Water Management in Iraq

Capability and Marsh Restoration

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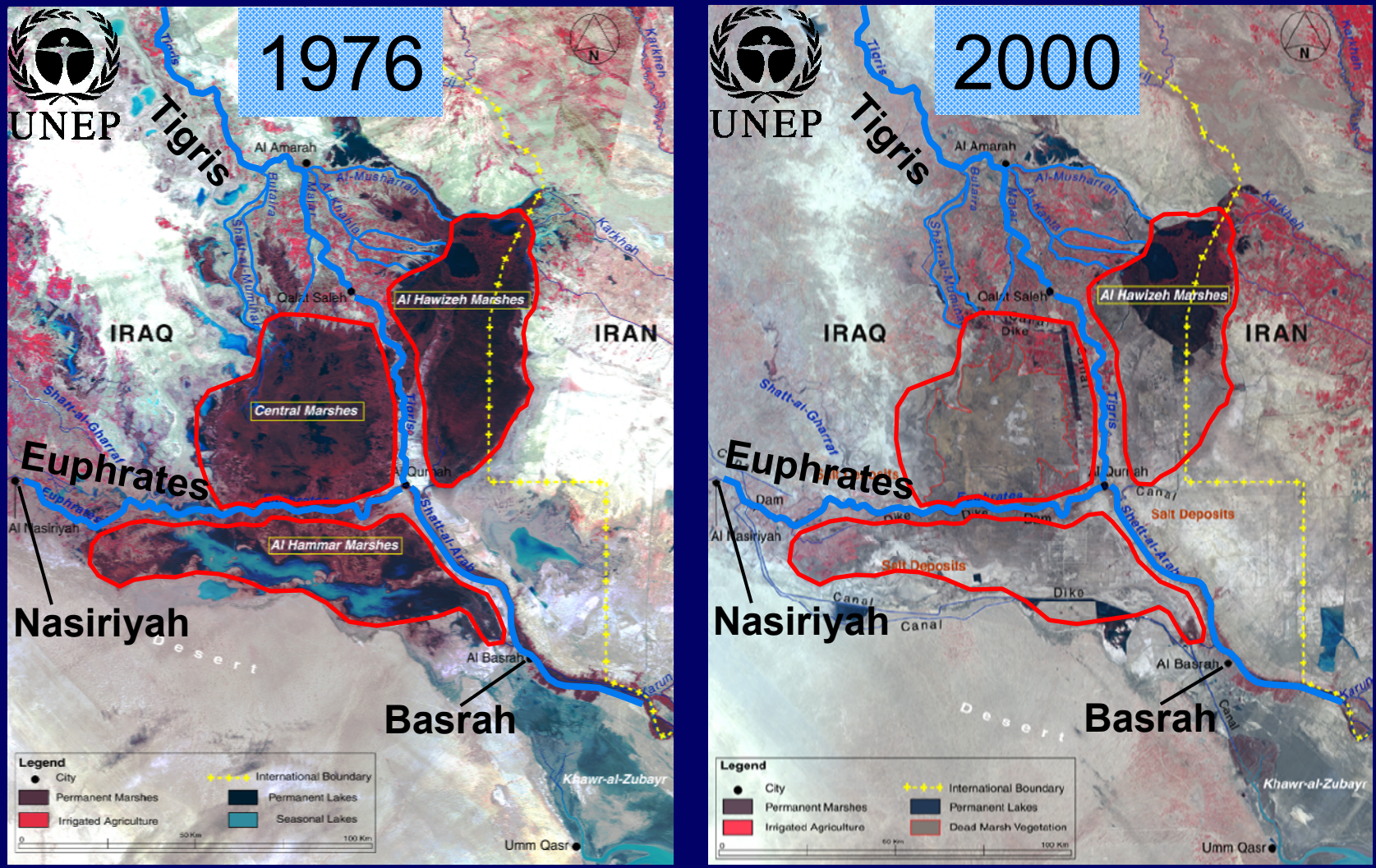
Iraq Ministry of Water Resources (MoWR)

- Rehabilitation and reconstruction of water management infrastructure.
- International donor and capacity building programs.
- Evaluation of available water resources, utilization, and management.
- USAID-sponsored Iraq Marshland Restoration Project (IMRP).

