water sector institutions. The proposed program for strengthening capacity is in the range of $150 million and a significant part of it is required early on in the implementation period. Key elements of the program include i) provision and strengthening of training institutions ii) conducting strategic and technical studies. iii) Improving the performance of urban water entities iv) training program; and v) construction of office buildings and related facilities.

9.5.1 Strengthening Training Institutions

Institutional capacities. Central to this component is strengthening mid level training centers that can generate adequate number of mid-level/intermediate professionals desperately needed at national, state and county levels. These professionals will provide support services to the MWRI, SSUWC and the state water and sanitation directorates. Thus, it is recommended to strengthen and upgrade the two training centers, Amadi Rural Development Institute and the Wau Vocational Center. Recently completed renovations works by USAID on Wau vocational center and on-going rehabilitation works on Amadi center by MDTF may not be sufficient to accommodate and train large number of mid-level professionals in high demand by the water entities. It is also envisaged to upgrade the levels of the centers into technology institutes and build essential linkages with major universities. In addition to several short and medium term training programs to be conducted in these institutes, it is recommended that 2 to 2.5 years of training program focusing on the following packages be urgently implemented.

- Operation and maintenance of water supply equipments
- Drilling technology
- Sanitation and Hygiene promotion and
- Water quality monitoring

9.5.2 Advisory Services and Technical Studies

Given the current gap in the availability of skilled manpower and the time it requires to obtain adequate number of local graduates, it is essential to recruit technical assistants who will provide professional support to the states as well as to the MWRI, MHPP and SSUWC. The MWRI and SSUWC will require highly skilled experts in the areas such as hydrogeology, water treatment plant operations, financial management and program monitoring and evaluation. Experts in water and sanitation engineering as well as in geology will also be recruited to work in ten states. These experts will build capacities in the state water and sanitation directorates and provide technical support in program planning and management. All the recruited experts will provide technical support services and work under the existing government structure. Such services will be required until at least 2015.

Under the proposed action plan, important studies have been recommended which amongst other things are expected to develop legal framework, clarify sectoral responsibilities, trigger investment into the sector and identify gaps and challenges to move the sector forward. Major proposed studies include: preparation of a sanitation master plan; supply chains of goods and services; determination/validation of access data on water supply and sanitation; feasibility studies and design of Wau and Malakal water supply and sanitation systems; water tariff studies; private sector development to water and sanitation related activities; and organization and management structure/Institutional arrangements for the water and sanitation.

9.5.3 Implementation of the Proposed Program

Inadequate offices and related equipment have continued to pose problems for the MWRI, SSUWC, states and counties. Office spaces of the MWRI being very limited, staffs are congested in small rooms and pertinent services like the rural water supply and sanitation directorate, water quality laboratory and the water information management services have been forced to be located further away from the main office. On a positive side, construction of office buildings for the state water and sanitation directorates is underway through funds obtained from MDTF. However, county water and sanitation departments as well as the MWRI and SSUWC urgently need modest offices. Field vehicles and motorbikes, necessary for supervision and monitoring works will also be provided to the states and counties. Given the large number of IDPs and returnees as well as unexpected conflicts that are frequently encountered, it is recommended to construct emergency warehouse units at strategic locations. These units will help in storing water treatment package plants, chemicals and tools much needed during emergency periods such as floods and drought.

Figure 9.7: Capacity building program and technical Support

Source: Estimate by authors
South Sudan: An Infrastructure Action Plan

9.6 Development Costs and Financing Arrangements

9.6.2 Development Expenditure Program

The proposed development program for the water supply and sanitation sector in the decade ahead amounts to $1.94 billion at 2010 constant prices. As indicated in Table 9.15, it includes an estimated $ 150 million for capacity building and advisory services, about $280 million for rural water supply, about $ 710 million for urban water supply, about $173 million for rural sanitation and about $443 million for urban sanitation. In addition public sanitation facilities much needed in various towns and cost-effective waste treatment facilities for the state capitals will be constructed at an estimated $70 million. A significant portion of the next four years will be dedicated towards building much needed capacity particularly at the state and county levels while remaining part of the program period will be dedicated to implementation of major water supply and sanitation projects. One of the recommendations of this report is making preparations early on in the program to ensure all state capitals will have adequate water supply and sanitation services before the end of 2020.

Table 9.15: Development expenditure for the water and sanitation sector (In $ millions)

<table>
<thead>
<tr>
<th>Category</th>
<th>Projected</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing</td>
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<td></td>
</tr>
<tr>
<td>Capacity building and technical studies</td>
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<td>0.79</td>
</tr>
<tr>
<td>Strengthen vocational centers</td>
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<td></td>
</tr>
<tr>
<td>Training program at all levels</td>
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<td>26.50</td>
</tr>
<tr>
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<td>9.28</td>
<td>5.36</td>
</tr>
<tr>
<td>Technical support for Ministries and states</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analytical &amp; technical studies</td>
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<td>1.03</td>
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<td>Rural water supply program</td>
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<tr>
<td>Urban water supply</td>
<td>69.39</td>
<td>32.65</td>
</tr>
<tr>
<td>Juba, Wau &amp; Malakal distribution rehabilitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Juba, Wau &amp; Malakal water supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Towns (Kuajok, Rumbek, Torit, Yambio, Bentiu, Aweil and Bor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 small towns water supply project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban towns rehabilitation program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban sanitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upgrading waste stabilization ponds in Juba</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste treatment systems for 9 state capitals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional sanitation facilities for towns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household sanitation program</td>
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<td></td>
</tr>
<tr>
<td>Rural sanitation program</td>
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<tr>
<td>Urban water supply</td>
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</tr>
<tr>
<td>Juba, Wau &amp; Malakal distribution rehabilitation</td>
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<td></td>
</tr>
<tr>
<td>Juba, Wau &amp; Malakal water supply</td>
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</tr>
<tr>
<td>7 Towns (Kuajok, Rumbek, Torit, Yambio, Bentiu, Aweil and Bor)</td>
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<tr>
<td>50 small towns water supply project</td>
<td></td>
<td></td>
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<tr>
<td>Urban towns rehabilitation program</td>
<td></td>
<td></td>
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<tr>
<td>Urban sanitation</td>
<td></td>
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<tr>
<td>Upgrading waste stabilization ponds in Juba</td>
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<td>Waste treatment systems for 9 state capitals</td>
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<tr>
<td>Institutional sanitation facilities for towns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household sanitation program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source: Estimate by authors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Given the large investment requirement for implementing this program, sequencing the components of the plan is critical. As depicted in Table 9.14, the immediate priorities are fourfold: (i) undertaking reform studies and implementing recommended measures to bring urban water entities into healthy financial situation; (ii) strengthening training institutions and state water and sanitation directorates (iii) moving quickly to rehabilitate the urban and small town water supply and sanitation systems and (iv) rolling out community awareness programs on hygiene education and improved sanitation facilities. With a systematic implementation of these critical components of the program in the next three to four years, this program expects accelerated and sustainable delivery of water supply and sanitation services in the decade ahead.
Since 2005, a number of water and sanitation programs and projects were implemented in South Sudan with the support of donors and NGOs. The government of South Sudan along with the support of donors and NGOs implemented a number of water and sanitation programs. UNICEF plays a key role in coordinating and supporting a large rural water supply and sanitation program as well as in building the capacity of states and counties. An estimated 20 NGOs are actively engaged in rural and small town water supply and sanitation programs. Notable among them are PACT, SNV, MEDAIR and OXFAM. While a list of programs implemented by NGOs in various states couldn’t be obtained during the preparation of this report, Table 9.16 shows a list of major development partners active in the water and sanitation sector in the country.

### 9.6.3 Funding Arrangements for the Program

Since 2005, most rural water supply and sanitation projects have been implemented by NGOs as emergency humanitarian assistance. The Multi Donor Trust Fund (MDTF) supports close to 50% of the total funding for water supply and sanitation sector and has so far committed $60 million to the sector. The Basic Services Fund (BSF) committed $15 million to rural water supply and sanitation activities. UNICEF, USAID, JICA, GIZ and the Egyptian Government also supported the water supply and sanitation sector. A critical concern in the decade ahead is the two major donors in the water and sanitation sector i.e. MDTF and BSF are phasing out their intervention in 2012. This has been manifested by very little commitment for 2012-13. Hence, concerted efforts are necessary to engage all partners to support the sector.

#### Table 9.16: List of major donors active in the water sector in South Sudan

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<th></th>
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</thead>
<tbody>
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<td>MDTF</td>
<td>Rural and urban water supply and sanitation, capacity building etc.</td>
<td>2007-2012 (phases I &amp; II)</td>
<td>$60.0</td>
<td>9.30%</td>
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<td>BSF</td>
<td>Rural and urban water supply and sanitation, capacity building etc</td>
<td>2010-2011</td>
<td>$14.3</td>
<td>56.80%</td>
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<td>USAID</td>
<td>Rehabilitation of urban water supply and capacity building</td>
<td>2009-2013</td>
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<td>GIZ</td>
<td>Urban water supply and sanitation, capacity building</td>
<td>2009-2013</td>
<td>$16.0</td>
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<tr>
<td>JICA</td>
<td>Urban water supply and capacity building</td>
<td>2010-2014</td>
<td>$50.0</td>
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<tr>
<td>SDC (Switzerland)</td>
<td>Capacity building (Northern Bahr el Ghazal state)</td>
<td>2010-2013</td>
<td>$4.8</td>
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<tr>
<td>UNICEF</td>
<td>Capacity building &amp; rural water supply &amp; sanitation</td>
<td>2010-2013</td>
<td>$34.2</td>
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<td></td>
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<tr>
<td>FRANCE</td>
<td>Urban Water Supply</td>
<td>2011-2014</td>
<td>$8.4</td>
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<td></td>
</tr>
<tr>
<td>Govt. of Egypt</td>
<td>Small towns water supply</td>
<td>2007-2013</td>
<td>$26.0*</td>
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</tr>
</tbody>
</table>

*Includes water resources programs

Source: Estimate by authors

Since 2005, most rural water supply and sanitation programs have been implemented by NGOs as emergency humanitarian assistance. The Multi Donor Trust Fund (MDTF) supports close to 50% of the total funding for water supply and sanitation sector and has so far committed $60 million to the sector. The Basic Services Fund (BSF) committed $15 million to rural water supply and sanitation activities. UNICEF, USAID, JICA, GIZ and the Egyptian Government also supported the water supply and sanitation sector. A critical concern in the decade ahead is the two major donors in the water and sanitation sector i.e. MDTF and BSF are phasing out their intervention in 2012. This has been manifested by very little commitment for 2012-13. Hence, concerted efforts are necessary to engage all partners to support the sector.

As discussed earlier, the proposed water supply and sanitation program seeks estimated total expenditures

### Funding Arrangements

Since 2005, a number of water and sanitation programs and projects were implemented in South Sudan with the support of donors and NGOs. The government of South Sudan along with the support of donors and NGOs implemented a number of water and sanitation programs. UNICEF plays a key role in coordinating and supporting

<table>
<thead>
<tr>
<th>Projected</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>2012</td>
</tr>
<tr>
<td>2013</td>
<td>2014</td>
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<tr>
<td>2015</td>
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</tr>
<tr>
<td>2019</td>
<td>2020</td>
</tr>
<tr>
<td>2011-20</td>
<td>2011-20</td>
</tr>
</tbody>
</table>

### Urban Water Supply

| Juba, Wau & Malakal distr. Rehab | 3.80 | 4.80 | 8.60 |
| Juba, Wau & Malakal project     | 20.00 | 20.00 | 20.00 | 20.00 | 50.00 | 80.00 | 80.00 | 330.00 |
| 7 Towns (Kiaj, Rumbek, Torit, Yambio, Bentui, Aweil and Bor) | 5.00 | 22.00 | 40.00 | 50.00 | 60.00 | 60.00 | 60.00 | 297.00 |
| 50 small towns water supply     | 2.00 | 2.00 | 2.00 | 2.20 | 6.00 | 2.52 | 9.00 | 1.39 | 4.06 | 31.17 |
| Urban towns rehabilitation      | 4.00 | 4.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 43.00 |
| Sub Total                       | 29.80 | 30.80 | 32.00 | 49.20 | 71.00 | 77.52 | 124.00 | 146.39 | 149.06 | 709.77 |
| Rural sanitation program        | 11.01 | 11.48 | 13.82 | 17.27 | 17.65 | 23.51 | 24.18 | 24.82 | 29.11 | 172.84 |
| Sub Total                       | 11.01 | 11.48 | 13.82 | 17.27 | 17.65 | 23.51 | 24.18 | 24.82 | 29.11 | 172.84 |

### Urban Water Supply

| Waste stabilization ponds in Juba | 3.00 | 5.00 | 8.00 |
| Waste treatment (9 towns)        | 4.50 | 13.00 | 15.00 | 11.00 | 3.50 | 47.00 |
| Instit. sanitation facilities for towns | 1.00 | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 15.00 |
| Household sanitation program     | 38.74 | 42.02 | 40.92 | 40.48 | 49.25 | 52.85 | 55.35 | 60.64 | 63.43 | 68682417.28 |
| Sub Total                        | 39.74 | 46.02 | 46.92 | 42.48 | 55.75 | 67.85 | 72.35 | 73.64 | 68.93 | 513.68 |
| Grand Total                      | 69.39 | 155.10 | 157.48 | 155.40 | 167.64 | 173.69 | 214.78 | 270.03 | 284.96 | 293.10 | 1941.56 |

Source: Estimate by authors

### Rural Sanitation Program

| MDTF Rural and urban water supply and sanitation, capacity building etc. | 2007-2012 (phases I & II) | $60.0 | 9.30% |  | |
| BSF Rural and urban water supply and sanitation, capacity building etc | 2010-2011 | $14.3 | 56.80% |  | |
| USAID Rehabilitation of urban water supply and capacity building | 2009-2013 | $25.0 |  | 14.60% | |
| GIZ Urban water supply and sanitation, capacity building | 2009-2013 | $16.0 |  |  | |
| JICA Urban water supply and capacity building | 2010-2014 | $50.0 |  |  | |
| SDC (Switzerland) Capacity building (Northern Bahr el Ghazal state) | 2010-2013 | $4.8 |  |  | |
| UNICEF Capacity building & rural water supply & sanitation | 2010-2013 | $34.2 |  |  | |
| FRANCE Urban Water Supply | 2011-2014 | $8.4 |  |  | |
| Govt. of Egypt Small towns water supply | 2007-2013 | $26.0* |  |  | |
of $1.94 billion. Table 9.17 sets out indicative financing strategy for the program period. About 70% of the $150 million required for capacity building and analytical studies will be financed by donors with the remaining 30% will be met by the Government.

