Application of the Multi-Criteria Analysis of Discrete Alternatives to Selection of the Operating Policy for Euphrates-Tigris Multiple Reservoir System

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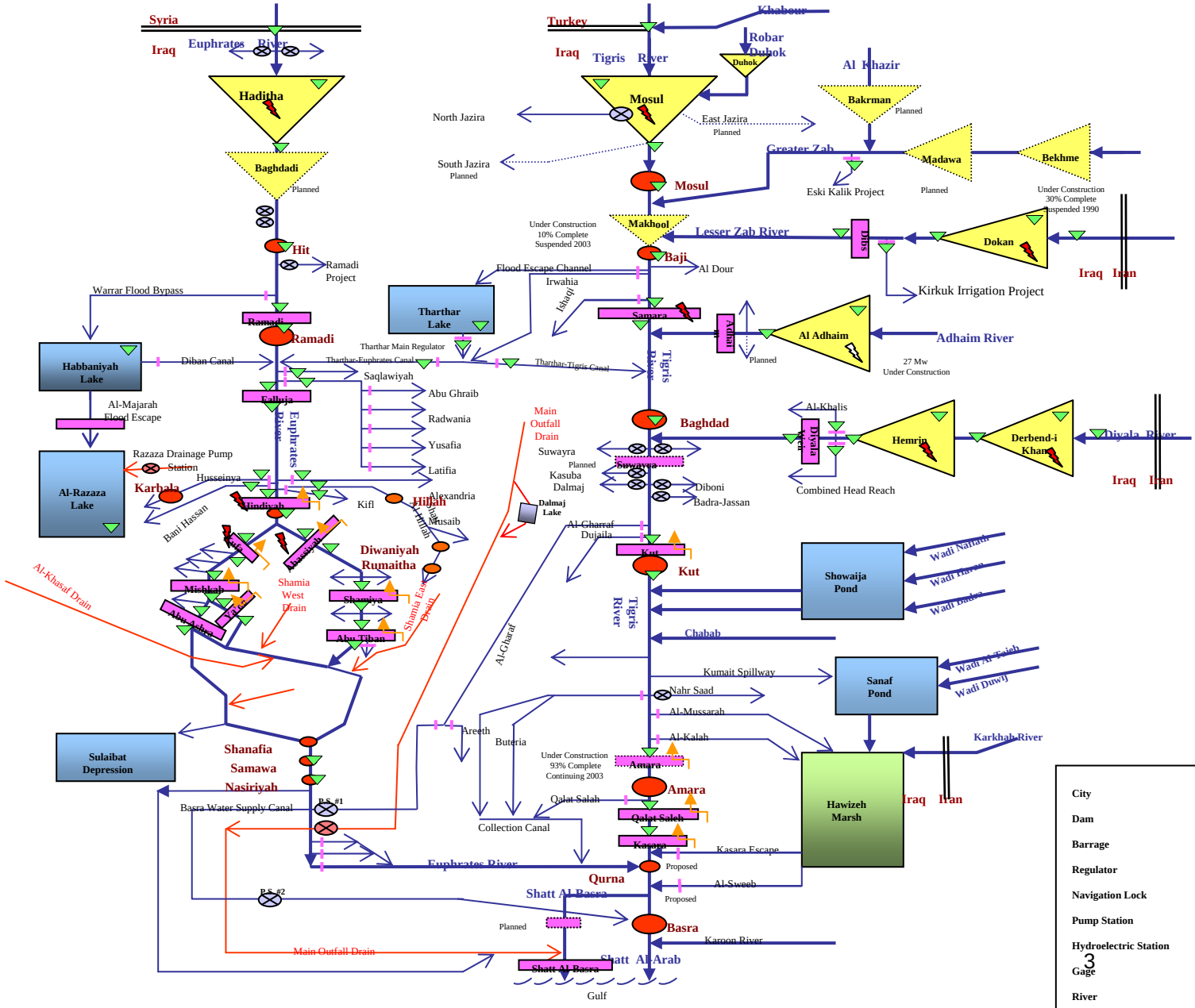
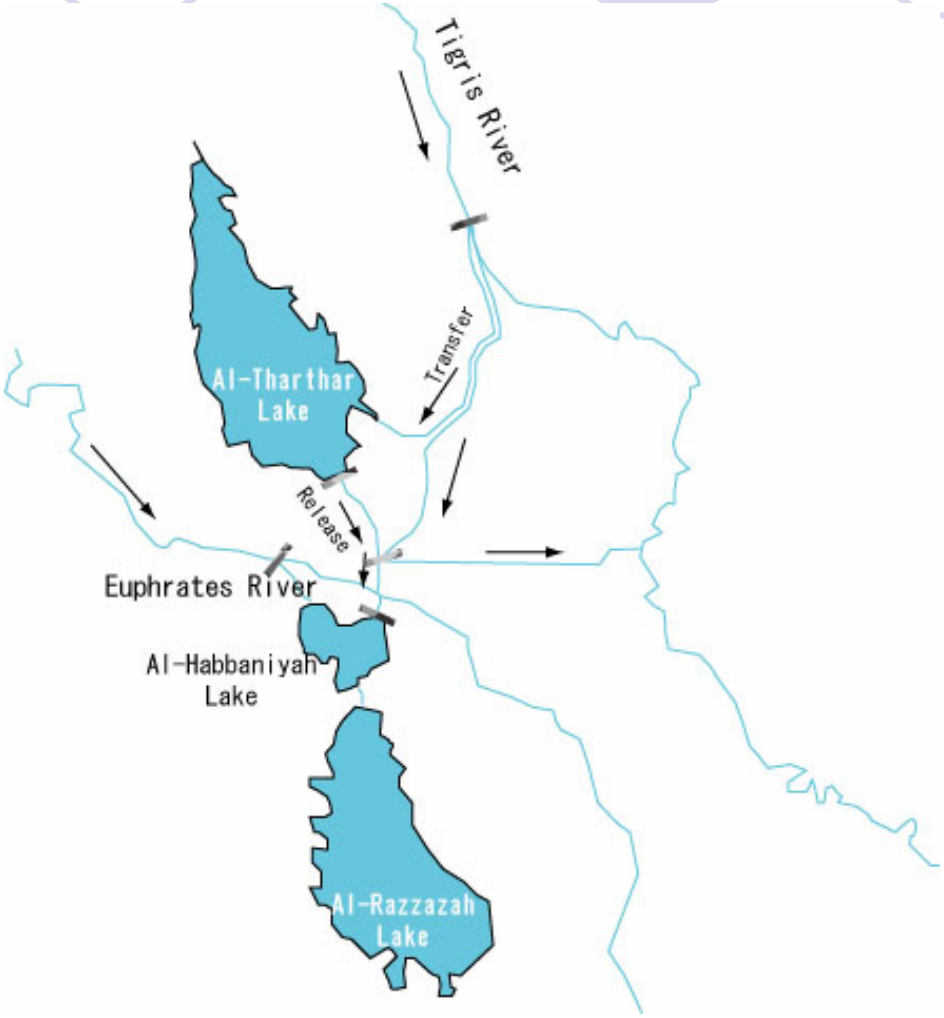
Euphrates-Tigris Water System