Tigris-Euphrates River Basin

- **Euphrates Basin**
  Thirty-two BCM; 95% Turkey, 5% Syria.
- **Tigris Basin**
  Fifty BCM; 20 BCM Turkey, 30 BCM tributaries.
- **System storage**
  Turkey – 90 BCM; Syria – 14 BCM; Iraq – 110 BCM.
- **Utilization**
  Iraq – 90% used for irrigation.

Drying of the Marshes



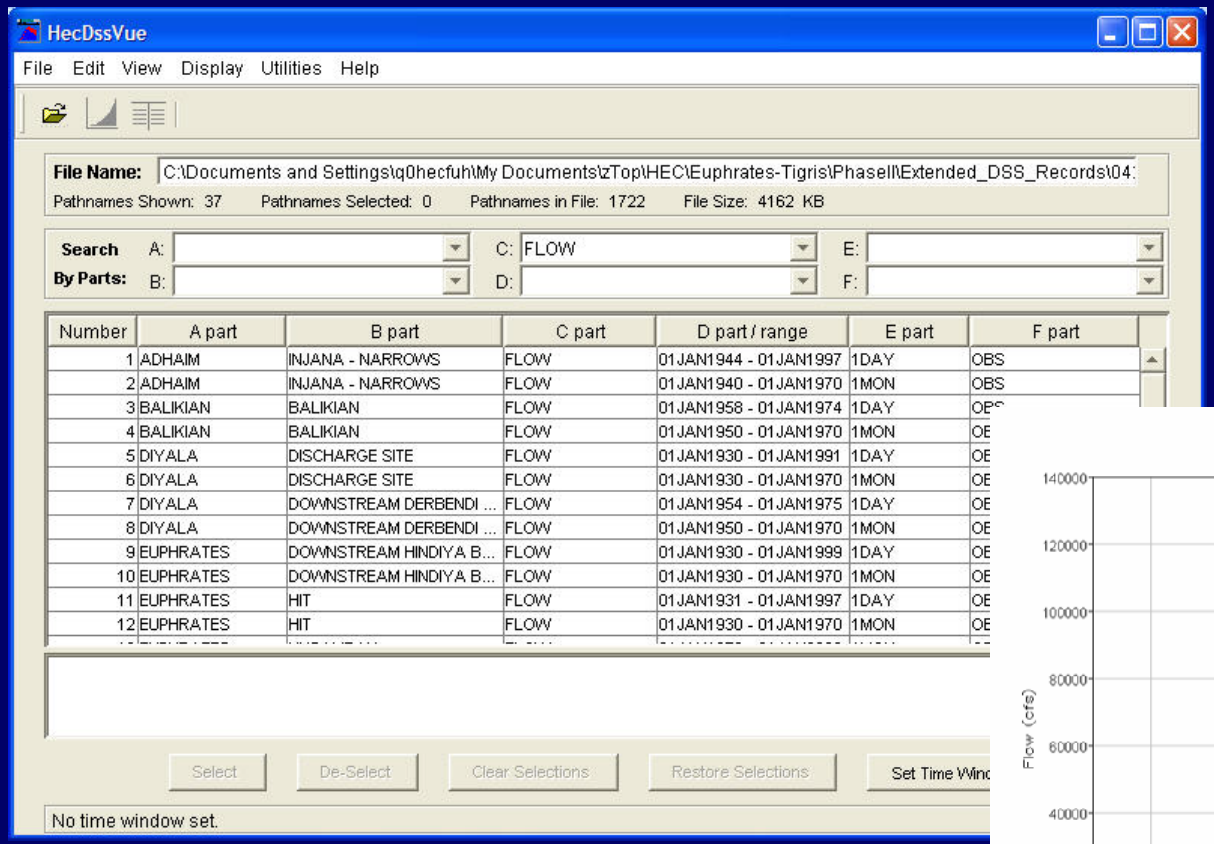
Images courtesy of UNEP/DEWA/GRID-Geneva
http://www.grid.unep.ch/activities/sustainable/tigris/2003_may.php