### Table 9.17: Indicative Funding of expenditure for the water & sanitation sector

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</table>

Source: Estimate by authors

The program recommends about $990 million for the water program. About 40% or $396 million estimated for the rural and urban water supply component of the program will be covered by the Government while the balance $ 594 million is expected to be met by donors. The Government’s policy on household sanitation services states that costs of household sanitation facilities will be borne by individual households. As discussed elsewhere in this report, on site sanitation facilities will continue to dominate the type of sanitation facilities during the program period. This report puts the costs of rural and urban sanitation facilities for households at $96 million. For the purposes of this report, about 90% of these costs amounting to $554 million will be borne by individual households while the balance of $62 will be equally shared between donors and government. In addition, low cost waste treatment facilities will be constructed in all the ten state capitals as well as public sanitation facilities in most towns for an estimated cost of $70 million. While the Government will meet 10% of these costs amounting to $7 million, the balance $63 million will be covered by donors.

#### 9.7 Maintenance Programs for Water Supply and Sanitation

Insufficient emphasis towards periodic maintenance of water and sanitation facilities has been the principal cause for the deterioration of more than 4,000 water points and an even greater number of sanitation facilities. Poor maintenance practices will also continue to shorten the life span of most functioning facilities. In particular the problem of sustainability is crucial in rural water supply services where quite often management and maintenance of rural water supply facilities is left for Water Management Committees. The assumption that villagers can maintain pumps having established a water committee and received some training has been widely discredited in recent years. While the principle of decentralizing such responsibilities is commendable, often these committee members are not equipped with the necessary training and tools and don’t get any backstopping services from the water sector institutions. In addition, water fees collected from users in rural areas is not sufficient to meet operation and maintenance costs of water supply schemes. The willingness and affordability at the current stage is also too low. While more works will be necessary to aware the community on their responsibilities and allowing some time for improvement of resources, this report strongly recommends establishing a Rural Water Supply Maintenance Trust Fund at the national level to provide the necessary support for operation and maintenance of facilities in the rural areas. It should also be noted that without adequate funds for Operation and Maintenance (O&M) of assets, the upcoming large scale program will simply result in a very high percentage of mal-functioning and inoperable schemes within only a few years. Thus, the Trust Fund will play a paramount role in the interim period of at least 4-5 years until the states and communities manage to fully cover the operation and maintenance costs of the systems. Initially, each State will be requested to prepare a business plan and indicate the financial gaps needed for O&M costs of facilities. It will also enter into a commitment to take over full responsibilities beyond the Trust Fund’s operational period.

Detailed information on the current level of O&M expenses couldn’t be obtained at the time of drafting this report. Rough estimates obtained from two states indicate that annual routine maintenance and rehabilitation costs average about $350,000 per state per year. As the bulk of these costs will be expenditures for rehabilitation works, this report assumes that annual routine maintenance costs will not exceed $50,000 per state per year indicating the severity of the problem. Where the SSUWC is responsible for operating urban towns (Juba, Wau, Malakal and Renk) reports indicate total expenditure on routine maintenance to be $ 1.5 million per year. As revenue is not ring. funded in the urban towns, the Government allocates budget to cover operation and maintenance costs.

In determining annual routine maintenance costs for the decade ahead, the value of the capital stock of urban and rural water and sanitation infrastructure has been calculated. For the purposes of this report, an estimated 4% of the capital stock has been considered in determining routine maintenance expenditure. Table 9.18 indicates the required maintenance outlays for the decade ahead. On the basis of the available information, actual expenditure for routine maintenance costs of urban water supply services is estimated at 30% of the required amount while in rural areas, less than 10% of the required amount has been allocated for the same year. For the purposes of this report, annual routine maintenance expenditure for urban and rural water supply services is put in the range of $20 million a year. It is projected that expenditures for urban and rural water supply will reach $45 million by 2020. Also routine maintenance expenditures for sanitation facilities will rise from $8 million to about $27 million by 2020.
9.8 Management of Risks and Uncertainties

Implementation of the proposed water and sanitation program is vulnerable to a number of risks which in turn calls for the design of appropriate mitigating measures. These risks mainly emanate from i) poor water governance ii) securing adequate financing resources iii) ensuring sustainability of water and sanitation schemes iv) provision of construction materials and skilled manpower v) security and political stability.

9.8.1 Water Governance

Water governance poses a major risk towards the successful implementation of the envisaged program. As proven in many African countries, where strong policy and regulatory frameworks are adopted and strong political commitment is demonstrated, accelerated and sustainable delivery of water supply and sanitation is ensured. Management of such a large investment calls for the availability of adequate and qualified human resources with extensive experience in design, supervision and operation of water and sanitation schemes. It also requires setting up suitable policies and regulations. Essential guidelines on procurement, financial management and M&E are also critical for the successful implementation of the program. Weak institutional and human resources capacity is a major threat towards attaining the goals set in the program. Central to the success of urban water supply and sanitation service delivery is also the Government’s readiness to implement the recommendations of the reform study on the South Sudan Urban Water Corporation and delineation of service provision as well as regulatory responsibilities among line ministries and state Governments. To avert these risks, the program recommends a series of measures such as implementation of training program and provision of technical support mainly at the state water and sanitation directorate levels as a matter of high priority.

9.8.2 Mobilization of Investment

As discussed in this report, the proposed program for delivery of sustainable water and sanitation service calls for capital outlays of about $2 billion. Given the large number of competing sectors such as education, health and other infrastructure services that are much needed for South Sudan, there is a risk of securing sufficient public funds for the water and sanitation component of the program. In addition, the global economic crisis is a major threat that could contribute to reduced flow of funds mainly by donors.

9.8.3 External and Internal Conflicts

One of the major risks of the proposed program is ensuring stability within the country and along its borders. In particular, the success of the rural water supply and sanitation component of the program entails a series of interactions with communities often located in remote areas. Conflicts hamper the smooth progress of the implementation plan and due care will be taken prior to implementation of specific projects. Accordingly cultural and traditional beliefs as well as potential sources of conflicts will be assessed and built into the design of the planning process.
10.1 Current Status of Communications Services and Infrastructure

Telecommunications has been recognized as the fastest growing sector in South Sudan with liberalization and competition leading to growth in the coverage area. While mobile network connectivity continues to grow, a key component to propel ICT growth in South Sudan—the national broadband backbone is lacking. On the other hand, for information dissemination, the mass media environment in the country is liberal with the right to expression enshrined in the Transitional Constitution of South Sudan 2011.

In order to further integrate as a sovereign nation, the country has already obtained its own international dialing code, +211, by the International Telecommunication Union (ITU)\(^{114}\) and its own internet domain, .ss, by the International Organization for Standardization (ISO).\(^{115}\) Attribution of an ISO country code is not only essential for Internet top level domain names (ccTLD), but without one, a country cannot have a currency code or issue machine-readable passports or facilitate international financial and banking transactions. The 211 dialing code and .ss domain are fully operational as this was a priority area of action by the Government. The Ministry of Telecommunication and Postal Services announced 15 December 2011 as the deadline for changeover from the Sudan 249 code to the 211 code.\(^{116}\) In addition, the Ministry has applied for membership to the Universal Postal Union (UPU) which will also enable the country to receive and send mail internationally.

10.1.1 Policy and Institutional Arrangements for the ICT Sector

There are two policies guiding operations in the ICT sector; namely, the Telecommunications and Postal Services Sector Policy, Framework and Work Plan 2008, and the Ministry of Information and Broadcasting Organization Bill of 2008. The ICT sector is governed by the Ministry of Telecommunications and Postal Service (MoTPS) as well as the Ministry of Information and Broadcasting (MoIB). Both ministries provide policy direction and perform regulatory functions. Annex 11 presents the detailed list of functions for each Ministry.

In the case of MoTPS, government will act as a facilitator, enabler and regulator of the ICT sector so as to allow the private sector and civil society organizations to operate effectively in ICT policy formation and implementation.\(^{117}\) For this purpose, the Ministry will encourage all the interested parties to fully be involved in the following:

a) Participate in provision of universal service/access
b) Attract more private sector resources and foster partnership between private and public sectors;
c) Develop a sector with efficiency, credibility, commercial integrity and good corporate governance;
d) Provide quality and sustainable service with choices to consumers;
e) Keep abreast with and participate in developments in ICT within Africa and globally.


Private sector is expected to play a key role in development of physical infrastructure, human resource capacity, and in ICT services and production sector of the economy. Development partners will be sought to provide the financial assistance for implementation of the policy as well as to build capacity for sustainability. Support will also be sought for SME ICT-based business incubators especially in area of software development.

For a variety of reasons, the rules and regulations in place currently are not consistent across all the telecommunications operators in the country. The operators have different rules governing licenses and spectrum dues as well as investment incentives such as periods for tax breaks, etc. The prevailing situation does not provide a level playing field for all the operators and urgently needs to be redressed. This situation is partly due to the fact that some of the operators such as MTN Sudan and Zain have licences that were issued by the Sudan regulatory authority, National Telecommunications Corporation (NTC), while others such as Gsmtel and Vivacell have ‘regional’ licences issued by the Government of South Sudan (GOSS) permitting them to operate only in what was then Southern Sudan. This arrangement came about because under the Comprehensive Peace Agreement (CPA), the Government of South Sudan shared responsibilities for the telecommunications sector with the Government of National Unity (GNU).

The two ministries are currently working on new bills to share responsibilities for the telecommunications sector in South Sudan. The Ministry of Information and Broadcasting (MoIB) believes in facilitating freedom of expression and availing information to all South Sudanese whether within the country or in the diaspora. The ministry is finalizing three bills, namely the South Sudan Broadcasting Corporation Bill, 2011; the Media Council Bill, 2011; and The Right of Access to Information Act, 2011. The South Sudan Broadcasting Corporation Bill is intended to set up the South Sudan TV and Radio Broadcasting Services as an independent corporation funded by government (in a model similar to the BBC). The proposed SSBC will operate alongside the over 30 private FM stations operating nationwide whose proliferation has been encouraged by GOSS so as to facilitate the dissemination of information. The new bills are also proposing an Independent Broadcasting Authority (IBA) or Media Council, a Board of Directors for Public Broadcasting Corporation (BDPB), and a Commission of Rights of Access to Information (CRAI).

Institutional arrangements for the ICT sector. Regulation for the ICT sector is presently provided by the MoTPS and the MoIB – although the new bills under preparation by the Ministries do call for independent regulators. There is presently limited drive for a converged regulator that would handle both telecommunications and broadcasting sectors. Currently, the regulation function by the MoTPS is handled under the Directorate of Telecommunications. Within the directorate, they have also designated a Liaison Officer who is the direct link between the operators and the ministry. In MoIB, there are two offices responsible for radio and TV. The public Southern Sudan Radio and TV are under the Directorate of Southern Sudan Radio & TV while the private media stations are under the Director of Public Information. The two ministries do share responsibilities in the licensing of new media operators whereby the MOIB gives approvals, assesses and issues warrants of establishment, while the MoTPS controls the frequency allocations.

The regulatory situation in the comparator countries is presented in Table 10.1. Except for Eritrea, the other countries do have a regulator that is separate entity from the Ministry. Of note are factors that impact the independence of a regulator such as autonomy in decision making and self-financing of the regulator. Among the comparator countries, only Malawi makes information on its license agreements public. In addition, Malawi and Rwanda have a converged regulator handling both telecommunications and broadcasting sectors.

Figure 10.1 highlights the institutional arrangements for the ICT sector whereby regulation is currently provided by the Ministries. Regulatory functions at state levels are executed through the State Governments while matters related to taxation and revenue are handled by the Ministry of Finance. For example, the Ministry of Finance is responsible for assessment of custom duties and assessment and collection of taxes on equipment and services.