- Build around two major rivers: Euphrates and Tigris
- Vital source of water supply for agriculture
- Very complex in terms of number of elements, interconnections and interactions among them
- Involves water quality and quantity aspects
- Operation involves multiple, conflicting and often imprecisely stated objectives
- Currently used operating rules inefficient

Schematic Diagram for Storage and Control of Water in Iraq



Case Study System



Goal of the Research

Find Operating Policy

from the available set of Policy Alternatives

to secure possibly best water allocation

in space and time

How to Achieve the Goal ?

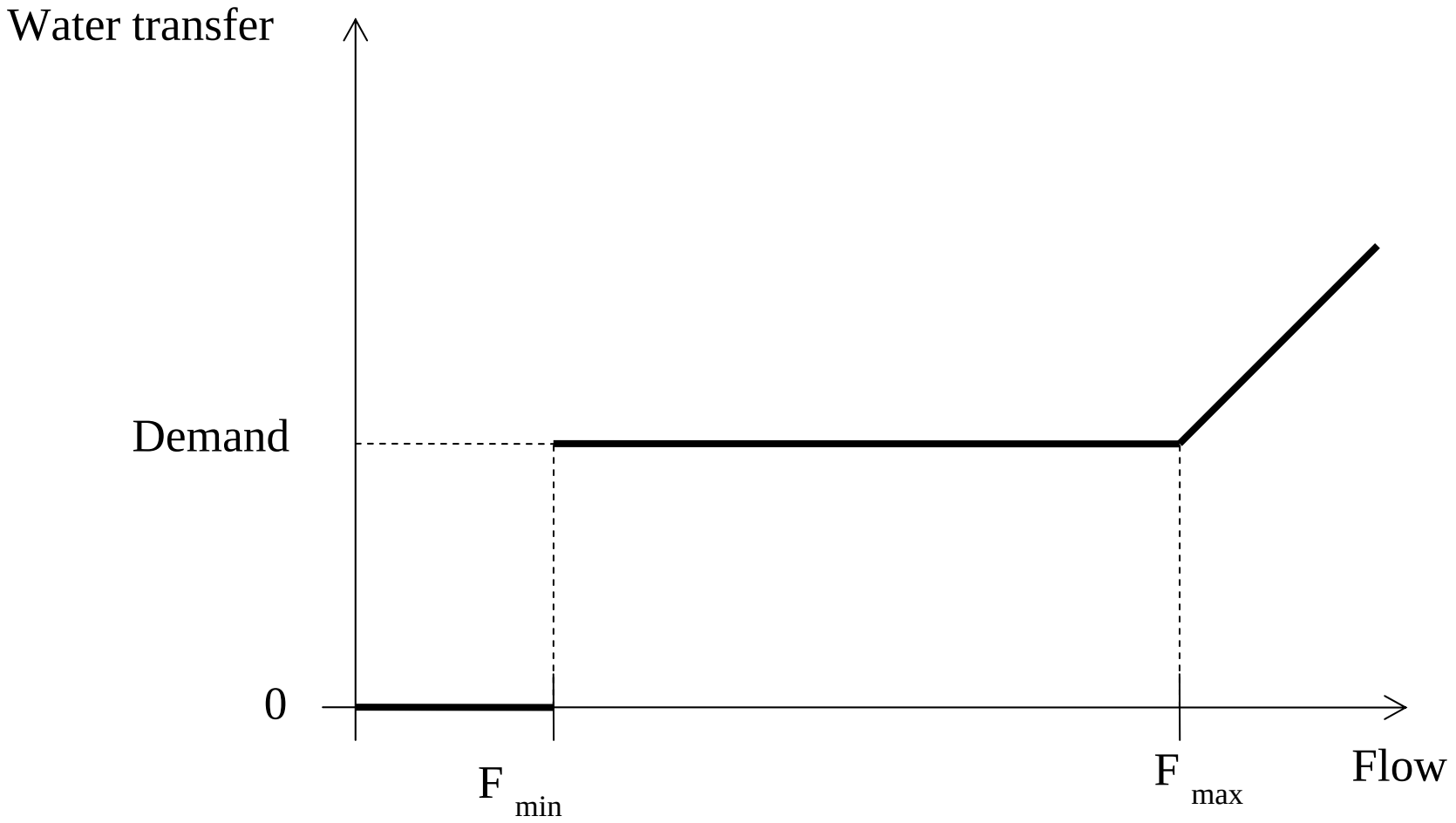
Simulation of system operation for given Policy Alternatives followed by Multiple Criteria Analysis of Discrete Alternatives (MCAA) to select the most suitable policy

Types of Decisions

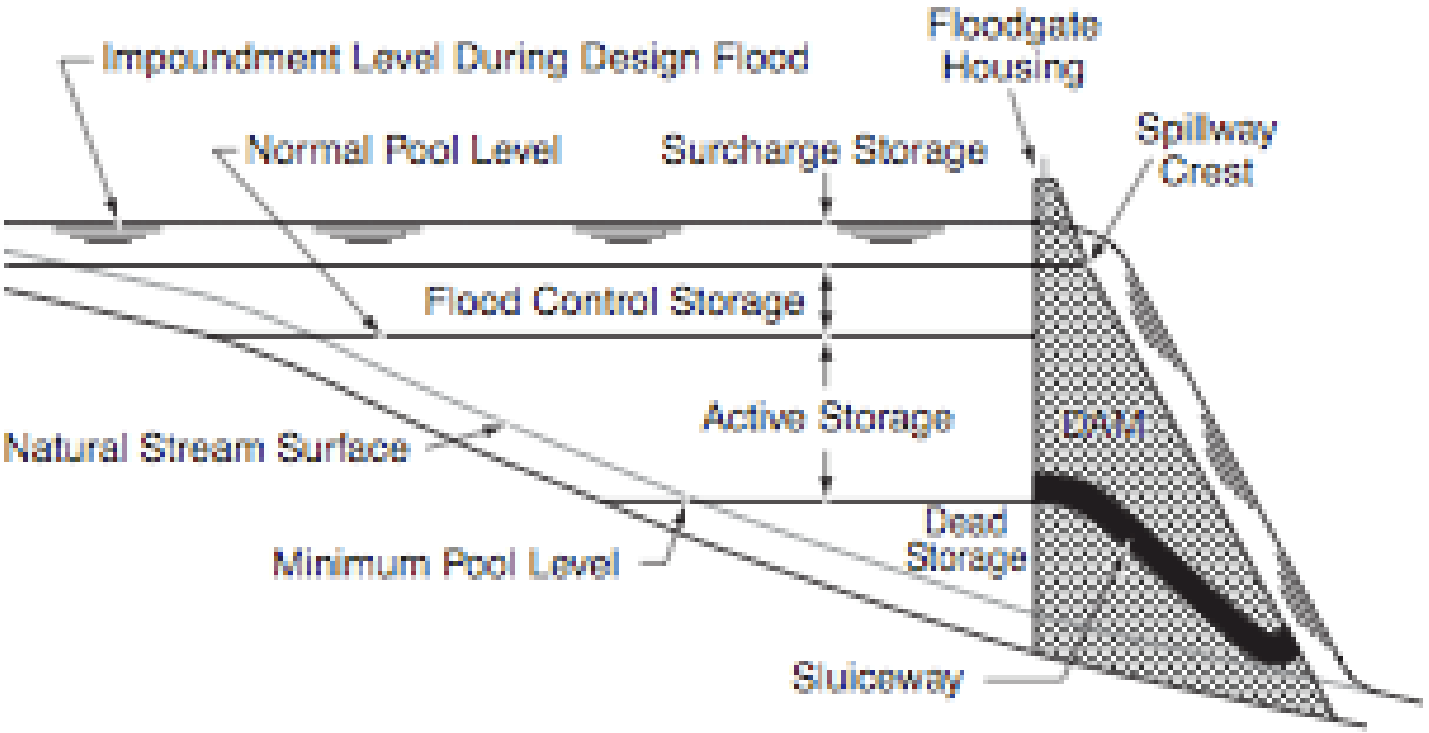
- Strategic decisions:
  - Cropping pattern
- Operational decisions
  - Water transfers from the river(s) to water users
  - Water transfers from the river(s) to reservoirs
  - Releases from reservoirs
  - Interbasin water transfers