USACE Hydrologic Engineering Center

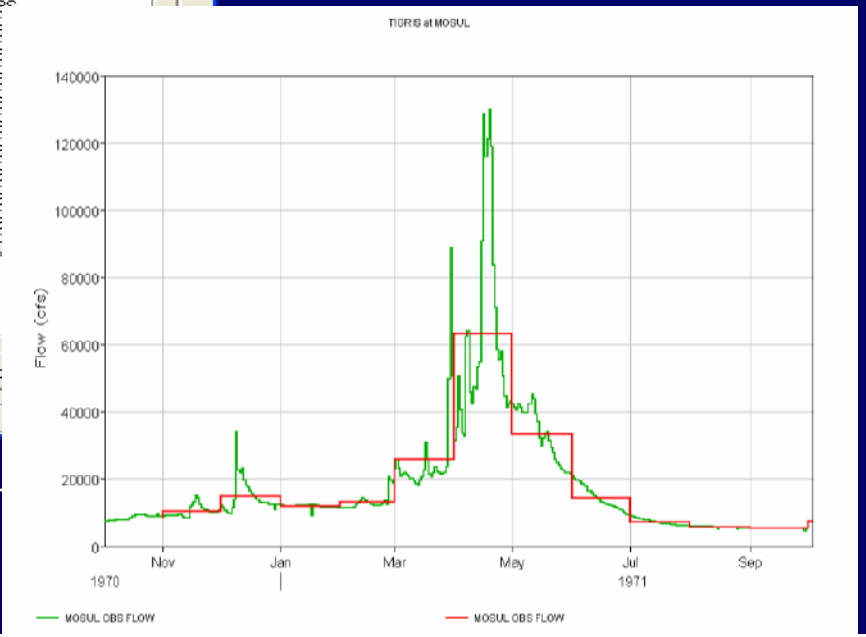
Restoration and Capacity Building support – Flow Data

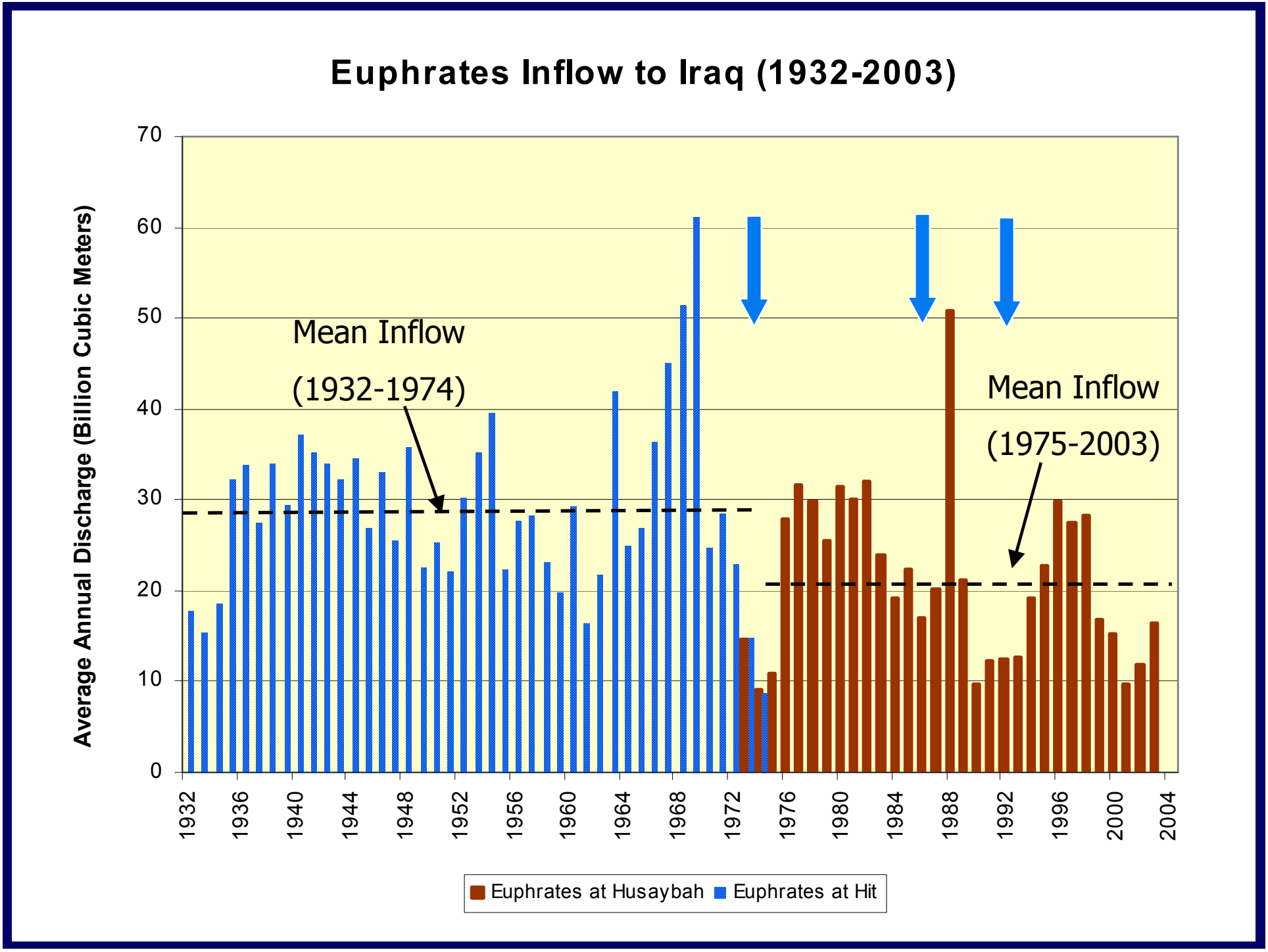
- Reconstruct streamflow data for gages.
  - Retrieve historic – archives through mid-70's.
  - Fill in missing, add new data through 2004.
  - QA/QC and place in HEC-DSS database.
- Develop scenario data sets.
  - Logic for headwater and local inflow to model.
  - Unimpaired (essentially 1930 system status).
  - Present development (2004).
  - A likely future scenario circa 2030+-.