![Figure 10.1: Institutional Arrangements for the ICT Sector in South Sudan](source.png)

Source: Ministry of Telecommunications and Postal Services and Ministry of Information and Broadcasting

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10.1.2 ICT Infrastructure and Access

National ICT infrastructure. Currently there are five telecommunication operators including MTN Sudan, Zain, Sudani, Vivacell and Gemtel. Of these, Vivacell and Gemtel have been operating under ‘regional licenses’ that restricted their operations to the territory of South Sudan, while the other three operators have licenses permitting their operations over all parts of Sudan and South Sudan. A brief on the five operators is presented in Annex 11-A.

Figure 10.2 highlights the spread of the telecommunication operators via the number of points of presence they had in the ten states of South Sudan as of June 2011.118 MTN had added another 21 sites while Zain had added another 43 sites, as of August 2011. Together MTN and Zain have just over 60% of the currently available sites.

There is also uneven distribution of access to telecommunication services with respect to the population of South Sudan. For example, the three states of CES, Warrap and Jonglei representing the states with the most and the least number of telecommunication sites respectively have 13.4%, 11.8% and 16.4% of the population as of 5th Sudan Population and Housing Census, 2008. Clearly, the distribution of the presence of telecommunications points is generally under-matched with the population percentages in the various states as highlighted in Figure 10.3.

As can be observed from Figure 10.2, there is an uneven spread of telecommunication services across South Sudan with the Central Equatorial State (CES) having the largest number of sites at 104 (30%) and on the other hand, Warrap and Jonglei having only 15 (4%) sites each. Even with the states, the distribution of sites among the counties remains uneven with Juba and Yei having 67 (64%) and 21 (20%) of the 104 sites in the CES, respectively. The other counties with relatively high number of sites are Renk with 27 (40%) sites in Upper Nile and Wau with 22 (69%) sites in Western Bahr el Ghazal (WBG).

Figure 10.3: Trend of PoPs with Population Percentage in South Sudan States

Source: South Sudan National Bureau of Statistics

118 MoTPS Telecommunications Companies Outreach Data as of June 2011
Regional ICT infrastructure. Overall, an estimated 21,000 kilometers is needed to provide a reasonable degree of integration across Africa and plug the missing links\textsuperscript{119}. At regional level, South Sudan currently does not have any intra-regional fiber optic backbone connectivity, as highlighted in Map 10.1. As a landlocked country, regional connectivity would enable South Sudan access to submarine cables which, in turn, would facilitate a reduced cost in ICT access as well as increased international bandwidth (compared to what is currently available via satellite). International and Internet charges for countries without access to submarine cables can easily be twice as high as those that do have access to submarine cables.

In the past decade or so, the African continent has benefited from the arrival of a number of undersea fibre optic cables that facilitate the delivery of broadband access. Map 10.2 highlights the fibre optic cables currently available on the coastline, from which it can be observed that South Sudan has opportunities to link to the cable through Kenya, Ethiopia or Sudan. Currently, of the four options to obtain access to submarine cable, namely through Kenya, Uganda (and through Kenya), Ethiopia or Sudan, the preferred option for South Sudan in the short-term seems to be to connect via Lokichoggio in Kenya. One of the major operators has indicated preference via Ethiopia and onward to Djibouti. In the long-term, it is prudent to have multiple access points to the undersea cables as this will enhance the resilience of South Sudan’s broadband network and promote competition among service providers.

Selected indicators on ICT infrastructure and access. The national and regional infrastructure required to provide adequate ICT access consists of (i) strategic information systems necessary for sustainable economic development such as education, health, public financial management, and transportation, and (ii) broadband telecommunications networks, and computer hardware and software.\textsuperscript{120} The core ICT indicators used in this Report are developed by the Partnership on Measuring ICT for Development\textsuperscript{121}, and can be broadly classified in two types:\textsuperscript{122}

- indicators where a higher value implies a better situation in terms of ICT infrastructure and access development
- tariff indicators where a lower value usually indicates a better situation

Table 10.2 highlights selected indicators on infrastructure and access. From the available statistics on South Sudan, it is clearly a case of very limited ICT infrastructure and access – even when South Sudan is assessed against the comparator countries.

Table 10.2: Selected Indicators on ICT Infrastructure and Access

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Year</th>
<th>Burkina Faso</th>
<th>Burundi</th>
<th>Eritrea</th>
<th>Malawi</th>
<th>Niger</th>
<th>Rwanda</th>
<th>Sub-Saharan Africa\textsuperscript{a}</th>
<th>Developing Countries\textsuperscript{a}</th>
<th>South Sudan 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Telephone lines per 100 inhabitants</td>
<td>2010</td>
<td>0.9</td>
<td>0.4</td>
<td>1</td>
<td>1.1</td>
<td>0.5</td>
<td>0.4</td>
<td>1.4</td>
<td>11.6</td>
<td>0.11\textsuperscript{b}</td>
</tr>
<tr>
<td>Mobile cellular telephone subscriptions per 100 inhabitants</td>
<td>2010</td>
<td>34.7</td>
<td>13.7</td>
<td>3.5</td>
<td>20.4</td>
<td>24.5</td>
<td>33.4</td>
<td>33</td>
<td>53</td>
<td>78.8</td>
</tr>
<tr>
<td>Mobile subscribers in 2010 (% of total telephone subscribers)</td>
<td>2010</td>
<td>97.6</td>
<td>97.2</td>
<td>77.4</td>
<td>95</td>
<td>97.8</td>
<td>98.9</td>
<td>12\textsuperscript{c}</td>
<td>125</td>
<td>12\textsuperscript{c}</td>
</tr>
<tr>
<td>Mobile subscribers in 2006 (% of total telephone subscribers)</td>
<td>2006</td>
<td>90.1</td>
<td>86.5</td>
<td>62</td>
<td>81.8</td>
<td>93.8</td>
<td>94.2</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Fixed internet per 100 inhabitants</td>
<td>2009</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.75\textsuperscript{c}</td>
<td>0.03\textsuperscript{c}</td>
<td>1.4</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Internet users per 100 inhabitants</td>
<td>2010</td>
<td>1.4</td>
<td>2.1</td>
<td>5.4</td>
<td>2.3</td>
<td>0.8</td>
<td>7.7</td>
<td>12.8</td>
<td>26.3</td>
<td>26.3</td>
</tr>
<tr>
<td>Fixed broadband and Internet subscribers per 100 inhabitants</td>
<td>2010</td>
<td>0.08</td>
<td>0</td>
<td>0</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
<td>0.2</td>
<td>4.8</td>
<td>4.8</td>
</tr>
<tr>
<td>International Internet bandwidth (capacity that backbone operators provide to carry Internet traffic) per inhabitant (bits/second/inhabitant)</td>
<td>2005</td>
<td>16.39\textsuperscript{d}</td>
<td>0.55</td>
<td>1.72\textsuperscript{d}</td>
<td>2.38</td>
<td>2.33</td>
<td>2.75\textsuperscript{d}</td>
<td>3.03\textsuperscript{d}</td>
<td>3.03\textsuperscript{d}</td>
<td></td>
</tr>
<tr>
<td>Percentage of the population covered by a mobile cellular telephone network</td>
<td>2006</td>
<td>60.3</td>
<td>60</td>
<td>50</td>
<td>93\textsuperscript{d}</td>
<td>45</td>
<td>90\textsuperscript{d}</td>
<td>60\textsuperscript{d}</td>
<td>60\textsuperscript{d}</td>
<td></td>
</tr>
</tbody>
</table>

Source: World Bank Data – Africa Infrastructure, ITU World Telecommunication/ICT Indicators Database, AICD 2011, South Sudan Ministry of Telecommunication and Postal Services. Notes: No data available, \textsuperscript{1} – 2005 Data, \textsuperscript{2} – 2006 Data, \textsuperscript{3} – 2007 Data, \textsuperscript{4} – 2008 Data, \textsuperscript{5} – 2009 Data, \textsuperscript{6} – 2010 Data, \textsuperscript{7} – 2011 Data, \textsuperscript{8} – 2011 Estimate.

Limited infrastructure in the country is compounded by the relatively high tariffs associated with ICT services.


\textsuperscript{121} The core ICT indicators have been developed with the main purpose of producing high-quality and internationally comparable data on information and communication technology. The tables have some missing data which further emphasizes the need to gather more information on the status of ICT in South Sudan as most of the ICT-related information is aggregated with that of Sudan.

services. With 50.5% of the country’s population living on less than US$32 per month, ICT services are generally unaffordable (requiring more than 50% of the monthly income) – by similarity with costs in the six comparator countries. Indeed, for example, Zain charges about SDG 250 for the modem and SDG 50 per month128 for a 2 GB connection.129 These charges are about the same for Vivacell and MTN. Depending on specifications, the costs for internet access via satellite options such as Very Small Aperture Terminals (VSATs) range from $500 and $4,000 a month.

### Table 10.3: Selected Indicators on ICT Tariffs in Comparator Countries

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Year</th>
<th>Burkina Faso</th>
<th>Burundi</th>
<th>Eritrea</th>
<th>Malawi</th>
<th>Niger</th>
<th>Rwanda</th>
<th>South Sudan</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-minute call in $</td>
<td>2007</td>
<td>0.2</td>
<td>0.06</td>
<td>0.03</td>
<td>0.2</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local telephone call during peak time</td>
<td>2007</td>
<td>1.2</td>
<td>2.4</td>
<td>3</td>
<td>1.9</td>
<td>1.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>International telephone call to the USA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Charges in $</td>
<td>2007</td>
<td>50.71</td>
<td>9</td>
<td>8.6</td>
<td>48.35</td>
<td>45.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection fee for residential telephone service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly fee for residential telephone service</td>
<td>2007</td>
<td>5.07</td>
<td>0.4</td>
<td>0.7</td>
<td>7.28</td>
<td>1.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed telephone monthly price basket</td>
<td>2007</td>
<td>12</td>
<td></td>
<td>1.67</td>
<td>12.64</td>
<td>7.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile prepaid tariffs per month in $</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile price basket as a percentage of per capita income</td>
<td>2007</td>
<td>38.65</td>
<td>138.15</td>
<td>91.53</td>
<td>50.54</td>
<td>64.11</td>
<td>54.27</td>
<td></td>
</tr>
<tr>
<td>Internet access charges in $</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet access tariffs per month in $ (20 hour Internet basket)</td>
<td>2006</td>
<td>75</td>
<td>52</td>
<td>29.33</td>
<td>52.66</td>
<td>51.21</td>
<td>84.57</td>
<td>24.01</td>
</tr>
<tr>
<td>Internet basket as a percentage of per capita income</td>
<td>2006</td>
<td>195.76</td>
<td>624</td>
<td>160</td>
<td>371.71</td>
<td>236.37</td>
<td>405.94</td>
<td></td>
</tr>
</tbody>
</table>

Source: World Bank Data – Africa Infrastructure, ITU World Telecommunication/ICT Indicators Database


123 Equivalent to US$880 for the modest and US$1701 for the subscription


126 World Bank. South Sudan Statistics Database.


129 Th e use of computers and the Internet requires at least a minimal level of literacy and the ability to retrieve and process information.

130 Th e availability of ICT to households is limited, as is the extent of use of ICT by individuals. Th e use of ICT by individuals is based on households’ membership. However, there is a reference indicator on access to electricity by household.

131 Th e ICT access refers to the availability of ICT within the home, while the use of ICT refers to the use of ICT by one or more individuals of the household, whether at home or elsewhere.

In addition to infrastructure, access by users is affected by factors such as high prices that prevent the public from accessing ICT services as well as quality of service of ICT services which affects users’ willingness to pay for them. Th e use of computers and the Internet requires at least a minimal level of literacy and the ability to retrieve and process information. Th e availability of ICT to households is limited, as is the extent of use of ICT by individuals. Th e use of ICT by individuals is based on households’ membership. However, there is a reference indicator on access to electricity by household.

In assessing the ICT sector, it is important to consider both the supply and demand affecting the sector. Sustainable development of the ICT sector requires both an enabling environment for supply-side growth in terms of access to networks and services as well as demand for and adoption of ICT services by the users.

#### Figure 10.4: Literacy Rates among Males and Females in South Sudan and SSA (2008)

In addition to literacy, there is the need for basic and advanced ICT skills so as to spur demand. Established in 2009, the College of Computer Science and IT at the University of Juba is currently offering degree and diploma programs in computer science, information technology, and computer networks. Th e university also offers short courses to the public and to government institutions. In addition, the Ministry of Telecommunications and Postal Services has plans for an ICT Institute to provide ICT training particularly for government’s human resources.

