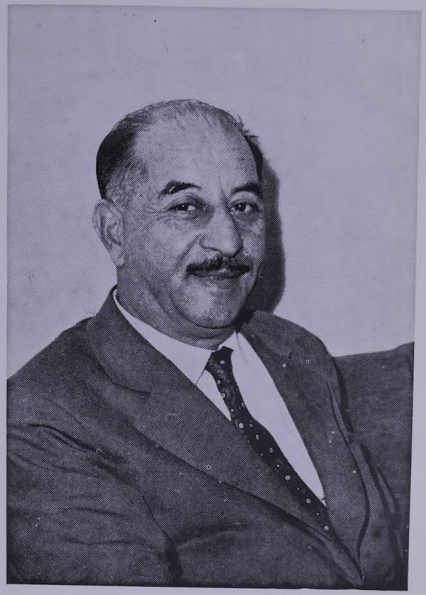
REPUBLIC OF IRAQ

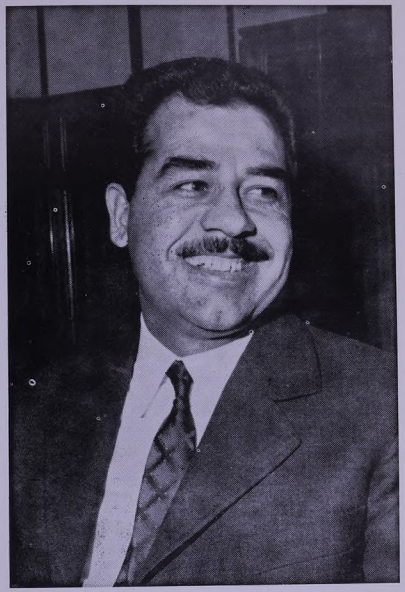
DEVELOPMENT OF IRRIGATION, DRAINAGE & FLOOD CONTROL DURING THE PERIOD 1950-1975 IN IRAQ



THE PRESIDENT LEADER

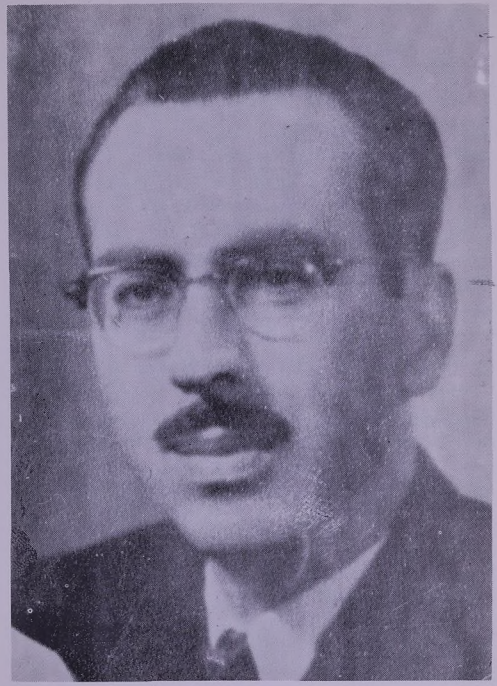
AHMED HASSAN AL - BAKR,

President of the Iraq Republic and
Commander - in - Chief of the Armed Forces



MR . SADDAM HUSSAIN,

Vice - Chairman of the Revolutionery Command Council



MINISTER OF IRRIGATION

DR. MUKARRAM J. AL-TALABANI

Development of Irrigation Drainage and Flood Control During the period 1950-1975 in Iraq

The Scientific exploitation of water and considering it as a valuable resource, methods of usage to secure National wealth through agricultural development; power generation, improvement of navigation and fishery wealth, providing water for industrial and municipal purposes, all these made the Ministry of Irrigation in the Republic of Iraq plans to achieve several projects, to complete projects have been started with and start with others on the long term period, provided that Financial and Technical requirements are available.

The total area of Iraq is (453) thousand Km^2 (about 45 million ha.), the cultivable area estimated by (24) million ha. of which about (4) million ha. located on the planes within the mountainous areas (400) mm. above rain fall line, most of the rest area is located on the Delta planes (150) mm. below fall line. The actual planted area is estimated by (6) million ha.

The climate of Iraq is semi-tropical, arid and continental with dry hot summers and dry cold winter. Average annual rainfall inthe northeast is (800) mm, and in the middle and south is around (150) mm.