Tigris-Euphrates Database



- HEC-DSSVue archived records of observed:
  - Stream flows
  - Reservoir elevations
  - Reservoir outflows

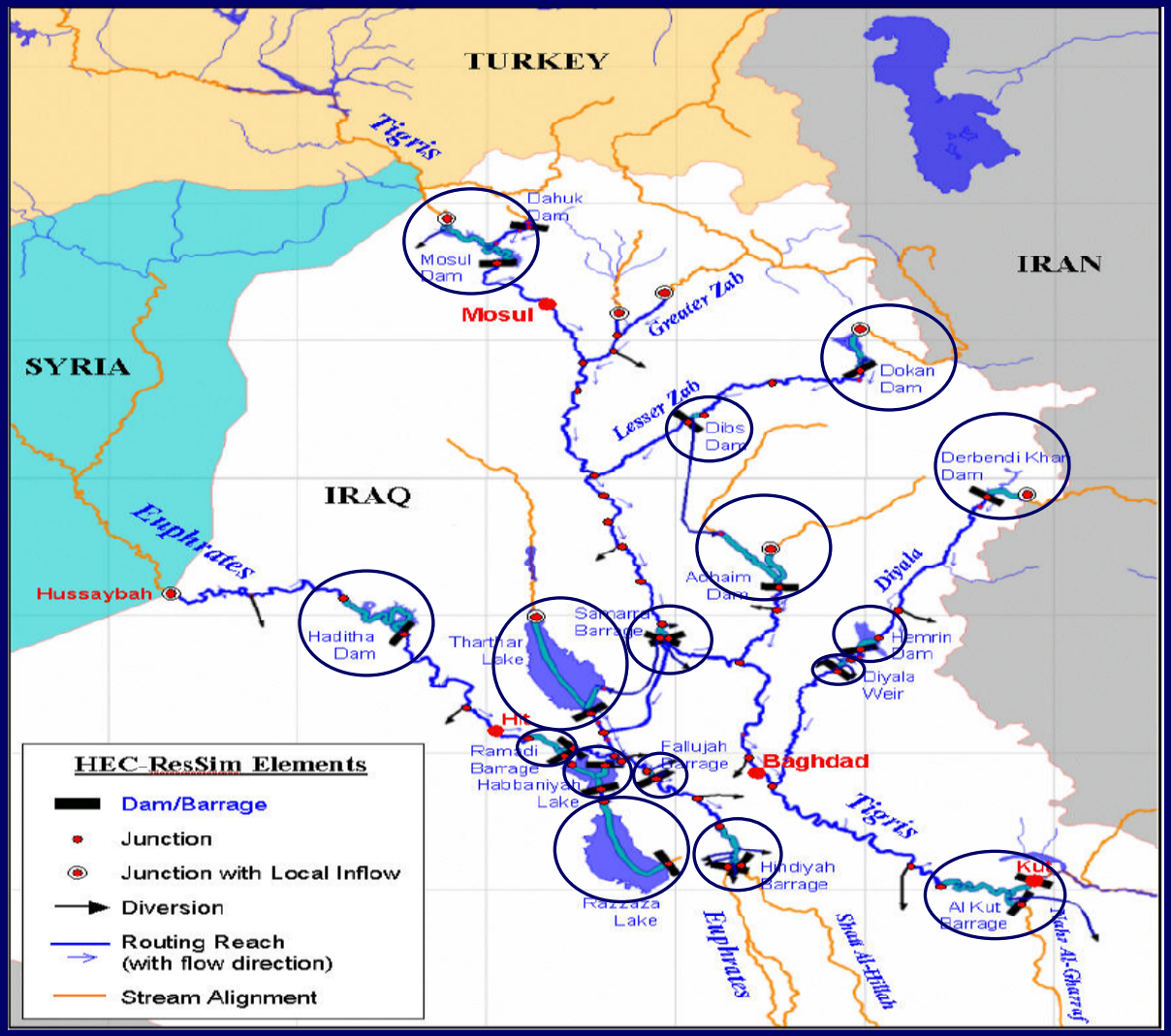



Euphrates Inflow to Iraq (1932-2003)
Average Annual Discharge (Billion Cubic Meters)
70
60
50
40
30
20
10
0
1932
1936
1940
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004
Mean Inflow
(1932-1974)
Mean Inflow
(1975-2003)
Euphrates at Husaybah
Euphrates at Hit