Selected indicators on access and use of ICT by households and individuals. Th ere are twelve core indicators on access to, and use of, ICT by households and individuals. Of these, six are on household access to ICT and six are on the use of ICT by individuals (i.e. household members). Th ere is also a reference indicator on access to electricity by households. ICT access refers to the availability of ICT within the home, while the use of ICT refers to use of ICT by one or more individuals of the household, whether at home or elsewhere.
Table 10.4: Status of Access to and Use of ICT by Households and Individuals in Comparator Countries

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Year</th>
<th>Burkina Faso</th>
<th>Burundi</th>
<th>Eritrea</th>
<th>Malawi</th>
<th>Niger</th>
<th>Rwanda</th>
<th>South Sudan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of households with a radio</td>
<td>2009</td>
<td>69.5</td>
<td>66</td>
<td>43</td>
<td>45.8</td>
<td>24.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of households with a TV</td>
<td>2009</td>
<td>16.9</td>
<td>9</td>
<td>9.9</td>
<td>23</td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of households with a telephone</td>
<td>2009</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of household with a fixed telephone</td>
<td>2008</td>
<td>2.7</td>
<td></td>
<td>1.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of household with a mobile cellular telephone</td>
<td>2008</td>
<td>21.6</td>
<td></td>
<td>31.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of households with a computer</td>
<td>2008</td>
<td>1.6</td>
<td></td>
<td>0.4</td>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of individuals who used a computer in the last 12 months</td>
<td>2008</td>
<td></td>
<td></td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal computers per 1,000 inhabitants</td>
<td>2005</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Proportion of households with Internet access</td>
<td>2008</td>
<td></td>
<td></td>
<td></td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of individuals who used a Internet in the last 12 months</td>
<td>2008</td>
<td></td>
<td></td>
<td></td>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Figure 10.5 shows that variation among the states in terms of access to ICT by households. Except for Unity State, the dominant ICT tool available to households is the radio – a typical finding in low income developing countries. By comparison, in 2009, 77% of households globally had a television set while 34% households had a computer.129

10.1.4 Status of ICT-enabled Services in South Sudan

Increasingly in Africa, mobile phones and applications are becoming a key player in the arena of ICT-enabled services including such applications as mobile money, market information systems, weather forecasts/alerts. In the case of South Sudan, some services, such as mobile money are yet to be implemented – pending development of appropriate regulation according to informed sources. ICT-enabled services already available in South Sudan include:

- A videoconference facility via satellite has been piloted with an iDirect hub at the MoTPS and a link between Juba and one of the state capitals. The Ministry plans to make the same facility available at all state capitals. Already, a VSAT-based network links all the state capitals and Juba.
- The Ministry of Internal Affairs is developing a National Identification System.
- An Electronic Record Management system has been piloted in the Ministry of Cabinet Affairs.
- The Sudan Vote Monitor website enabled the public to monitor and report on the April 2011 national elections via SMS, email or the web.

ICTs in education. ICTs have also been used in the field of education – where a mix of old and new ICTs have been deployed, i.e. radio, MP3 players, computers, etc. ICTs are known to have a positive impact on increasing opportunities for education and for lifelong learning. In November 2005, the Multi-Donor Trust Fund (MDTF) gave the first disbursement of $20 million to the GOSS for the rebuilding of health and education services.130 A significant investment is required for the education system in South Sudan - only 1,600 schools exist for the 1.6 million children of school age, only 10% of the classrooms are in permanent buildings, 80% of the children have no bench to sit on and only one-third of the schools have access to latrines and half have access to safe clean water.131

In spite of the seemingly dire situation, there are still initiatives that seek to take advantage of the use of ICTs in education. These include the use of radio and the use of computers. The Southern Sudan Interactive Radio Instruction (SSIRI) is program of the Ministry of Education, Science and Technology132 that focuses on the effective use of radio for delivering high-quality education programs to children, youth and adults.133 Administered by the Education Development Centre (EDC), it is funded by the United States Agency for International Development (USAID): SSIRI broadcasts three major programs on FM radio stations throughout Southern Sudan, namely:

- Primary Education – The Learning Village that consists of half-hour programs in English, local language

131 GOSS Ministry of Labour, Public Service and Human Resource Development.

Source: South Sudan National Bureau of Statistics

Figure 10.5: Status of Access to ICT by Households by States in South Sudan

Source: South Sudan National Bureau of Statistics

In recognition of the energy challenges, SSIRI provides participating schools and adult learning centres with solar-powered and wind-up radios. SSIRI outreach coordinators train teachers on how best to use and care for the radios and how to integrate the radio programs into the school day. For areas that are out of the coverage range of the FM stations, SSIRI makes the programs available via digital devices such as MP3 players and boom boxes — whereby solar panels or wind-up devices are used to recharge the batteries. In addition, to further strengthen teacher education programs, SSIRI is implementing computer centres that have Internet access and video production equipment.


10.2 Expanding Access to Communications

It is widely accepted that the ICT sector, including ICT infrastructure and ICT-enabled services, has a key role to play as a driver of economic and social development. A 2009 World Bank econometrics analysis of 120 developed and developing countries showed, for example, that there is an increase in economic growth of 1.3 percentage points for every 10-percentage-point increase in the penetration of broadband services.138 Because a broadband network has the potential to contribute so much to economic development in South Sudan, it should be widely available at affordable prices and should become an integral part of national development strategies. The regional and national infrastructure required to provide adequate access in the information age consists of: 139

- Strategic information systems necessary for sustainable economic development such as education, health, public financial management, and transportation infrastructures.
- Broadband telecommunications networks, and computer hardware and software.

10.2.1 Key Challenges Facing the ICT Sector in South Sudan

South Sudan faces a number of well known challenges for the development of its ICT sector and expanding access to communications, including:

- Lack of access to infrastructure
- Lack of energy sources for users and for powering up the ICT infrastructure
- Expensive communication infrastructure
- High tariffs associated with ICT services and applications.

In addition, as a newly formed country, South Sudan has unique challenges to address including the launch of its own country code and its own domain name. While preparations for management of the new .ss domain are still underway, a plan to migrate to its own country code is underway. All the telecommunications operators have noted that they were on course with the necessary hardware and software configurations required to start offering services under the South Sudan code of +211. On top of the equipment requirements, this exercise is expected to include procurement and delivery of new SIM cards, training of agents to support users swap cards and mobilisation of users to swap cards. All operators indicated that they would meet the costs for this exercise, which was estimated to range from half a million to about US$2 million. Furthermore, the telecommunications operators identified a number of challenges for their operations in South Sudan. Key challenges identified by the operators can be classified broadly as infrastructure, regulatory and financial.

Infrastructure. The key concerns about infrastructure are as follows:

- Need for a fibre optic national backbone as the country currently relies on a combination of microwave and expensive satellite links to provide nationwide coverage.
- The broadcasting sector currently relies primarily on satellite communications to transmit radio and TV signals to the Diaspora and the local audience as well. Via satellite, South Sudan TV is available to the local audience and the Diaspora in Africa, Middle East, Western Europe, North America and Australia. However, not all the local audience has access to satellite receivers and yet the terrestrial radio and TV transmissions do not cover the entire South Sudan territory. If the national backbone were in place, this would also serve the purpose of transmitting radio and TV. The terrestrial infrastructure would also facilitate the expansion of coverage of public TV and radio service nationally.

- A number of companies (over 20) have offered solutions to the South Sudan National Backbone. GOSS requires technical assistance in order to evaluate the options being offered.
- Poor quality of service and unreliability of phone service (a development worker noted that they still maintain a satellite phone as backup).
- Lack of other basic infrastructure, in particular, roads that are necessary in order to reduce the currently very high operational costs, and energy to run their equipment and services.

Regulation. Key concerns about the regulatory environment are as follows:

- Revision of license may have a significant adverse impact on existing investments – and so existing operators would like minimal change from the status quo.
- Need for fair and level-playing ground for the enabling environment and for actions by the regulator.
• Comprehensive development of ICT-enabled services including mobile banking – for which regulation is required – and which would drive access and usage of their networks.

• Clear quality of service parameters against which ICT services can be measured. Currently all operators noted that they do meet internationally accepted key performance indicators; however, MoTPS does not have the capacity to make independent assessments.

• The regulator/MoTPS lacks spectrum management capacity and hence cannot adequately address complaints related to signal interference.

Financial: The key financial concerns are as follows:

• Provision of services and equipment is done in USD and yet operators collect revenue in local currency. The exchange rate has been fluctuating rapidly posing a challenge for operators.

In comparing Figure 10.3 and Figure 10.7, one can observe that CES and Upper Nile which have a much higher proportion of telecommunication PoPs relative to the population, also have within them counties that have population densities above 50 people per square kilometer. However, population density is not the only determining factor as high-yielding economic activities (in case of low density population, but with high incomes) can also be a factor to incentivize operators to move into low-density areas. As indicated in Chapter 1, South Sudan has a population density of 13 people per square kilometer (see Map 1.3).


141 Government of South Sudan (2011), South Sudan Development Plan 2011–2013 (SSDP), envisions a key role for the ICT sector in the economic growth of the country. It also envisions economic benefits accruing to all South Sudanese from the use of ICTs in a variety of ways. These include Agricultural and Business Development Services that utilize ICT for enhanced market information and farmer/pastoralist association price negotiations, improved agricultural advisory services, and use of ICT for market and product information. As Table 1.8 in Chapter 1 indicates, in 2010 there were 97 businesses registered as providers of information and communication services in South Sudan (equal to 1.3% of total businesses registrations).

In its development plan, and as is typical for the ICT sector in other countries, the Government indicates its intention to limit intervention to those activities that the private sector is not able, or currently not willing, to engage in but which are of benefit to society. This calls for identifying the coverage gap within the ICT sector for which government will have the legitimate role in leading the supply and maintenance of public goods. As stated in the plan, GOSS plans to ensure that the provision and maintenance of public goods and services is done cost-effectively, sustainably, is based on value for money, and where appropriate will move towards cost-recovery for the services provided. The SSDP further recognizes that maintenance of public goods is a high priority as it is typically more cost effective to maintain existing infrastructure and services than it is to build new ones.

Development targets for South Sudan’s ICT infrastructure. The SSDP includes a number of targets for the Ministry of Telecommunications and Postal Services (MoTPS) as well as the Ministry of Information and Broadcasting (MoIB). In the short- term, over the period 2011–2013, the SSDP expects MoTPS, in collaboration with telecommunication operators and courier service providers, to increase coverage, access, usage and literacy of ICT and postal services across the country. The target number of counties with at least one base telecom station would rise from 61 to 79 (i.e., all counties to have at least one base station), and telecommunication exchange offices as well as opening of state offices from 4 to 12. The MoIB is expected to increase access to public media and improve the broadcasting quality of the South Sudan Radio and TV. The number of licenses is targeted to increase from 32 FM radio stations to 38, and newspapers to increase from 8 to 12. The number of states with radio relay stations is to increase from 0 to 10, and the average South Sudan TV broadcast time from 6 hours per day to 18. Fundamental to the successful deployment and utilization of ICT nationwide is reliable and affordable access to energy – a matter that is the subject of Chapter 8 of this Report.

For the purposes of this Report a series of objectives are set for the ICT sector for 2020. Achievement of these targets would bring South Sudan into line with many other Sub-Saharan countries and improve its regional and international competitiveness. These development targets take into account the Connect Africa Summit goals - which need to be achieved by 2015. The projections made here therefore are for the mid-term up to 2015 and for the long-term to be achieved by 2020. The projections take into account the following: (i) with peace, security and government commitment for the ICT, South Sudan has good potential to attract ICT investments; (ii) wireless access deployments will dominate the ICT infrastructure, even while it is expected that the infrastructure will include a combination of wireless, satellite and fibre optic networks; and (iii) demand initiatives including the use of e-government and m-government services will spur interest in use of the internet. Mobile computing devices including smart phones will encourage more use of the internet.
A combination of government interventions (e.g. a competitive enabling legal and regulatory environment, and universal access programs) and private sector initiative will lead to an increasing number of institutions making use of ICTs. This will include health/educational institutions being able to acquire internet access on their own with reducing costs of internet access as the South Sudan national backbone is rolled out.

In chartering the way forward for the decade ahead, the country would do well to align its framework with those of other African countries for the development of ICT in the region. This will not only enable national development, but enable such development in a manner that is consistent with regional objectives hence facilitating South Sudan's path towards regional integration.

Efficient infrastructure and related services have been recognized as important in pursuit of Africa's development goals, including regional integration. Conversely, inadequate ICT infrastructure and services result in increased production and transaction costs, which reduce competitiveness and make it more difficult to achieve Africa's development goals. Regional integration is also at the core of African Development Bank (AfDB)'s mandate and it has attached priority towards this since its establishment. Guiding frameworks for development of the ICT Sector in South Sudan are the Connect Africa Summit Goals and the 2010 Addis Ababa Declaration of the African Union on Information and Communication Technologies in Africa - Challenges and Prospects for Development. The need to strengthen ICT infrastructure was a key issue for the Connect Africa Kigali 2007 Summit whose primary aim was to mobilize the human, financial and technical resources required to bridge major gaps in ICT infrastructure across the continent. Improved ICT infrastructure is expected to support affordable connectivity and applications and services to stimulate economic growth, employment and development throughout Africa. The Kigali Summit endorsed five goals as highlighted in Box 10.1.

### Box 10.1: Connect Africa Summit Goals: Addressing Broadband ICT Infrastructure

#### Goal 1:
Interconnect all African capitals and major cities with ICT broadband infrastructure and strengthen connectivity to the rest of the world by 2012.