Relative humidity is generally low except the southern part of Iraq where climate is affected by the gulf. In summer temperatures may reach 50°C in the central and southern parts and in winter may drop to a few degrees below zero. Average evaporation in summer is around (15) mm./day. Average yearly wind speed is (3.6) meters/second.

The soils of Iraq and especially inthe central and the southern parts are alluvial soil and differs in its texture between medium near the river banks to fine in the basin and depression areas. Organic matter content, nitrogen and phosphourus are present in small percentages in these soils. The soils have become saline because of the irrigation for many centuries, the rise of the resultant saline water table and the high evaporation rates especially during summer.

The major water resources of Iraq are the twin rivers, Tigris and Euphrates and their tributaries, and the underground water which is limited and is useful mainly for municipal purposes. Iraq has planned and completed many steps in the control of its water resources for irrigation and flood control purposes by constructing dams and reservoirs on its main rivers as Dokan, Derbendi Khan, Habbaniya, and Tharthar. Besides that, Iraq has taken into consideration, in the National forthcoming development plans, the construction of dams and other reservoirs such as: Mosul, Haditha, Himrin, and Bekhma dams for the storage of the great quantities of water during the flood seasons.

Since the establishment of the I.C.I.D. in 1950 and upto 1975 (Silver Jubilee of the Commission) Iraq has implemented the following irrigation and drainage projects:-

Storage Projects (Dams and Reservoirs)

The allocated amounts for storage projects in Iraq for the Five year forthcoming development plan (1976-1980) are (ID. 286.150) million.

1. Constructed Storage Projects:-

The Constructed storage projects are:-

Habbaniya Project

Is a depression located on the South-East of Ramadi Town (western part of Iraq). It has been used in the past as flood relief on Euphrates basin downstream Ramadi barrage by making breaches on the right bunds of Euphrates river to divert water to the lake through Warrar inlet Canal. Modification has been made on the designs related to Habbaniya project in order to serve another purpose besides flood control, and that is (irrigation), by diverting stored water during flood terms to the Euphrates river through (Thebban) outlet canal (200 m^3/sec.) The flow of water is diverted to the lake by Warrar regulator through Warrar Canal (2800 $m.^3$/sec). All the said works have been completed in 1951. The other complimentary works as strengthening the levees surrounding the lake have

been completed in 1969. The storage capacity of the lake at this stage is (3,20) milliards Cu.M.

Dokan Project

Dokan is a concrete arch gravity dam, (116) meters high, located on the North-East of Iraq at the lesser Zab River one of the Tigris River tributaries. The purpose of the project is impounding water particularly for providing irrigation water during flood seasons for Kirkuk Audhaim project, (area about 300 thousand ha.) power generation and flood protection. The storage capacity is (6,8) milliards Cu.M. and consisting of three irrigation outlet tunnels. The flow of each is (110) cumecs. The cost of the Dam and its appurtenant works is approximately (15) million ID. The work was completed in 1959 by Domez Palo Firm and other sub-contractors under supervision of the Consultants Benni Deacon and Gourley Partners Consulting Engineers.

Derbendi Khan Project

Derbendi Khan is a rock fill dam with impervious rolled Central Core, maximum height is 128 meters located on Diyala - Sirwan river (285) km. by road north east of Baghdad, Iraq, and in Sulaimaniya Governorate. The purpose of the project is to regulate supply of irrigation for Diyala area (middle of Iraq) near Baghdad for an area about half a million ha., flood control and future hydro-

electric power. The total volume of storage is (3.25) milliards Cu.m. and consists of (3) outlet tunnels for irrigation with total maximum flow of (486) cumecs.

The final cost of the project has reached to (28) million ID. and it has been executed in 1963 by American, German, and French firms under the supervision of Harza American Consultants and a group of Yogoslav engineers.

Tharthar Project

Tharthar is one of the most important project for flood protection purposes. The project area is located on the North of Baghdad. The project comprises of a link canal with head regulator which is located on Tigris river near Samarrah barrage with a capacity of (9000 m^3/sec.). and electrically operated gates. The project was completed in 1956 with an estimated storage capacity of (73) milliards cu.m. which has been increased upto (88) mulliards cu.m. after development.

2. Proposed Storage Projects:

The construction of dokan and Derbandi Khan dams have regulated the flow inthe Lesser Zab and Diyala rivers besides that supplying required water for the area of Tigris and Diyala besins during summer time. The present available storage water on the Tigris basin (Diyala included) is about (10) milliards cu.m. which is the total storage capacity of Doakn and Derbandi Khan dams.