Restoration and Capacity Building Reservoir Simulation Model

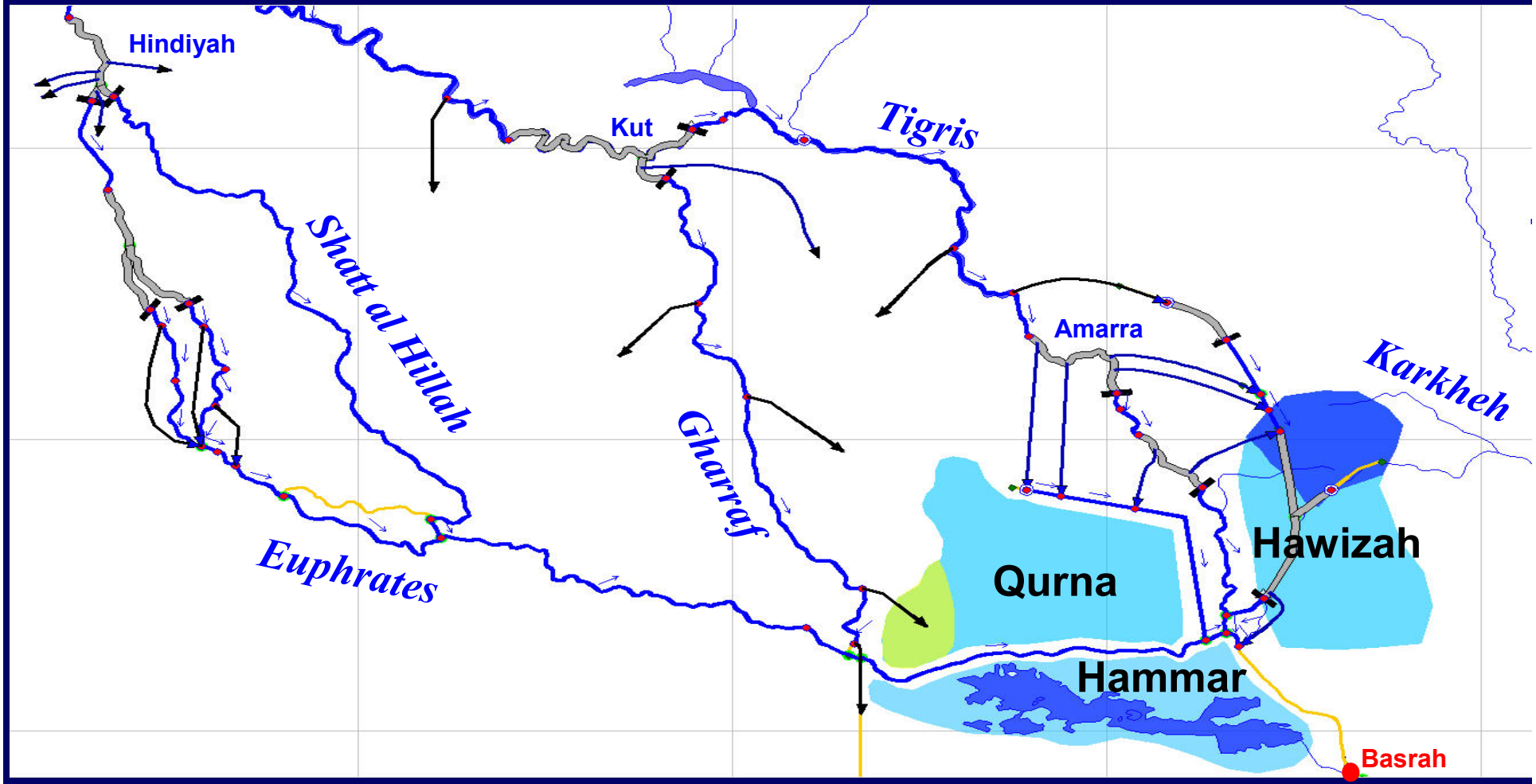
- Model development in partnership with Iraq Ministry for Water Resources (MoWR)
- HEC-ResSim Reservoir System Analysis software
- Rule-based, multi-purpose, seasonal reservoir operation
- Complex network of interconnected reservoirs, river reaches, and control points