#### Goal 2:
Connect African villages to broadband ICT services by 2015 and implement shared access initiatives such as community tele-centres and village phones.

#### Goal 3:
Adopt key regulatory measures that promote affordable, widespread access to a full range of broadband ICT services, including technology and service neutral licensing/authorization practices, allocating spectrum for multiple, competitive broadband wireless service providers, creating national Internet Exchange Points (IXPs) and implementing competition in the provision of international Internet connectivity.

#### Goal 4:
Support the development of a critical mass of ICT skills required by the knowledge economy, notably through the establishment of a network of ICT Centres of Excellence in each sub-region of Africa and ICT capacity-building and training centres in each country, with the aim of achieving a broad network of inter-linked physical and virtual centres, while ensuring coordination between academia and industry by 2015.

#### Goal 5:
Adopt a national e-strategy, including a cyber-security framework, and deploy at least one flagship e-government service as well as e-education, e-commerce and e-health services using accessible technologies in each country in Africa by 2012, with the aim of making multiple e-government and other services widely available by 2015.

In line with the Connect Africa Goals, the strategies proposed to enhance South Sudan's ICT sector are consistent with general trends for developing countries as highlighted in Box 10.2.

### 10.2.3 Regulatory reform

Given its professed strategy of a private-sector led development of the ICT sector, it is imperative that the country offers an enabling environment that serves to promote private investment in the sector, while at the same time ensuring that these services are provided within an operating environment that promotes competition among providers. A clear regulatory regime would minimize uncertainty for current and potential investors in South Sudan as to its ICT investment climate and it would lower the perceived risks of investing in South Sudan. This is particularly important given the numerous other challenges facing development of the ICT sector including low population densities, a largely rural population, and very limited infrastructure such as roads and electricity supply.

### Box 10.2: Key Tools and Measures for Enhancing ICT Markets

| Regulatory reform | In particular, promotion of a level playing field, open access and fair competition for ICT investments and service provision, policies that entice new entrepreneurial investment in under-served areas |
| Universal Access and Service Funds (UASFs) | UASFs and other public finance mechanisms such as loan guarantees and public-private partnerships (PPPs) to enhance and target investments into priority areas in need of special finance |
| Fiscal measures | Enabling tax, tariff, import, and business regulation policies designed to reduce risks and financial burdens and provide incentives to ICT investors and financiers |
| Demand support and capacity building | Initiatives in e-governance, education and training, budget allocations within the public sector for ICT networking and service applications, as well as government pre-purchase of capacity through open tenders (i.e., the government commits to a medium-term contract with one or more providers to purchase capacity in bulk and hence becomes an anchor tenant, which lowers the risk to the private operator in building the infrastructure). Another measure of demand support and capacity building is open procurement plans that leverage ICT industry competition and private sector development |
| Regional investment | Support and promotion of domestic, regional and other South-South investments (e.g., mobile communications, software and systems houses emanating from emerging markets), and increased sub-regional and regional cooperation to address infrastructure and last mile gaps |

Following consultations with stakeholders in government, private sector and civil society, and based on observations, one of the key areas for regulatory intervention is the lack of an independent regulator and lack of a level-playing field for the current telecommunications operators.

Development of independent regulator. The position taken in this Report is that South Sudan can benefit from the creation of an independent regulatory authority for ICT services. International experience has indicated that introduction and strengthening of independent,
neutral sector regulation has helped to reinforce investor confidence and market performance, while enhancing consumer benefits, as noted by the UN Task Force on Financing ICT.144 An independent regulator should be free from political interference in its day-to-day or decision-to-decision operations, but the regulator should clearly understand that its role is to implement the policy of the government and only make decisions that are within its legal authority.

The regulatory functions required in South Sudan are typical of the most important duties of regulators, including:

- Implementing the authorization framework that provides opportunities for new companies and investors to establish ICT businesses. Simple authorization procedures tend to maximize new entry.
- Regulating competition (including tariffs) involving different types of telecommunication/broadcasting licenses and give simplified license formats with regulations on quality of service and other pertinent areas. The licensing regime should be so as to harmonize and level the playing field in South Sudan where operators seem to have significantly different terms of engagement in the country.
- Spectrum regulation and management: Identify options and develop regulatory recommendations so as to simplify the spectrum regulation and management regime in South Sudan, based on international best practices; identify the mechanism to make the spectrum also technology and service neutral; identify spectrum related issues and challenges for high speed data services such as JG, 4G and other broadband Sectors. In addition, there is need to establish a digital migration plan for South Sudan to comply with the international cut-off date of 2015 for analogue transmission.
- Quality of service (QoS): Conduct an analysis of QoS in the telecommunications sector; undertake a consultation with stakeholders to identify reasons for below-standard QoS as well as to identify mechanisms to improve QoS, identify ways to harmonize, clarify, and simplify the regulation of QoS in South Sudan.
- Tariff and competition regulation: Undertake an analysis of the existing competitive scenario, comparing especially market performance and indicators such as QoS and tariffs with regional peers and global benchmarks. Provide guidance on the optimal number of operators in different service markets, voice, data, broadband, etc.
- Numbering management: Numbers are a valuable resource in the ICT sector and hence the need to develop a numbering plan for the +211 code, and guidelines on how best to allocate for the number resources – taking regional experiences and international best practices into account. There is also need to consider option of charging for number resources as one of the mechanisms for financing the regulator.
- Regulatory strategy and related policy recommendations: Analyze the current telecommunications market situation, including support for rollout of services in rural and underserved areas.
- Licensing of services: Define the terms and conditions for different types of telecommunication/broadcasting licenses and give simplified license formats with regulations on quality of service and other pertinent areas.
- Prioritize as well as the perceived value attached to the domain name; (ii) promote the utilization of the .ss name space, and (iii) facilitate articulation of the views of South Sudan relating to internet use, at both local and international fora.

There is a broad range of models for management of the .ss domain, including management by the regulatory authority, government, private sector, academic institution and telecommunication operators. In any case, it is important that management of the .ss domain will cater for issues including:

- Need to involve stakeholders so as to cater for the needs and interests of the entire local Internet community
- Priority as well as the perceived value attached to the Internet, or more specifically, to the .ss domain, by government in national development plans
- Funding and sustainability of the registry (ccTLD activities) – including whether provision of domain names will be operated as a government activity or as a monopoly service or as a competitively offered service by a number of private sector companies and other institutions
- Oversight of the activities of the registry – including whether this would be done by the regulatory authority, government or by a non-profit or commercial entity that are able to get on board a broad range of stakeholder views from government, the technical community, and the end-users.
- Security of internet networks in general and the domain names related business.

Technical assistance to enable South Sudan plan and map out the management of the .ss domain is a key component in promoting development of the ICT sector.

Establishment of an Internet Exchange Point. There is need to establish an Internet Exchange Point (IXP) to keep local traffic local within South Sudan and hence reduce on costs for international bandwidth as well as increasing the available data speeds to local users. From a public policy perspective, an IXP ensures online services are equally accessible to all local users, enhances competitive opportunities, and improves the quality and affordability of Internet services.147 Furthermore, the presence of an IXP helps to encourage more local content development and creates an incentive for local hosting of services – due to the lower cost and the larger pool of local users, who are able to access online services faster and more cost effectively. Existing telecommunications and ISP operators should all be encouraged to join the IXP which should also eventually have a connection to the national backbone.

Given the existing development of the South Sudan Gateway and the need for all the operators to have linkage with this, the functionality of an IXP could be considered as an additional function focused on interchange of data.

Open access policy in support of a sustainable ICT sector. At the Fourteenth Ordinary Session of the Africa Union Assembly in 2010, Heads of State and Government emphasized the need to develop a sustainable ICT sector based on the principles of technological neutrality, non-discrimination and open access. Principles of open access are important to ensure that all networks – particularly subsidized or public/private partnership networks, and networks in rural or remote areas – offer capacity or access to all market participants in a non-discriminatory way. This helps promote the delivery of ICT services in a competitive and affordable way for end users.

Open access entails facilitating competition at every layer within the communications network. This means that there is competition in access to the undersea cables, in the national backbone, and in the last mile. There is also competition in the provision of services over the ICT infrastructure. Given the huge need for ICT infrastructure across South Sudan, the principle of open access will be a major consideration. In support of its infrastructure rollout, South Sudan will need policies to: 148


South Sudan: An Infrastructure Action Plan
• Promote effective competition and encourage investment: Encourage wired and wireless infrastructure sharing by multiple providers – which can be more efficient, especially in low population density areas (which represent much of South Sudan)

• Facilitate access to rights of way: (i) facilitate access to public rights-of-way available for building ICT networks which can help ease construction of both long distance (backbone) and local connection; and (ii) develop policies that provide open access to government-sponsored and dominant operator networks so as to enable greater competition in downstream markets

• Facilitate open access to critical infrastructure: (i) develop policies that provide open access to government-sponsored and dominant operator networks enable greater competition in downstream markets; and (ii) consider implementation of local loop unbundling if necessary to facilitate competition

A concern that has so far been raised by one of the current telecommunication operators is that the requirement for operators to build out their networks in an open access manner should be coupled with a requirement that all interested to make use of their networks will need to declare the traffic/service to be deployed (i.e. no “dark sharing” permitted). Some of the existing operators have also expressed reservation with infrastructure sharing as they consider it as a means for introducing cut-throat competition in areas where they have borne the full cost of making infrastructure available. It is thus important that open access principles are deployed in such a way so as to not serve as a dis-incentive for potential investors in South Sudan’s ICT infrastructure.

### 10.2.4 ICT Infrastructure and the Case for Universal Access Programs

The Connect Africa Summit called for the following with respect to ICT infrastructure:

- Interconnect all African capitals and major cities with ICT broadband infrastructure and strengthen connectivity to the rest of the world by 2012.
- Connect African villages to broadband ICT services by 2015 and implement shared access initiatives such as community tele-centres and village phones.

Given the limited ICT infrastructure currently available as well as the low population densities that are largely rural-based, programs for ICT infrastructure development will necessarily need to address the question of universal access.

#### Development of a national backbone network

**The Ministry of Telecommunication and Postal Services (MoTPS) has already put forward a proposal for a national backbone infrastructure. The plan involves backbone infrastructure linking various parts of the country along with a series of metropolitan fibre rings in the state capitals. In the immediate term, it is important to consider quick access to the undersea cables to provide an alternative to expensive satellite access.**

In addition to the Corridors, it is proposed to build 2–3 metropolitan rings per Corridor depending on the towns most likely to benefit from the factors such as presence of the corridor as well as economic and social development opportunities. Assuming 100 km of connection per ring, an average cost of $3 million per city is estimated, making it a total of $9 million per Corridor and a total of $27 million.

Altogether, over the decade, a total of $140 million is required for the country backbone and metropolitan rings around 9 key state capitals/major towns. This estimate assumes an all fibre network; however, the final design would need to integrate wireless options as appropriate for particular links or sections of the networks. The estimate also caters for the metropolitan rings independent of the backbone – even when there would be instances of overlap between the two networks. This all would serve to lower the cost estimates determined for the decade.

**Development of a universal access program.** In rolling out communication services across South Sudan, it is important that the rollout plan is guided by anticipated demand from the various rural areas in order to prioritize the network deployment. Such demand can be estimated from data including the percentage telecommunication expenditure of GDP, percentage of GDP accounting for household income, typical rural income compared to average income, regional variation of income, percentage of telecommunication revenue from business users, and (ii) a rate of $19,000 for links longer than 400 km.

While the World Bank used a threshold of 300 km, given the higher cost of construction in South Sudan, for the purposes of this Report a threshold of 400 km is used instead of 300 km. For comparison purposes, in October 2008, Rwanda contracted Korea Telecom for a 2,300 km project at $17,391 per km, and in November 2007, Malawi contracted Huawei Technologies for a 1,500 km project at $15,267 per km.

**Map 10.3:** Proposed Expansion of National Broadband Network

Source: Ministry of Telecommunications and Postal Services

**In addition to the Corridors, it is proposed to build metropolitan rings around the state capitals and major towns of South Sudan. These fibre rings will serve to provide broadcast connectivity between government ministries, commissions, chambers and other strategic offices. The rings should also be extended to provide broadcast connectivity to key institutions in the education and health sectors.** It is proposed to build to build 2–3 metropolitan rings per Corridor depending on the towns most likely to benefit from the factors such as presence of the corridor as well as economic and social development opportunities. Assuming 100 km of connection per ring, an average cost of $3 million per city is estimated, making it a total of $9 million per Corridor and a total of $27 million.

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telecommunication expenditure by households, as well as household number and size.151 The universal access demand studies would be part of the regulatory strategy and related policy recommendations that need to be made for regulation of the ICT sector in South Sudan.

In addition to demand, in deploying universal access funds, it is important to address a number of important elements to consider, namely, connectivity, competition, innovation/growth and social benefit.152 Projects which focus on one and exclude the others will likely not be optimal for taxpayers. For example, money invested which creates or strengthens a monopoly provider in a given state or region may expand connectivity, but will likely stifle competition, innovation and possibly social welfare. On the other hand, simply focusing on projects which ensure economic growth based on the demand studies may leave further unserved/underserved areas without sufficient connectivity and lead to social inequality.

