For many locations in Sudan, the Nile River is the key transport link. River transport between Kosti and Juba (1,436 km, or 892 miles) had no overland alternative as of the mid-1980s.

The principal seaport of the nation is Port Sudan, on the Red Sea, and as of 1988, Sudan had 25 merchant vessels registered.

Small population

There are only 26.5 million people in Sudan, as of 1992, in an area the size of the European Community, where 300 million people reside. This means there are an average of 10 persons per square km, in contrast to over 200 per square km in Europe. Sudan's population is comparable to that of Taiwan, which is 80 times smaller in area. Sudan's small population, and certain related vital statistics, reflect the consequences of decades of British imperial rule.

About 30% of the population lives in urban centers, and there are over 2 million refugees in various locations in the country. As of the mid-1980s, the principal towns, with their population at the last census, which was in 1983 (the populations are all higher now), were:

Omdurman	526,287
Khartoum (capital)	476,218
Khartoum North	341,146
Port Sudan	206,727
Wadi Medani	141,065
Al-Obeid	140,024
Atbara	73,009

Nuplexes can make new water, power resources

The additional flow to the Nile for Sudan and Egypt from the completed Jonglei Canal of some 4 billion cubic meters a year, when considered on a per capita and per square kilometer basis for 86 million people, shows the need for new sources of water. Likewise, were all potential dam sites to be completed on the Nile system (see diagram), the hydroelectricity produced, on a per capita and per square kilometer basis, would still not be enough for growing economies.

The source of new water and power in the lands of the Nile? "Nuplexes" of modules of nuclear power stations, coupled with advanced seawater desalination systems, and industrial and agricultural projects, located at strategic sites on the Red Sea for Sudan and the Mediterranean Sea, Suez Canal, and Red Sea for Egypt. This is the "Oasis Plan" approach for Middle East development and peace, proposed for years by Lyndon H. LaRouche, Jr.

First, look at the existing "energy balance" of Sudan. Then look at what one or more nuplex sites would mean for transforming the supplies for electricity and water to the economy.

As of 1987, the annual energy supply in Sudan amounted to 10 million tons of oil equivalent (TOE), 84% of which is from biomass—mostly from wood and charcoal, but also agricultural waste. Annual energy consumption is about 6.1 TOE, because close to 40% of supply is lost in conversion and distribution. For example, 44% of the wood is lost when converted to charcoal. Petroleum energy accounted for 13% of the total energy supply in 1987; and hydropower contributed 3%. However, hydropower accounts for 60% of the electricity supply. This share is declining somewhat, as thermal electric generating stations can be built.

But compared to even the most modern hydroelectric generator, just one nuplex installation can begin to shift the energy and water-use balances into new modes.

The Roseires Dam Hydro Station on the Blue Nile has a maximum capacity of 250 MW of electricity. The Sennar Dam downstream has 15 MW.

There are new designs for high-temperature gas-cooled nuclear reactors (HTGRs) based on underground modules of 200-350 MW each, that are safe, can be assembly-line produced and installed in series as required, and coupled with modern desalination systems. A study for the Metropolitan Water District of California for the Pacific coast, found that a single desalination plant, consisting of four 350 MW HTGRs, could produce 146.1 million cubic meters of water a year—the equivalent of a small stream. In addition, the four-module nuplex would provide 466 MW of electric capacity.

Another type of HTGR design comes from Germany, with many features made-to-order for the seacoasts of the dry lands of the lower Nile. The reactor is 200 or 300 MW (a useful size where the transmission grid is being developed), but highly efficient and safe. Called the "pebble-bed" reactor, the fuel is pellet shaped (0.5 millimeter diameter), and can employ thorium (the use of which has been developed in India) in the cycle.

The power and water from the nuplex generators could be put to intensive use for high-tech agriculture, food and industrial processing, and chemical production. In a compact region such as the Jordan River basin, merely 20 such installations—ideally located at points along man-made seawater canals—could create the water equivalent of a new Jordan River.—*Marcia Merry Baker*