- Scenario simulations
- Train/transfer model development and application skills to Iraqi engineers

Reservoir Simulation Model



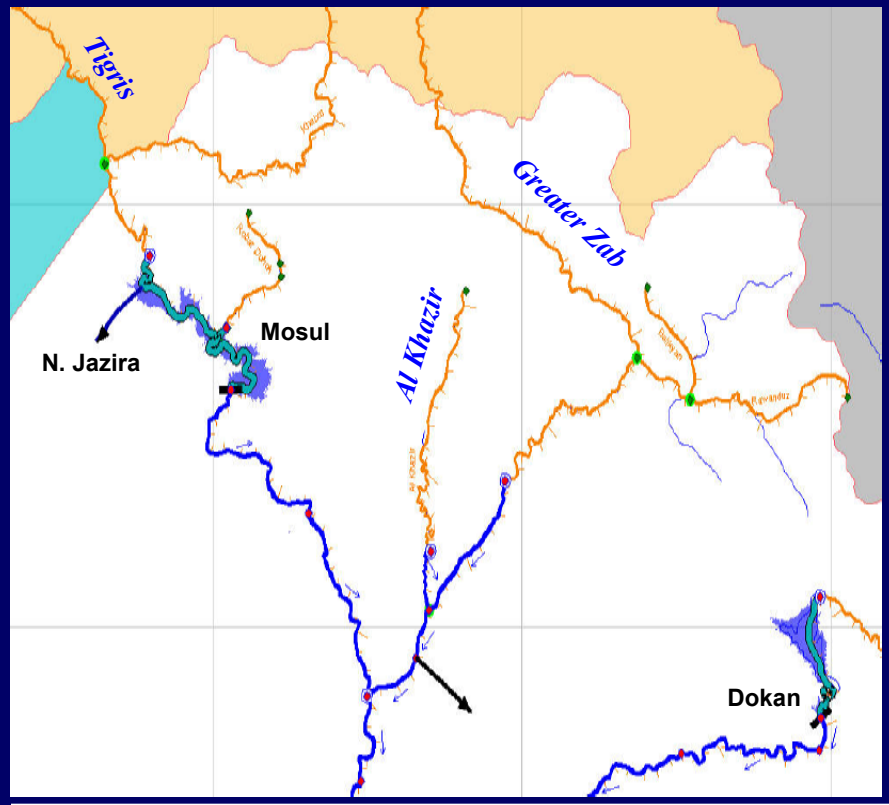
- Major Dams
- Off-stream storage reservoirs
- Low-head diversion structures "Barrages"
- Irrigation Diversions
- Delivery points to the Marshes