This quantity is sufficient to provide irrigation water for the actual need of the croped area. On the completion of the projects under execution (Diyala, Kirkuk, Ishaqi and Dalmaj... etc). The demands for water become more and more and it will be very necessary to find ways of conserving water by the construction of additional reservoirs on the said basin to provide sufficient water for a total area about (2,15) million ha. It is also projected to construct other dam on the Tigris river and its tributaries. On the Euphrates basin the present available storage water is about (3,25) milliards cu.m. which is the storage capacity of Lake Habbaniya. This quantity is not sufficient to irrigate (1,5) million ha. of the agricultural lands located on the mentioned basin which needs not less than (18) milliard cu.m. and it became very necessary to construct another reservoir on upper parts of the Euphrates river such as Haditha dam (under construction now).

The most important proposed storage projects at present concerning Tigris and Euphrates basins are as follows:

Mosul Dam:-

Is located on the Tigris river almost (56) km. North Mosul town within Naynawa Governorate (North of Iraq), the height of the Dam is (127) m. it is combined rock-fill and gravel-fill dam. The maximum storage capacity is (13.3) milliard cu.m. The aim from construction is to provide water for an area about (250) thousand ha. of the Jazira area, hydroelectric power, flood control and Tourisim purposes.

The cost of the project is estimated more than (150) million ID. It is expected to start with the works in this project by the end of 1979 and will be completed in 1981.

Himrin Dam:-

Himrin is located on the Diyala river a t a distant of (120) km. (Northeast of Baghdad) within Diyala Governorate (middle of Iraq). It is an earth rock-fill dam and its total storage capacity according to the present study is (3,95) milliard cu.m. The cost of the dam is (21) million ID.

The works in the project will be completed by the end of 1979 as expected.

Bekhma Dam:-

Bekhma is located on the upper Zab river (North-East of the Country) within Erbil Governorate.

It is a concrete buttress arch fill dam and it can be constructed as a rockfill type. The total storage capacity is (8,3) milliards cu.m. for the purposes of Flood Control in the upper Zab river basin, agriculture and power generation. The dam will also provide water requirements for Makhmour plane project in the said governorate.

The specialized Soviet Institutes were asked to submit the technical requirements, designs, survey works, and field investigation according to the economical and technical cooperation agreement held in Moscow in September 1972.

Small dams on the Tigris river tributaries (North of Iraq)

Many foreign specialized companies and Institutes were asked to perform the required studies and investigations for a number of small projects in the north part of Iraq to irrigate the plane areas located there such as: Al-Khazer-Komil-Khalikan dam project on Al-Khazer river, Kolus dam and other dams of small capacities such as: Gali Dohok, Derbendi Comi Aspan, Waddi Bazka, and Derbend Shedla.

Haditha Dam:-

Is located on the Euphrates river upstream of Haditha town (West of Iraq) with an initial capacity of (7) milliard cu.m. necessary investigations, studies, and survey has been performed by the relevant Soviet Organizations. The cost of construction of the dam is ID. (80) million, and it is expected to be completed in 1980.

3. Irrigation and Drainage Projects:

Most of the irrigation and drainage projects in Iraq have been started with, since a long time ago, and up to date there is no complete irrigation and drainage project except small scattered areas here and there. The works executed in those projects comprise a small part of the works included in the whole project. The Ministry of Irrigation, since establishment in 1969, has considered to complete the irrigation and drainage projects upto collector drains and field irrigation canals. The government is also interested in implementation of projects scheduled in the National Development Plan for the years 1976/1980, on turn-key basis and upto cropping and marketing.

The number of the projects included in the above plan is (20) with a number of small projects in the Tigris river basin, of which total irrigable area is (2,341,743) ha. The number of the projects on the Euphrates river basin is (13) project and other number of small projects of which the total irrigable area is (1,567,370) ha. There are (3) projects in the Shatt-Al-Arab basin of (13,600) ha. area possible for irrigation.

The amount allocated for irrigation and drainage projects in the Development Plan for the year 1976/1980 is ID. (333.320) million. Since 1951 and upto 1974, the amount spent on irrigation, drainage, storage, and flood control projects, is ID. (221.083) millions, the list enclosed herewith gives an idea of the exploitation for the agricultural sector sanctioned at this stage. The annual expended amounts and the percentage of expenditures for each year. The following is the most important irrigation and drainage projects:-

Eski Kelek Irrigation Project

The lands involved in the project are located on the south east bank of the upper Zab river (one of the Tigris river tributaries). The irrigable area of the project is estimated by (10) thousand ha. The work in the project is divided into two stages, the first stage which irrigates five thousand ha. has been completed in 1971 with a total

cost of ID. (1.057) million. The work in this stage comprises; main and branch canals (136) km. length with appertenant structures and head regulator.