In developing the universal access program, recommendations from the Tenth Forum on Telecommunication/ICT Regulation and Partnership in Africa (FTRA-2009) can serve as a guide for the program development. As presented in Annex 11-C, FTRA 2009 with its theme “Universal Access and Service Fund (UASF)” provided the opportunity to analyze in depth the mechanisms for the allocation and use of UASFs, and adopted ten recommendations in order to promote the roll out of networks and services to rural areas.153


As already noted in the discussion of an independent regulator (Sec. 10.2.1.1), there is need for a technical study to analyze the current telecommunications market situation in the country – including support for rollout of services in rural and underserved areas. The study would among other issues determine the size of the underserved/uneconomic areas for direct private sector intervention, the model(s) to be applied for universal access support and subsidies (e.g. competitive subsidy model, reverse action model, incentive-based private sector model), and the social development priorities. Initially funded by government, it is expected as the regulator develops and is able to generate its own income through licences and fees, the regulator would take on the costs for implementing the universal access strategy.

10.2.5 Business Environment for the ICT Sector

An important measure for promotion of the ICT sector is enabling tax, tariff, import, and business regulation policies designed to make South Sudan an ICT investment destination. In addition, if ICT uptake is to be significantly increased across the country, a major barrier that will need to be addressed is the cost of ICT services. Efforts to reduce ICT price baskets could include infrastructure development and policy as highlighted below.154

**Box 10.3: Strategies to Reduce the Cost of ICT Services**

- Regulatory policies to enhance liberalization and privatization as well as to strengthen national and regional agencies.
- Regulatory policies to promote infrastructure sharing and hence lower the costs of investment in ICT infrastructure in a bid to encourage more investment.
- Reduce and/or lower various ICT-related costs such as taxes on ICT equipment and services, interconnection rates and regulatory fees, and incorporate mobile cellular into universal access policies, for example, by allowing mobile operators to receive money from universal funds to expand coverage.

Source: International Telecommunication Union

A major barrier to the uptake of ICT services is aff ordability. To address this concern, government subsidies may be implemented, including the following:

- Subsidize the purchase of devices or computers, by means of government financing or bulk procurements, vouchers, or distribution of devices. This process could be managed by a Department or an Authority for Information Technology in South Sudan.
- Introduce tax credits for the purchase of devices or computers, or by reducing import duties and other taxes.
- Establish locations for shared or community access to computers and other devices to facilitate the use of ICT services, in addition to providing ICT equipment to educational institutions at cost or via subsidies. The community access points can also serve as Public Information Centres for distribution of government information.
- Introduce measures that reduce or eliminate taxes on ICT service so as to reduce the total price paid by consumers.

Currently, the Ministry of Information and Broadcasting proposes a rollout of Public Information Centres to all states at a rate of three centres established per year. This rollout is considered essential for internal and external communications to be facilitated through adequate and timely information to the public, systematic information flow and management, and the development and use of offi cial government websites, email, video and audio communication. Such internal and external communications would form part of the South Sudan e-Government program using ICT-enabled services to reach out to citizens. This type of initiative not only addresses affordability, but is also likely to generate further interest of the public to make use of ICT services as they interact with government via ICTs. However, it is important to consider the rollout of the Public Information Centres as being of multipurpose functionality such as serving as a library, internet access point, community meeting area, etc., in order to maximize the utility of these centres.

At this point, it is also important to acknowledge the key role that the postal sector can have in stimulating demand for ICT services. MoTPS has already indicated a need to renovate the existing postal buildings. This is a good move given the wide geographical spread of post offi ces, and the trust that people tend to have in the network of post offi ces. In proceeding with this plan, however, it is imperative that consideration be given to the re-development of the postal sector in the current e-environment. Properly integrated with the use of ICTs, the postal services can continue to be a relevant and affordable link with communities providing both traditional and electronic services including public information services, fnancial services, public internet services, in addition to the delivery of letters and packages.

**Attractiveness.** In order for consumers to take up ICT services, they need to perceive such services as adding value. The attractiveness of ICT services is therefore key in generating demand. Attractiveness and relevance is facilitated by ensuring that the market provides suffi cient choice and diversity of services, applications and content to appeal to all consumers. One way of making ICTs attractive is by supporting generation and dissemination of local, relevant content in local languages. Another is through creating e-government and ICT applications in areas such as health, education and agriculture.

Governments are able to enhance ICT demand by promoting e-government services and ICT-related standards, distributing content through electronic means, and supporting the development and distribution of electronic content by other players. Government services and applications can be categorised as follows:

- Making government information available (e.g. online, via mobile applications, or through radio and TV, or through the Public Information Centres being established through the Ministry of Information and Broadcasting).
- Conducting transactions with the government.
- Participating in the political process.
- Improving effi ciency and effectiveness of the public sector.

As a new country, South Sudan can draw on lessons from the eTransform Africa initiative by the African Development Bank and the World Bank. With the support of the African Union, eTransform Africa – www.etransformafrica.org - seeks to identify how information and communication technologies have the potential to transform the education and other sectors in Africa. Annex 11.C highlights recommendations for policy makers and regulators in the areas of e-education, e-health and e-fi nancial services.

In order for e-government services and applications to flourish in South Sudan, there will be need for cyber laws to defi ne and recognize electronic signatures, electronic fi ling systems and certifi cation of electronic documents as well as laws to address cyber security and to address cases of cyber fraud and other crimes. There will also be need to create awareness and sensitize the public about the various cyber laws so as to help users gain further knowledge of e-government services/applications.

### 10.2.7 Development of Regional Backbone Network Links

As previously noted in Section 10.1.2, the country currently does not have any infra-regional fi ber optic backbone connectivity. Furthermore, as a landlocked country, South Sudan does not have direct access to submarine cables and hence is currently not able to tap into lower costs submarine broadband capacity as compared to access via satellite. As such, it is in the country’s best interest to engage in initiatives to address infrastructure and last mile gaps on the continent – as in turn, the country will benefi t from submarine broadband access through transiting neighboring countries with submarine access. Not only infrastructure, but there is need for regional participation in initiatives to address regional concerns such frequency planning, cyber security, regional trade information, etc.

Currently, there are four options for South Sudan to connect to the submarine cables:

1. **Access via Lokichoggio in Kenya (with potential access to EASSy, TEAMs, and Seacom)**
2. **Access via Uganda with onward access via Malaba in Kenya or via the virtual landing station at Mutukla on the Uganda/Tanzania border (with potential access to EASSy, TEAMs, and Seacom)**
3. **Access via Ethiopia with onward access via Djibouti (with potential access to EASSy, Seacom as well as Mediterranean undersea cables EIG and I-ME-WE)**
4. **Access to Port Sudan in Sudan (with potential access to EASSy)**

### 10.2.7.1 Development of Landlocked Connectivity

Already Kenya and South Sudan have announced the ‘Four In One’ project (also known as the Lamu-Southern Sudan-Ethiopia Transport (LAPSET) Corridor Project), which is comprised of construction of a railway line, the rehabilitation of roads from Lodwar – Lokichoggio – Juba, construction of a fi ber optic link, and an oil pipeline from Lamu (Kenya) to Kajoارة Port (South Sudan)158. While Kenya’s national backbone has been completed up to Lokichoggio, the fi ber is reportedly yet to be lit. Currently, South Sudan is already connected to Uganda via microwave, and Uganda’s national backbone includes a fi ber optic link up to Nimule on the border with South Sudan.

In order to enhance reliability of the country’s international bandwidth capacity, and to avoid monopolistic access to the submarine cables, it is recommended to establish at least two virtual landing stations under open access principles such that all ICT operators can gain access on transparent and fair terms. A virtual landing station enables a landlocked country such as South Sudan to have an equivalent physical landing point of the undersea cables.

With in-country connectivity to the relevant borders catered for under the South Sudan national backbone costs, the cost of each virtual landing station is estimated at $3 million. It may also be necessary to budget for $2 million per virtual landing station to connect to the closest fi ber/broadband link in the country of transit to the cable. Such connections could be established as high-speed terrestrial wireless links in the interim, given the drive within the region for broadband national networks largely based on fi ber networks in future. This should later serve to provide redundancy or can be redeployed when the fi ber links are eventually established. Feasibility studies are required to establish the actual link routes given the multiple options to connect to the submarine cables, and to identify the amount of resources required to connect South Sudan to the submarine cable and to other African capitals – as called for by the Connect Africa Summit.

In enhancing the country’s regional connectivity, it is also important to follow up on existing regional connectivity projects, particularly those in Eastern Africa, to which South Sudan has proximity. Table 10.6 presents details for two regional backhaul connectivity projects in Eastern Africa.

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Table 10.6: Regional Backhaul Connectivity Projects in Eastern Africa

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>East African Regional Backhaul Network (EAC-BIN)</td>
</tr>
<tr>
<td>Country links</td>
<td>Burundi, Kenya, Rwanda, Tanzania and links to Djibouti, Eritrea, Ethiopia and Sudan</td>
</tr>
<tr>
<td>Route (km)</td>
<td>4367</td>
</tr>
<tr>
<td>Supporting institutions</td>
<td>World Bank Regional Communications Infrastructure Programme (NEPAH IPPF)</td>
</tr>
<tr>
<td>Status</td>
<td>Feasibility study addressing missing links is being fi by the AfDB and World Bank</td>
</tr>
</tbody>
</table>

Source: African Development Bank.

10.3 Building Institutional Capacities

As noted earlier in this Chapter, the ICT sector is governed by the Ministry of Telecommunications and Postal Service (MoTPS) as well as the Ministry of Information and Broadcasting (MoIB). Both ministries provide policy direction and perform regulatory functions. However, there remains need for institutional and human capacity development. For example, as the current regulator, the MoTPS does not have the capacity to monitor spectrum utilization even though it does have a frequency allocation plan in place. One of the ongoing concerns within the MoIB is the lack of maintenance/repair technicians to handle any problems with their expensive transmission and broadcasting equipment. Such equipment is currently shipped to Nairobi or Dubai for repair.

The proposed Action Plan for the ICT sector includes a total of $38.1 million for a range of capacity building initiatives ($32.2 million) and technical studies that will support policy making and program design and implementation ($5.9 million). Table 10.7 below provides details for the capacity building and technical support program.

Table 10.7: Regional Backhaul Connectivity Projects in Eastern Africa

<table>
<thead>
<tr>
<th>Category</th>
<th>Estimate</th>
<th>Projected</th>
<th>Total 2011-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity building and technical support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ongoing programs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donor-funded capacity building for the media</td>
<td>3,945</td>
<td>2,914</td>
<td>2,641</td>
</tr>
<tr>
<td>Proposed programs</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Strengthen Samuel Yunis Institute</td>
<td>-</td>
<td>-</td>
<td>750</td>
</tr>
<tr>
<td>Support for government printing press</td>
<td>-</td>
<td>-</td>
<td>30</td>
</tr>
<tr>
<td>Develop communications regulatory authority</td>
<td>-</td>
<td>-</td>
<td>2,000</td>
</tr>
<tr>
<td>Improve business operating environment</td>
<td>-</td>
<td>-</td>
<td>300</td>
</tr>
<tr>
<td>Support for University of Juba</td>
<td>-</td>
<td>-</td>
<td>375</td>
</tr>
<tr>
<td>Capacity building for e-applications</td>
<td>-</td>
<td>-</td>
<td>500</td>
</tr>
<tr>
<td>Strengthen procurement capacities</td>
<td>-</td>
<td>-</td>
<td>500</td>
</tr>
<tr>
<td>Total</td>
<td>3,945</td>
<td>2,914</td>
<td>7,096</td>
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<td>Technical studies</td>
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</tr>
<tr>
<td>Proposed programs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master plan for national fibre optic grid</td>
<td>-</td>
<td>-</td>
<td>500</td>
</tr>
<tr>
<td>Design of universal access program for ICT</td>
<td>-</td>
<td>-</td>
<td>500</td>
</tr>
<tr>
<td>ICT skills audit &amp; training needs assessment</td>
<td>-</td>
<td>-</td>
<td>300</td>
</tr>
<tr>
<td>Develop &amp; popularize cyberlaws</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>E-Readiness study to assess requirements for e-applications</td>
<td>-</td>
<td>-</td>
<td>300</td>
</tr>
<tr>
<td>Development &amp; support for e-applications</td>
<td>-</td>
<td>-</td>
<td>500</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>-</td>
<td>2,200</td>
</tr>
<tr>
<td>Grand total</td>
<td>3,945</td>
<td>2,914</td>
<td>9,296</td>
</tr>
</tbody>
</table>

Source: Annex Table 11.1.
10.3.1 Ongoing Initiatives in Support of Institutional Capacity Building

In general, the full potential of ICT in South Sudan is significantly hindered due to minimal uptake and utilization of ICT services. Even where available, communities generally lack the capacity to make the best use of the services. Measures to address this situation include initiatives by UNDP to assist GOSS through its ICT institutions and its volunteers to promote ICT for human development. The UNDP has provided communication facilities to the President’s office and to all State Governor offices. In addition, UN volunteers have been posted to all Governor’s offices to provide technical support and basic capacity building.