Lower Basin

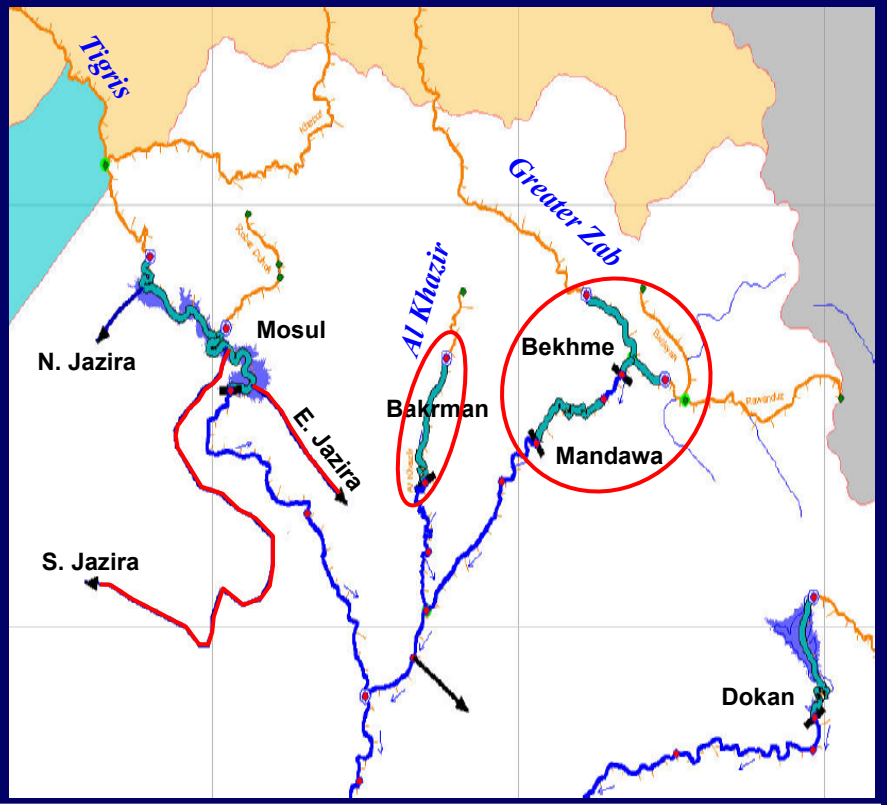

Hindiyah
Kut
Tigris
Shatt al Hillah
Gharraf
Euphrates
Amarra
Karkheh
Hawizah
Qurna
Hammar
Basrah