The second stage which consists of lands about five thousand ha. irrigated by branch canals taking water by means of two electrical pumping stations feeded by the main canals. All these works are under construction and are expected to be completed during 1975 with a total cost of ID. (1.19) million.

Ishaqi Irrigation and Drainage Project:

The project area is located on the both sides of Baghdad - Samarrah road (North of Baghdad) from Baghdad to Samarrah which is estimated by (100) thousand ha. the work in the project comprises irrigation and drainage networks upto collector drains with appurtenant structures and is divided into (15) main contracts. The study and design works for those contracts have been prepared by some foreign Consulting Engineers. The commencement in the project work was in November 1968, the percentage of the constructed works until April, 1974 was between 39% to 60%. Total cost of the project is estimated by ID. (150) million for cropping and marketing. It is expected to complete the project works during the forthcoming five year plan and it is considered one of the important projects due to the close proximity of this large and fertile land to the

Capital Baghdad, availability of irrigation water, intensive inhabitance about (100) thousand of peasants, availability of electricity and main and branch access roads that facilitates marketing the agricultural and livestock yields.

Improvement of Lower Diyala Irrigation and Drainage Project

The lands of the project are located within Diyala & Baghdad governorate and comprises all lands in South Hemrin mountain on the both sides of Diyala river and on the east bank of Tigris river. Area of the project is irrigated from the offtake canals upstream of Diyala weir (completed in 1971) from Diyala river, and from Tigris river by pumping. The area of the project consists of an alluvial plan which forms a part of the Rafidain main plane.

The irrigable area of the project is limited with (350) thousand ha. and is considered one of the important agricultural projects which has booussed on at the present and forthcoming National Development Plan due to its fertility of lands, being intensive with peasants, (190) thousand population close to the capital, availability of electricity and main and branch communication which facilitiates marketing of agricultural and livestock yields. The project is also considered one of the most

important resources for fruits and cetrus in Iraq.

The project has been studied by foreign consulting Engineers and a lot of works have been executed such as:- main outfall drains, drainage pumping stations, Diyala weir, combined head reach project to regulate water flow in existing old offtake canals upstream Diyala weirs on the left bank of Diyala river, In upper Khalis project of an area about (50) thousand ha. a complete irrigation and drainage networks have been constructed with appurtenant structures and other works are now under construction and are expected to be completed during the forthcoming five year plan (1976/1980).

Mandali Irrigation Project

The project is located on the east part of Iraq within Diyala governorate the aim is to provide the necessary water for irrigation and domestic uses by pumping water from the main canal to a high lands for an area about (11) thousand ha. The works in the first stage have been completed and include two electrical pumping stations, steel pipe line, and the main canal with related concrete structures, The cost of this stage was ID. (2.65) million, and it is under operation at present time to supply water for orchards and domestic uses in and around Mandali town.

The works of the second stage are under construction, include the construction of an irrigation network and pumping station, Asbestos-Cement Pipeline to irrigate an area about (10) thousand ha. The cost of this stage is ID. (1.756) million.

The work is expected to be completed at the beginning of 1976.

Improvement of East Gharraf Irrigation and Drainage Project

The project includes the lands located on the left Shatt-Al-Gharraf taking-off from the right bank of Tigris river upstream of Kut Barrage (constructed in 1939) and extended from Kut at distant of (170) Km. South of Baghdad city to the lakes at the southern and in the governorate of (Thee Qar) at a length of (120) Km. and width of (20-30) Km. The project extends over gross area of (288) thousand ha. including a series of Lakes within the project area covering some (25) thousand ha.

The cost of the project is ID. (70) million for the construction of new and remodelled irrigation systems taking-off from existing Gharraf Canal, an open collector and disposal drainage system, roads, pumping stations for drains water and operating buildings.

Cross regulators have been constructed on Shatt-Al-Gharraf canal with construction of embankment along both sides and completing some minor canalization to irrigate specific spots within the project area. In the forthcoming five year plan (1975/1980), it is intended to start with construction of the project which includxs (10) ten

contracts, seven will cover works for perennial irrigation, two for rice and one which is part perennial and part rice and is planned to be carried out within (14) years for cropping and marketing.