To date there have been a number of initiatives to build institutional and human capacity, including for example:

- Under MoIB, the Capacity Building, Institutional and Human Resource Development (CABIHRD) project supported the establishment of a Public Information Centre. Achievements to date include:
  - Construction of the Public Information Centre in Juba
  - Procurement of furniture, computers, a web server, generators, photocopiers, printers and scanner for the Centre
  - Official GOSS website was developed and launched in December 2009

- In 2008/9, 46 staff under MoIB received training from the Government of Kenya in a variety of areas including news reporting, news editing, and TV production. In the same period, 53 staff under MoTPS were identified for management and leadership training.

- The MoTPS has proposed the Samuel Yunis ICT Institute to build requisite expertise and capacity to design, develop, operate, manage, maintain and use emerging information systems and ICTs. 159 An Acting Principal is already in place and the short term plans are to outsource trainers from the African Advanced Level Telecommunications Institute (AFAILTI) – an ICT capability building inter-governmental organization headquartered in Nairobi, Kenya.

Nevertheless, there is need for significant institutional and human capacity building if South Sudan is to harness the opportunities of the ICT sector.

10.3.2 Proposed Institutional Capacity Building Program for ICT

The institutional capacity for South Sudan can be met in a variety of ways, including training and the use of technical assistance – with a requirement to build local capacity. In the area of training, there is need for a comprehensive ICT Skills Audit and Training Needs Assessment to determine the skills gap in ICT sector ministries and further on with various levels and entities of government and key users such as health and educational institutions. Government entities include, for example, the Government Printing Press that has recently procured modern printing equipment, but is in need of recruiting and training appropriate technical and administrative staff.

The assessment would address both needs in terms of management and regulation of the sector as well as needs in terms of effective uptake and usage of ICT services and applications. There is currently opportunity to have the ICT Skills Audit and Training Needs Assessment conducted as one of the activities under the Africa Development Bank’s Korea-Africa Economic Cooperation (KOAFEC) ICT Training program. In addition, South Sudan can also benefit from ongoing KOAFEC ICT Training as well as KOAFEC consultancy services in ICT policy, infrastructure and applications. For example, support will be required for the development of ICT applications such as e-government and applications in education and health as outlined in Sec. 10.2.4.3.

The proposed training initiatives also need to support institutions such as the Samuel Yunis ICT Institute and tertiary institutions such as the University of Juba with the objective to build local human resource capacity for the ICT sector. The Samuel Yunis ICT Institute already had temporary space and has been awarded temporary accreditation by the Ministry responsible for Education. The first batch of 60 trainees, all employees from various ministries, were brought onboard in 2011 and trained by MoTPS part-time staff. To be fully functional, the Institute requires full-time staff, equipment and office/classroom furnishings. There is also need to upgrade the Institute’s trainers on industry specific certifications. In the case of University of Juba, there is need to set up a secure, reliable and scalable network and email system to promote teaching, research and collaboration. The university will also need access to broadband internet as well as establish specialized computer labs in fields such as computer engineering, mobile computing and applications, geographical information systems, computer networks, and software development.

The country is also in need of institution capacity building in support of the broadcasting sector. In terms of infrastructure, broadcasting would benefit from the proposed national backbone and other ICT infrastructure rollout. However, the public broadcasting sector in particular has specific needs as well. As a post conflict country, GOSS recognizes that timely dissemination of information is critical for stability. There is therefore need to expand on the studio and production facilities for South Sudan Radio and TV. Currently, South Sudan has only one radio studio and one TV studio – each of which is used for both transmission and recordings of programs. This limits the time available for airing of programs as part of the time must be used for production of programs. Although the immediate needs are for the establishment of studios in Juba, MoIB also has plans to establish regional studios in Wau and Malakal. In addition to the studios, there is need for outdoor broadcasting vans and associated equipment in support of live broadcasts.

The country’s ICT sector needs to lay a proper foundation for growth of the sector in a way that avails the benefits and opportunities for all her citizens. As such, there is urgent need for short-term technical assistance to work alongside the ICT ministries in getting the sector up and running effectively and efficiently. For example, as discussed in Section 10.2.1, there is need for technical assistance for establishment of a regulator and identification of key regulatory issues including regulatory strategy and related policy recommendations, licensing of services, spectrum regulation and management, quality of service (QoS), tariff and competition regulation, numbering management, and domain name management for .ss. In addition, there is need for technical assistance to develop a digital migration plan for South Sudan so as to prepare the country to comply with the international cut off date of 2015 for analogue transmission.

10.4 Proposed Capital Development Program for ICT

10.4.1 Overview of the Proposed Development Expenditure Program

As Table 10.8 indicates, total capital expenditures for the communications program are expected to increase from about $60 million a year in 2010 to about $100 million a year by 2020 (at 2010 constant prices). The total cost for the decade as a whole is estimated at $814 million, of which provision of universal voice and data coverage is $635 million, and development of the national backbone network is about $150 million. These estimates do not include the cost of building a link from South Sudan to one or more of the existing regional links to the submarine cables. These cost of the national backbone network could be lowered if the design takes into account complementarities of the networks; for example, rather than build out a projected link on the backbone, existing broadband links of the telecommunications operators could be integrated into the national backbone – under open access principles. The bulk of funding for the capital cost of the ICT Infrastructure Plan will be met through private sector participation. Annex 11-F presents details of the ongoing and proposed development expenditures for the Communication Program.

Table 10.8: Ongoing and Proposed Capital Expenditures for ICT Program ($ ’000 at 2010 constant prices)

<table>
<thead>
<tr>
<th>Category</th>
<th>Estimate 2010</th>
<th>Projected 2011-20</th>
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<tbody>
<tr>
<td>Ongoing Government capital works programs</td>
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<tr>
<td>Telecommunication &amp; postal services</td>
<td>2 170</td>
<td>1 390</td>
</tr>
<tr>
<td>Information and broadcasting</td>
<td>6 990</td>
<td>5 490</td>
</tr>
</tbody>
</table>

one notable development in some post-conflict countries, like South Sudan, hence the proposed program outlined earlier in this Chapter for liberalization of the sector. Like South Sudan, the ICT sector is private-sector-led development; substantial operating costs for ICT provision in South Sudan alone by MTN. These outlays have been made in the face of rapid growth as South Sudan becomes an increasingly attractive investment opportunity.

Experience from Sub-Saharan countries suggests that outlays for voice and data service provision are the equivalent of about 0.83% of GDP, 99% of which have been by the private sector. Applying these averages to the non-oil equivalent of about 0.83% of GDP, 99% of which have been by the private sector. Applying these averages to the non-oil component of South Sudan’s GDP suggests that capital outlays by the private sector have risen steadily from about $37 million in 2008 to about $44 million in 2010. (See Annex Table 11.3 for details of these estimates.)

For the purposes of this Report, it is assumed that, as in other post-conflict countries, facilitated by an enabling legal and regulatory environment, the share of ICT investment rises to at least 1% of the non-oil component of GDP Table 10.9 provides projections of private sector investment based on a high growth scenario for non-oil GDP. The figures include the capital expenditures to roll out universal access voice and public broadband coverage to at least 98% of the population by 2020. Operations and maintenance outlays, which are about 20% of total costs, are projected to rise from $13 million in 2011 to about $22 million by 2020. These are conservative estimates of capital and operating costs; they may increase more rapidly as South Sudan becomes an increasingly attractive investment opportunity.

### Private sector investment in the ICT sector

As is common with other developing countries, the focus in the ICT sector is on private-sector-led development; hence the proposed program outlined earlier in this Chapter for liberalization of the sector. Like South Sudan, one notable development in some post-conflict countries such as Afghanistan, Iraq, East Timor and Sri Lanka, has been the level of private sector investment in ICTs. Such countries can leapfrog (or “cheetah jump”) to state-of-the-art next generation networks given the often poor state of ICT infrastructure.

**Capital costs for voice and data services.** Private sector expenditures in ICT in South Sudan to-date include about $500 million by Zain as well as $50 million this year alone by MTN. These outlays have been made in the face of substantial operating costs for ICT provision in South Sudan. Both operators report that they spend in the range of SDG500,000-700,000 (equivalent to $169,000-238,000) to establish a base station in South Sudan compared to about SDG100,000 (equivalent to $34,000) for a base station in Sudan. They have indicated that in 2011 spending was in the range of $150 million on further expansion of their networks, on independent switching stations to separate their South Sudan operations from those of Sudan, as well as the costs associated with the shift to a+211 country code.

Chapter 8 provides detailed information about the current and projected demand for electricity. At the present time electricity consumption for ICT services accounts for about 1.3% of total demand; by 2020, it would account for about 1.6% of total demand under the high economic growth scenario used in this Report. Moreover, the reliability of the electricity supply would improve substantially if the capital investment of $2.2 billion for additional generation capacity and a national transmission grid proposed in this Report were implemented.

10.4.4 National Government Funding for the ICT Sector

While it is expected that the ICT sector will be largely private sector led, there will be need for government intervention particularly in addressing the social targets for the sector. Social targets include expanding voice and data services to rural/underserved areas, providing broadband connectivity to educational and health institutions, and implementing demand support programs. As indicated in the SSDP, government does intend to intervene in those activities that the private sector is not able, or currently not willing, to engage in but which are of benefit to society. This calls for identifying the coverage gap within the ICT sector for which government will have the legitimate role in leading the supply and maintenance of public goods. Universal coverage focuses on the supply side of the ICT sector while universal access considers both supply and demand side issues.

In assessing the coverage gap, there are two main areas to be considered – basic communications services defined as voice/SMS coverage and broadband services which includes internet coverage. For the purposes of this Report, universal coverage of voice/SMS services will be attained when at least 98% of the population lives within range of a mobile telephone signal. Furthermore, universal

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</thead>
<tbody>
<tr>
<td>Expand postal network and capacities</td>
<td>-</td>
<td>250</td>
<td>500</td>
<td>500</td>
<td>100</td>
<td>2 150</td>
<td></td>
</tr>
<tr>
<td>Expand radio and TV network</td>
<td>-</td>
<td>1 500</td>
<td>1 500</td>
<td>2 000</td>
<td>2 000</td>
<td>1 000</td>
<td>13 000</td>
</tr>
<tr>
<td>Establish South Sudan internet exchange point</td>
<td>-</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>150</td>
</tr>
<tr>
<td>Ongoing and proposed private sector programs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Construct landing platforms and region fibre optic links</td>
<td>-</td>
<td>1 000</td>
<td>3 000</td>
<td>3 000</td>
<td>3 000</td>
<td>-</td>
<td>10 000</td>
</tr>
<tr>
<td>Construct backbone network</td>
<td>-</td>
<td>12 213</td>
<td>12 213</td>
<td>12 213</td>
<td>16 150</td>
<td>9 197</td>
<td>112 680</td>
</tr>
<tr>
<td>Construct metropolitan rings for state capitals</td>
<td>-</td>
<td>3 000</td>
<td>3 000</td>
<td>3 000</td>
<td>3 000</td>
<td>27 000</td>
<td></td>
</tr>
<tr>
<td>Expand provision of universal voice and data services</td>
<td>51 200</td>
<td>52 130</td>
<td>48 900</td>
<td>51 800</td>
<td>56 000</td>
<td>67 000</td>
<td>153 000</td>
</tr>
<tr>
<td>Total</td>
<td>60 360</td>
<td>59 010</td>
<td>66 663</td>
<td>73 363</td>
<td>79 263</td>
<td>94 150</td>
<td>1 029 240</td>
</tr>
</tbody>
</table>

Source: Annex Table 11.1

### Table 10.9: Projection of Private Sector Capital and Operating Expenses for the ICT Sector

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Expenditure</td>
<td>52.13</td>
<td>48.06</td>
<td>51.06</td>
<td>54.5</td>
<td>58.32</td>
<td>62.76</td>
<td>67.9</td>
<td>73.6</td>
<td>79.87</td>
<td>86.78</td>
</tr>
<tr>
<td>Total Investment</td>
<td>65.16</td>
<td>60.08</td>
<td>63.83</td>
<td>68.12</td>
<td>72.9</td>
<td>78.45</td>
<td>84.88</td>
<td>92</td>
<td>99.84</td>
<td>108.47</td>
</tr>
</tbody>
</table>

Source: Annex Table 11.3 and estimates by authors.

### Table 10.10: Projection of Energy Consumption from Market-driven ICT Investment

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Electric Power Consumption (gWH)</td>
<td>55</td>
<td>7.1</td>
<td>9.2</td>
<td>12</td>
<td>15.6</td>
<td>20.3</td>
<td>26.4</td>
<td>34.3</td>
<td>44.5</td>
<td>57.9</td>
</tr>
</tbody>
</table>

Source: Annex Table 11.8
coverage of broadband service would be attained when a land connection for a public broadband facility (such as an Internet café or telecentre) is available within close proximity of more than 98% of the population.