Future Development

Existing Conditions



Future Conditions

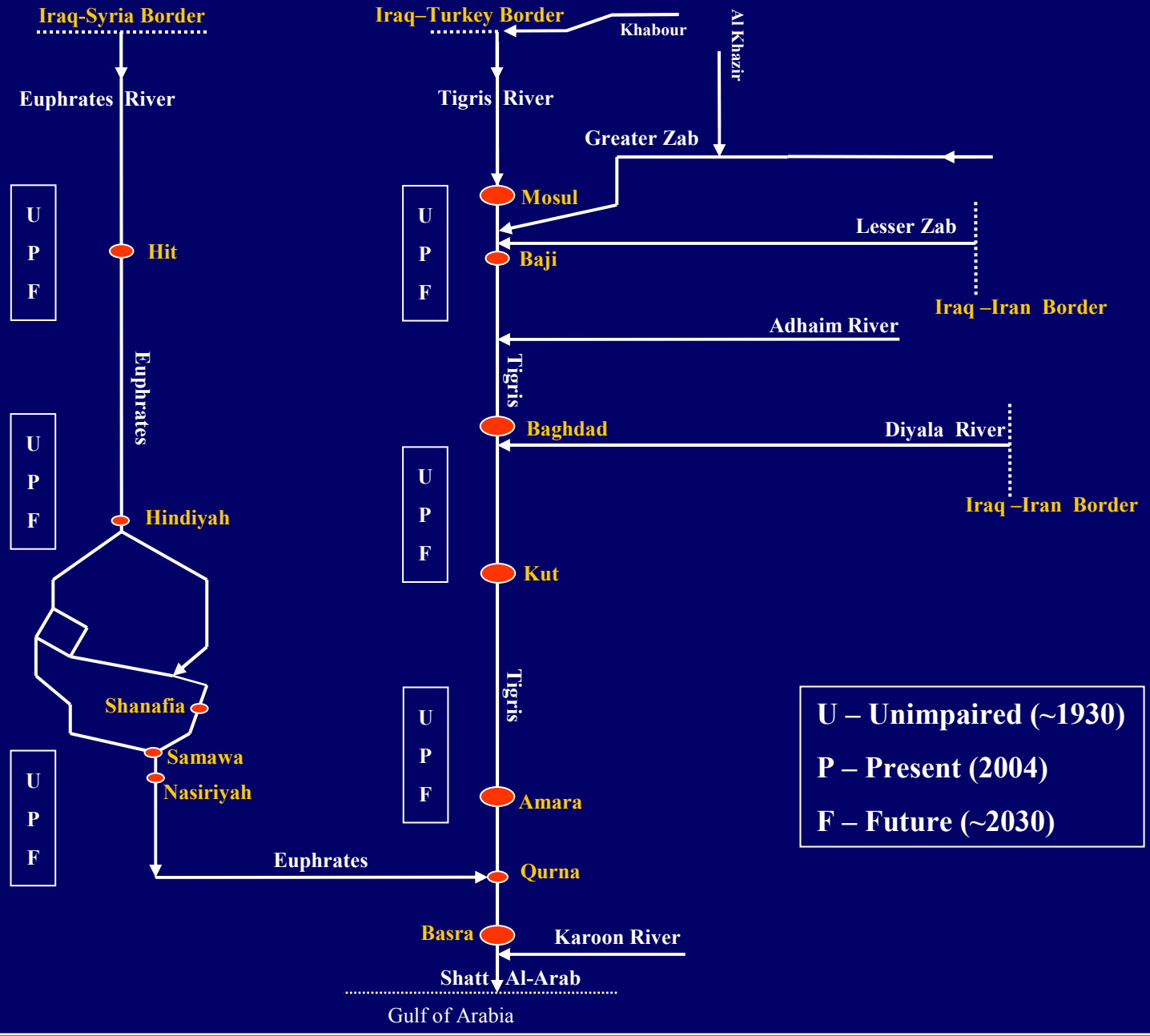


Modeling Scenarios

- Unimpaired (1930 level of development)
  - Simulate river system with regulation and depletion effects of projects that only existed in 1930
- Impaired (2004 level of development)
  - Simulate river system with regulation and depletion effects of projects that currently exist in 2004
- Impaired (2030 level of development)
  - Simulate river system with regulation and depletion – and including Marsh flow demand – effects of future projects that will exist in 2030

Tigris-Euphrates, Iraq

Water Balance



Capacity Building Activities

- USACE – ERDC led project, PCO sponsored.
- On-site, in US/Europe, study tours.
- Management-level training and tours.
- Technical training.
  - GIS, dam safety, water management.
  - Stream gaging.
  - HEC models.
- International professional and interagency relationship building.

HEC Key Activities

- Prepare standardized flow data sets.
- Perform ResSim scenario simulations.
- Conduct capacity building training under USACE and USAID programs.
- Transfer data and models to MoWR.
- Assist MoWR, USAID in further studies.

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