Saqlawiya-Abu Ghraib-Yousifiya - and Latiffiya Project

The project includes lands that are irrigated from Saqlawiya, Abu-Ghraib, Al-Yousiffiya and Al-Latiffiya canals taking-off from the left bank of the Euphrates river. This project is close to Capital Baghdad. The project area is (225) thousand ha. Most of the irrigation and drainage systems have been constructed and have also been started with the construction of field drains of the Pilot Project for an area of (15) thousand ha. Total cost of the project is about (120) million ID. upto cropping and marketing.

The work in the project is proceeding at present and is expected to be completed during the forthcoming (10) years. It is considered one of the most important projects due to land fertility, area being intensive with peasants, availability of electricity and main and branch communication. All these facilities marketing of the live stock yield and agricultural crops.

Dalmaj Project

The project is located in the South-West of Kut on the right bank of Tigris river between Kut and Nu-Maniya, for an area of (100) thousand ha. the project has been studied by foreign consultants and were prepared the documents of its contracts.

The works of: (Pumping stations, Mazzak irrigation and drainage system upto collector drains and appurtenant structures, Hawwar head regulator, Hussainiyah main drain and raising Kut Barrage gates) have been executed in 1965. The execution of other contracts in the projects are still continued as contracts (5-B) and (7-B), include irrigation and drainage systems and their structures. A Greece Company works on the project, under the supervision of MacDonald Consultant, The project is expected to be finalized during the five year forthcoming plan. Total cost of the project is about ID. (30) million.

Hilla - Diwaniyah - Daghara Project

The project is located in the middle of Iraq at Babil and Kadissiya governorates. It aims the land reclamation for an area of (312) thousand ha. with an estimated cost of ID. (41) million.

The project has been studied by foreign consultants and were prepared its contract documents. The work execution has been started since 1965 by improving and extending Shatt-Al-Diwaniyah and Daghara. Presently the execution of other contracts (which will be executed by a Greece Company) of the project are being carried out with an estimated cost of ID. (28) million. The work includes construction of irrigation and drainage systems, pumping stations and other appurtenant structures. The work includes construction of irrigation and drainage systems, pumping stations and other appurtenant structures. The work is expected to be executed during the five year forthcoming plan.

4. Flood Protection Works

Flood in the Euphrates and Tigris rivers starts in February, ends in May of each year. It is a result of the rainfall and snow melting in the area of feeding basins of the twin rivers and their tributaries.

Many projects have been constructed on the Ruphrates and Tigris rivers which aims flood protection, Iraq suffered from. So, as a result high flood water has been diverted to Tharthar depression since 1956, storing of the Lesser Zab river flood water in Dokan reservoir since 1958-1959, Diyala river flood water in Darbedndi Khan since 1961-1962 and Diverting Euphrates river water to Lake Habbaniya since 1955-1956.

The construction of Mosul Dam, high Enphrates Dam in Haditha, and Bekhma Dam on the upper Zab river will prevent flood dangerous, besides benefits obtained from the storage of water for agricultural purposes. Tharthar project has also been developed by raising the surrounding embankments in order to hold larger quantities for the same purpose. Its total capacity is (88) milliard cu.m. The statistics show that the largest amount which has been drawn off from Tigris river, in the years 1956-1966, during flood season of 1963, reached (14) milliard cu.m. and that of 1969 was (35) milliard cu.m. This was the largest amount entered the depression. The bunds on both banks of Enphrates and Tigris rivers are depending upon more than before, for the purpose of flood hazard protection. Priority was given to their construction, strengthening and raising since flood of 1967.

Enclosures

A list

List of the Determined and actual annual Investments for Agricultural Sector (Irrigation and Drainage) for the period of 1951 upto 1974 (Thousand of ID)
One ID. = about 3.4 $

Year	Periodical Investments Determined for Agricultural Section.	Anhual Expenditures for Irrigation and Drainage	% of Expenditures
1	2	3	4
1951/52	3534	841	24%
1952/53	8550	2491	29%
1953/54	13140	4795	36%
1954/55	14500	8519	59%
1955/56	15242	10940	27%
1956/57	28650	11298	39%
1957/58	31050	12085	39%
1958/59	30650	10768	35%
1959/60	47313	8646	18%
1960/61	29518	17457	59%
1961/62	19782	1962	10%
1962/63	20179	4296	21%
1963/64	22760	3043	13%
1964/65	24698	5723	23%
1965/66	25133	2800	11%
1966/67	29631	4479	15%