The cost estimates provided draw upon the gap analysis conducted by the AICD (2009) study on ‘Costing the Needs for Spending on ICT infrastructure in Africa’ for the period 2006-2015. The study estimated that if African countries promote effective competition and mobilize private sector resources, they will be in position to have more than 92% of their population covered by voice infrastructure by 2015. In the case of South Sudan, this Report sets the development target at 100% coverage by 2020.

**Box 10.4: Universal Coverage**

Universal coverage is a prerequisite to universal access and may fulfill the requirements of certain countries without further investment. Once coverage is achieved, fulfilling universal access to ICT services becomes a matter of achieving a social consensus on what level of services constitutes a basic right, what skills the population needs to benefit from those services, and whether the political will exists to invest public funds to bring people and services together.

To identify the coverage gap that would not be served by the private sector, the AICD analysis was conducted with the following key parameters – population density, income distribution, steepness of terrain, and size of the wireless cell site. The estimates for investment requirements to close the market and coverage gaps are the minimum investments required to achieve corresponding levels of population coverage, rather than to satisfy all demand for individual subscriber connections within those areas. In the discussion to follow, there are two primary types of investment gaps:

- **Efficient market gap**: Difference between existing coverage and the extent of commercially viable coverage under perfect competition whereby there are no economic or regulatory barriers to impede market development. Such gaps can arise because, for example, civil war can prevent network construction and rollout.
- **Coverage gap**: A geographic concept associated with delivery of universal coverage and it is of two forms:
  - **Sustainable coverage**: Areas in which revenue potential is high enough to cater for ongoing costs of the infrastructure.
  - **Universal coverage**: Areas beyond the existing coverage, efficient market gap and sustainable coverage areas for which the revenue potential is not sufficient to fully cater for capital or operating costs of the infrastructure.

While the AICD report did not examine the case of South Sudan, the findings of the comparator countries, as well as the gap analysis for Sudan prior to the independence of South Sudan, were used to make estimates for South Sudan. In making the projection for the funding gap to be covered by the Government of South Sudan, the Report assumes an increase in private sector investment consistent with that given in Table 10.9. The Report also assumes that in anticipation of increased investment to address the development targets identified in Table 10.5 above, the Government will maintain its contribution at 0.01% of non oil GDP as private sector will contribute to closing the efficient market gap and to at least 30% of the coverage gap. The operating and maintenance costs are assumed to be the equivalent of 0.2% of non oil GDP as in Table 10.9. This is because the population in the coverage gap is mostly rural and is the most sparsely populated; as a result, equipment is widely distributed in often hard to reach areas. This, in turn, drives up the operating and maintenance costs per individual. Based on these assumptions, Tables 10.11 and 10.12 present the public funding gap for universal voice and broadband coverage respectively. In the case of the voice coverage gap, the Government subsidy would amount to an average of $39.7 million a year to achieve 100% by 2020. In the case of broadband coverage, the annual subsidy would be $31.5 million a year.

### Table 10.11: Funding Required from Government to Bridge the Voice Coverage Gap

<table>
<thead>
<tr>
<th>Coverage gap (% of population)</th>
<th>Private sector contribution ($ million per year)</th>
<th>Public funding gap ($ million per year)</th>
<th>Public funding gap as % of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.2</td>
<td>43.6</td>
<td>17.03</td>
<td>39.7</td>
</tr>
</tbody>
</table>

Source: Annex 11-E

<table>
<thead>
<tr>
<th>Coverage gap ($ million per year)</th>
<th>Total Investment required for Universal Coverage ($ million per year)</th>
<th>Total Investment gap (% of GDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28.5</td>
<td>71.5</td>
<td>13.9</td>
</tr>
<tr>
<td>81.5</td>
<td>31.5</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Source: Annex 11-E

### 10.4.5 Donor Support for ICT Initiatives

The international donor community has shown interest in supporting development of the ICT sector in South Sudan. According to the Aid Information Management System (AIMS) of the Ministry of Finance and Economic Planning, in 2010 ongoing donor support for the ICT sector amounted to $12.3 million. Donor support has included the following:

- **Support from CTO to develop a three-year strategic plan as well as a plan for digital migration by the global deadline of 2015.**
- **World Bank mission in March-May 2011 to conduct an ICT infrastructure needs assessment.**
- **A September 2011 visit by ITU to assess ICT status in South Sudan and support that could be avaliable by ITU.**
- **UNDP has employed and deployed ICT specialists to State Governors’ offices to provide technical support and assistance.**
- **Preliminary proposal by MoTPS for establishment of a broadband backbone as highlighted in Map 10.3.**
- **Review of the taxation policies post-Independence to curb multiple (and sometimes illegal) taxation of goods in transit and to streamline taxation of service provision at national/state/county levels.**

In November 2011, the World Bank convened a roundtable to initiate a dialogue among donor agencies, international organizations, and ICT-focused NGOs to discuss existing and planned activities in support of the ICT sector in South Sudan. Annex 11-F provides a detailed description of existing and planned donor activities in support of South Sudan’s ICT sector. From informal conversations with donor representatives, it is clear that donors are ready to play an expanded role in capacity building, technical studies and demand support programs such as initiatives in e-applications. In that connection, it will be important for the donor community build on the November 2011 dialogue so as to avoid overlap and to maximize synergies in support for the ICT sector.

### 10.4.2 Implementation of the ICT Infrastructure Action Plan

This Report presents an ambitious ICT program both in terms of funding and in the timeline for implementation. A number of activities, studies and capacity building initiatives have been identified – all requiring urgent
action. However, this is because of the key role ICTs can play in supporting the overall economic and social goals of South Sudan. It is also because in order to realize the expectation of private sector led ICT infrastructure growth then key factors such as an enabling environment, a broadband national backbone, and perceived or actual demand need to be addressed. The indicative schedule for the Action Plan is set out in Table 10.13.

### Table 10.13: Indicative Schedule for ICT Infrastructure Action Plan

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<tbody>
<tr>
<td>Institutional Development and Policy Framework</td>
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<tr>
<td>Revise ICT sectoral bills</td>
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<tr>
<td>Migrate to .ss domain and country code</td>
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<td>Create regulatory authorities for ICT</td>
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<tr>
<td>Conduct studies to strengthen regulation</td>
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<tr>
<td>Capacity building programs related institutional development</td>
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<tr>
<td>Development of National Backbone</td>
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<tr>
<td>Develop Master Plan for National funding</td>
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<tr>
<td>Mobilize private sector funding</td>
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<tr>
<td>Implement investment program for backbone</td>
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<td></td>
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<tr>
<td>Establish virtual landing points</td>
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<tr>
<td>Rollout of universal access program</td>
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<tr>
<td>Conduct studies to establish universal access targets</td>
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<tr>
<td>Decide mechanism for private access program</td>
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<tr>
<td>Implement universal access program</td>
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<tr>
<td>Conduct demand support programs to promote uptake</td>
<td></td>
<td></td>
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</table>

Source: Prepared by authors.

Assessing the costs and benefits of support for the ICT infrastructure. In planning to support South Sudan’s ICT infrastructure and institutional capacity building, it is important that such support is assessed in terms of its costs and benefits. In assessing the benefits of the ICT infrastructure, one must forecast uptake of the infrastructure following policy implementation since the economic benefits arise from lower prices and greater consumption of the national connectivity and regional links – particularly to the undersea cable. For purposes of this Report, the development targets outlined in Table 10.5 represent the expected access and use of ICT infrastructure and services. As a post-conflict country with petroleum resources, South Sudan is presently an attractive investment destination. Furthermore, telecommunications has already been recognized as the fastest growing sector in South Sudan with liberalization and competition leading to growth in the coverage area. A 2009 World Bank study of 120 countries showed that there is an increase in economic growth of 1.3 percentage points for every 10-percentage-point increase in the penetration of broadband services.160 In all, it is therefore imperative that prompt implementation of the infrastructure action plan is undertaken to expand access to communications and to manage the risks and uncertainties in the ICT sector which in turn will facilitate greater access to communications.

The country’s ICT sector policies drive the expected private and public cost contributions for the ICT infrastructure. Annex 11-D summarizes some of the basic principles involved in costing of initiatives to develop the ICT sector. For instance, revision of the licensing framework shall entail expenditure on technical assistance, changes to the licenses of existing operators may also involve additional expenses, and some form of government investment will be required to stimulate rollout in rural and underserved areas.

### 10.5 Financing Arrangements for the ICT Program

The proposed program of development expenditures for the ICT sector amounts to $851.5 million for the period 2011-2020 (Table 10.14). This total does not include the projected operating cost of ICT service providers that is given in Table 10.9 above. Nor does it include the estimates for the government subsidy that is required to achieve universal coverage for voice, data and broadband services by 2020.

### Table 10.14: Ongoing and Proposed Funding for the Communications Development Program ($’000 at 2010 constant prices)

<table>
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<tr>
<th>Category</th>
<th>Estimate</th>
<th>2010</th>
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<th>2012</th>
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<tr>
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<tr>
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<td>61 924</td>
<td>2 641</td>
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<td>96 700</td>
<td>168 797</td>
<td>1 067 375</td>
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</tbody>
</table>

Source: Annex Table 11.2.

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As Table 10.14 indicates, the private sector investments of $785 million would account for a little more than 90% of total development expenditures. Detailed information about the balance sheets of the service providers is not available; a prudent assumption about the funding arrangements for the $785 million of additional assets held by these companies, and new entrants into the sector, would be that it would include $235 million of equity and $550 million of debt financing. A more stringent set of reporting requirements to a regulatory authority would typically include information about the balance sheets of the service providers. Such information would allow the regulatory body to satisfy itself as to the financial soundness of the ICT service providers. Elsewhere in Sub-Saharan countries, there have been examples of private sector service providers operating with balance sheets in which the ratio of debt to total assets exceeded 95%. In some of these cases, the excessive levels of indebtedness have resulted in financial collapse of the service provider, disruption in services, and requests for governments to step in and provide debt relief.

The proposed program includes a modest amount of funding by the international community. For the decade as a whole, the proposal is for donors to provide about $25 million of support for the program. These donor resources would all be directed at the program of capacity building, technical support and studies needed to ensure effective implementation of the ICT program and outlined in some detail in Table 10.7 above. The important point here is that a high priority should be given to the early mobilization of this support which will be critical for effective implementation of the ICT program in subsequent years.

Under the proposed program the government would fund a total of about $40 million of these development expenditures in the decade ahead. A significant portion of these outlays would be for support for the development of e-applications by South Sudanese institutions and the proposed regulatory authority. However, not included here would be the government subsidies required to ensure universal coverage of ICT services by 2020. As the earlier discussion indicates, achieving full coverage by 2020 would require total outlays by the government in the range of $700 million in the decade ahead. A portion of these expenditure requirements could be met from the imposition of a tax on ICT service providers that was then specifically earmarked for the universal coverage program.

### 10.6 Management of Risks and Uncertainties

Recent SWOT analysis has highlighted a number of concerns for Sudan from which risks and uncertainties pertinent to South Sudan can be drawn. These are highlighted in Box 10.5. From the SWOT and the sector analysis already presented in this Report, the key risks and uncertainties that the country needs to contend with are as follows:

- Lack of an independent regulator with the necessary institutional and human resource capacity to develop and promote a fair and level enabling environment for development of the ICT sector
- Lack of skilled human resources to develop and manage the ICT sector as well as to facilitate uptake of voice and internet services and applications
- Degree and pace that ICT operators can rollout their networks and services due to the lack of basic infrastructure such as roads and electricity
- Weak institutional arrangements and capacity for promotion of the ICT sector
- Threats to political stability and peace due to unresolved post-conflict issues

### Box 10.5: SWOT Analysis of ICT Sector in South Sudan

**Strengths**

As a post-conflict country with petroleum resources, South Sudan is an attractive investment destination. The country’s investment policies and intent for a private-sector led ICT sector do encourage foreign and local investment. There is a competitive environment with a number of international and local operators already in the ICT sector, including telecommunication operators, Internet Service Providers, and radio stations.

**Weaknesses**

Penetration rates for voice are very low, with the majority of subscribers being prepaid users who generate much less revenue compared to postpaid users. There are very low internet usages, with most internet access being via public points as opposed to individual use. The current high costs for internet access start-up equipment and monthly subscription coupled with low income users also drives down the potential number of internet users. High operational costs for operators due to lack of basic infrastructure including roads and electricity.

Institutional framework and capacity to manage the sector is weak, and there is lack of skilled human resources.

**Opportunities**

As a post-conflict country, similar to experiences in other similar countries, there is opportunity for expansion into underserved areas that were previously inaccessible due to security concerns.

With a good legal and regulatory environment, and an already competitive market, there is an opportunity for the sector to flourish with minimal public funding. Use of new technologies and the lack of legacy technologies can allow South Sudan to ‘cheetah jump’ in provision of a variety of ICT services and applications at lower service costs. Multiple broadband infrastructure options via Uganda/Kenya, Ethiopia/Djibouti, and Sudan can be considered for access to undersea fiber optic cables which should result in improved broadband access.

**Threats**

Unresolved areas of conflict with Sudan and other regions could threaten the peace needed to encourage operators to rollout and expand their networks. A poorly regulated competitive market could drive down ARPU’s to a point that the operators are no longer sustainable and the South Sudan is no longer an attractive investment destination.