

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
EGYPT-SADD EL-AALI (HIGH DAM) PROJECT

16 December 1955

ANNEX A

Technical Description of Sadd el-Aali Project

Agriculture cannot be carried on in Egypt without irrigation. Water rather than land is the limiting factor for agricultural production. Practically all the presently developed water supplies are already utilized. The cropped land for the large and growing agrarian population has diminished from 0.90 feddans (1 feddan = 1.038 acres) per head in 1927 to 0.70 in 1953.

A substantial increase in agricultural production is urgently needed to meet the needs of the increasing population, which is growing at the rate of 2 1/2 percent per year, and to give an impulse to the development of other sectors of the economy -- industry, trade and finance -- which are otherwise likely to stagnate.

There is also a rapidly growing demand for electric power in the country. Present generating capacity is about 540,000 kw. Four times this amount may be needed by 1973.

The Government of Egypt proposes to carry out the Sadd el-Aali project to meet the country's needs for water and electric power.

The project involves the construction of a high dam across the Nile about 6 1/2 km upstream from the existing Aswan Dam. This dam would create a reservoir with a capacity of 130 billion cubic meters. Its primary purpose would be to store, for irrigation, practically all the annual run-off of the Nile flood waters. The dam would protect downstream areas from floods, and would improve navigation conditions on the river. A power station would be constructed with a generating capacity of 720,000 kw (half the ultimate potential).

The very large size of the dam, which would take at least ten years to build, may be seen from the following figures:

Length, at crest of dam	5,000 meters
Length of river channel section	550 meters
Maximum height	111 meters
Base of dam along stream channel	1,300 meters
Placement of materials in dam	44 million cubic meters

The reservoir would store 70 billion cubic meters for irrigation; could hold 30 billion for flood control; and would have 30 billion dead

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storage for deposition of silt. It would extend more than 500 km upstream from the dam.

The power tunnels, powerhouse and emergency spillway would be located on the left (west) bank, and the diversion tunnels on the right bank. Turbines and generators would be installed in underground power caverns. A 380 kv transmission line would be built from the site to Cairo, about 800 km (500 miles).

Although it is too early to calculate firm estimates of cost, the following figures are the best overall preliminary estimates of public and private investment available at present:

	<u>LE</u> <u>Millions</u>	<u>\$ Equivalent</u> <u>Nearest 5 Million</u>
Dam, generating facilities and power transmission lines	167.5	480
Irrigation and drainage works, land reclamation and settlement, public utilities and indemnities	<u>250.5</u>	<u>720</u>
Total	418	1,200

The costs of the public investment in the project, exclusive of interest, are estimated -- in figures rounded to five million dollars -- to be:

	<u>Foreign</u> <u>Exchange</u>	<u>Local</u> <u>Currency</u>	<u>Total</u>
Civil Works	\$150	\$165	\$315
Power	125	40	165
Reclamation and related public works	65	215	280
Resettlement - indemnities	<u>15</u>	<u>35</u>	<u>50</u>
	355	455	810
Interest during construction*	<u>55</u>	<u>95</u>	<u>150</u>
Totals	410	550	960

The project has been studied by eminent consultants employed by the Egyptian Government. Its design is sound. The capacity of the

* To the extent that public investment is met otherwise than out of borrowed funds, this figure will be subject to reduction.

reservoir would develop the maximum possible amount of Nile water for irrigation under present upstream conditions. Other proposed reservoirs on the Nile do not have enough storage capacity in the aggregate to ensure a comparable supply of water.

The project would be an integral and essential part of any comprehensive scheme for the full development of the Nile water resources such as the so-called Century Storage scheme, designed to provide over-year storage in the equatorial lakes and thus to smooth out long-term wet and dry cycles and to reduce losses in flood seasons. Sadd el-Aali, on the other hand, would store annual flood water and smooth out the fluctuations of river flow in any particular year and provide some hold-over storage.

Egypt would have to reach some agreement with the Sudan on two points:

- (a) The indemnity to be paid for flooding Sudanese territory. The Sadd el-Aali reservoir would extend about 200 km into the Sudan and would flood the Sudanese town of Wadi Halfa.
- (b) The division between the two countries of the water made available by the project. At present, because of fluctuations in the run-off and the limited storage available, the usable supply of water for irrigation varies considerably from year to year. On the average Egypt uses 49.2 billion cubic meters annually and the Sudan 3.6 (both measured at Aswan); there are losses of 20 percent between the point of measurement at the Sennar Dam in the Sudan and the Egyptian measurement point, Aswan. The Sadd el-Aali reservoir would not only stabilize the amount of water available for irrigation in Egypt, it would also increase the available annual supply. Of the total new supplies of some 18.7 billion cubic meters, measured at Aswan (after allowing for evaporation losses), Egyptian planning assumes that at least 10.4 billion cubic meters would be used for irrigation in Egypt and the Bank has based its calculation of benefits on that assumption. If agreement with the Sudan is reached on a figure significantly different from this, the benefits will have to be re-assessed.

On that basis, it should be possible:

- i) to increase the area irrigated by 1.3 million feddans (from 6.15 to 7.45);
- ii) to convert about 670,000 feddans of basin irrigated lands to perennial irrigation; and
- iii) to increase yields by improving drainage and assuring a more regular water supply.

As a result of these developments the country's agricultural income would be increased, ultimately by some 45 percent.

The electric generating capacity to be installed (720,000 kw), together with that of the Aswan power scheme now under construction and new thermal capacity planned to be constructed, would increase the country's total capacity from the present figure of 540,000 kw to about 1,900,000 kw on completion of the dam. This would probably suffice to meet demand for several years. Sadd el-Aali power could be delivered to load centers in Cairo and the Delta at a cost substantially below that of thermal power.

The navigation and flood control benefits are also important, though not on the same scale as the agricultural and power benefits. The cost of bulk transport in the country would be reduced, since the stabilization of the Nile flow throughout the year would make the river, with its tributaries and canals, navigable at all seasons. If floods are controlled by the project, the Government will no longer have to make recurring expenditures for flood control. Moreover, land will no longer be damaged by seepage and infiltration during the flood season.

While the full benefits from the project will not accrue until sometime between 1970 and 1975, substantial results would follow after Stage One is finished. Up to 6 billion cubic meters of storage might then be obtained for a period of a few years for use after the fifth construction year. If the full amount were used by Egypt, 700,000 feddans of basin-irrigated land might be converted to permanent irrigation, raising agricultural output in the area by over 50 percent, and some 500,000 feddans of new land might be brought under irrigation.

Meanwhile, the project will be the dominating feature of Egypt's economic development during the next ten years. Its financing will no doubt strain the country's resources, but can be accomplished provided the direct foreign exchange cost of the project can be covered in the main by external loans and grants and the remainder of Egypt's development program is carefully restricted to the resources likely to be available.

The investment is very large, both absolutely and in relation to Egypt's resources; but the magnitude of the economic and financial benefits which may be expected to result from it justify the expenditures involved.

There do not appear to be any alternative investment opportunities of equal promise. Without Sadd el-Aali the growth in the economy is likely to lag much behind the probable increase in the population. This would mean a steady decline in the standard of living, with serious implications for the future social and political evolution of the country. Even though Sadd el-Aali may not make possible any

significant per capita rise in the current standard of living, it will at least prevent a disastrous deterioration in this standard, and will give the country a breathing spell which will provide an opportunity for broadening the industrial base of the country.

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The following dispatch not included in this copy:

Dispatch No: State Khartoum 230

Date: 7 June 55

Subject: Division of Nile Waters

Approved For Release 2000/08/29 : CIA-RDP79S01008A000100090003-1

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