1	2	3	4
1967/68	29710	6209	21%
1968/69	40000	6844	17%
1969/70	22000	9805	45%
1970/71	28000	8535	30%
1971/72	60001	12187	20%
1972/73	22000	12961	59%
1973/74	175001	54399	25.37%

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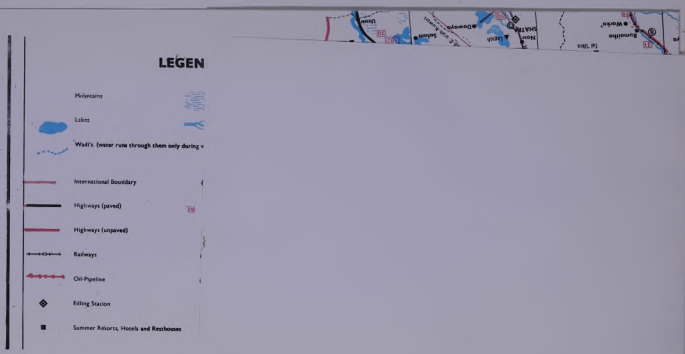
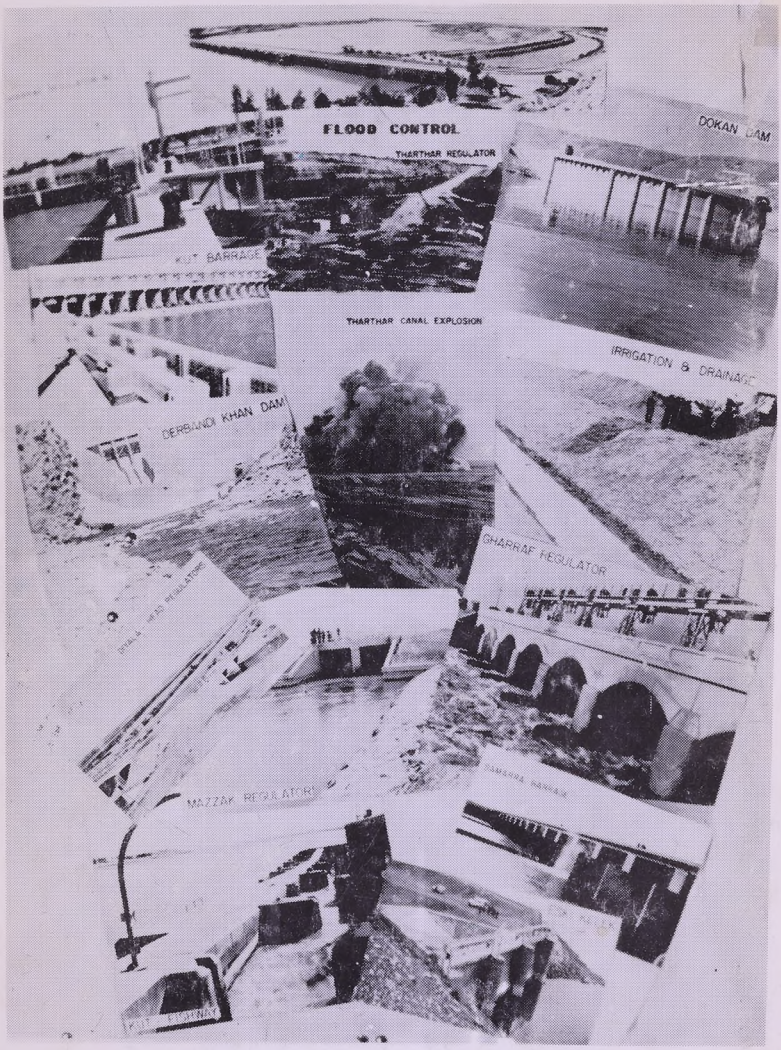

LEGEN
Mountains
Lakes
Wadi's (water runs through them only during
International Boundary
Highways (paved)
Highways (unpaved)
Railways
Oil-Pipeline
Filling Station
Summer Resorts, Hotels and Resthouses

MAP OF MAJOR IRRIGATION PROJECT IN IRAQ


FLOOD CONTROL
THARTHAR REGULATOR
DOKAN DAM
KUT BARRAGE
THARTHAR CANAL EXPLOSION
IRRIGATION & DRAINAGE
DERBUNDI KHAN DAM
GHARRAF REGULATOR
MAZZAK REGULATOR