Decision Rules Used (1)

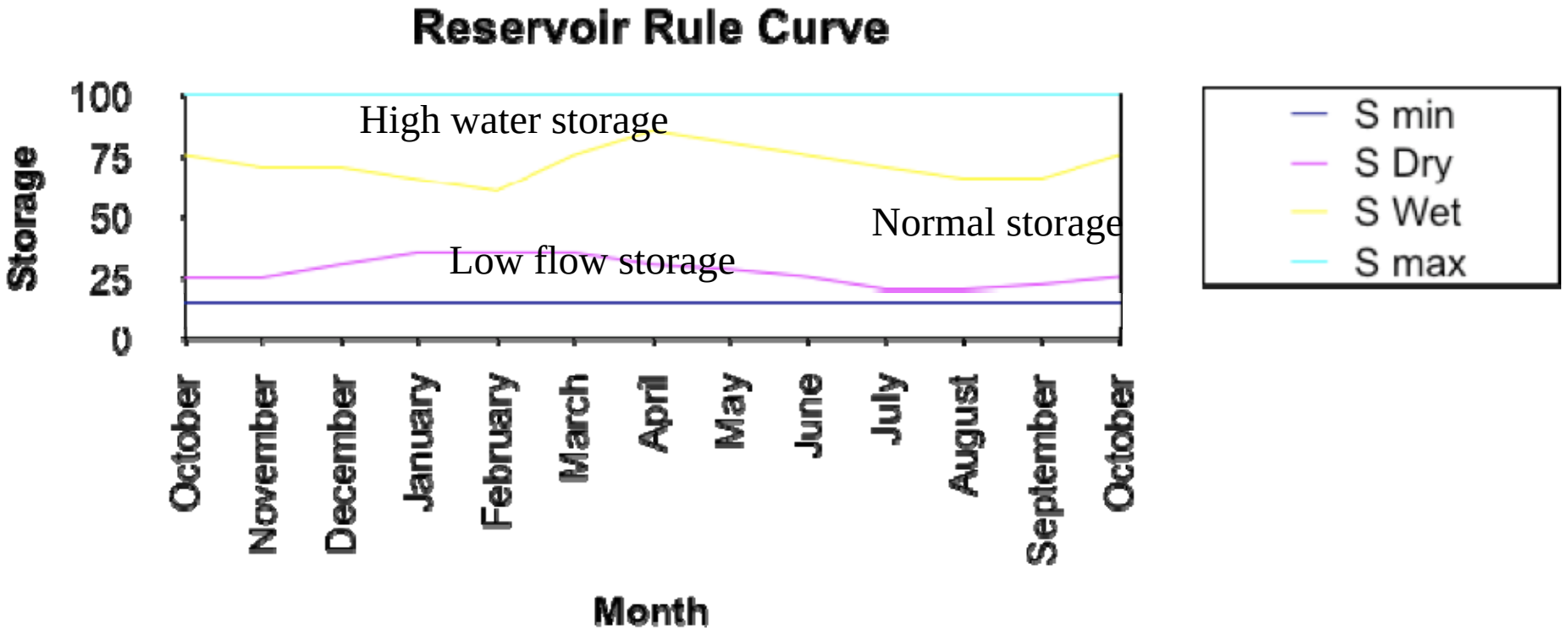
Parametric Rule



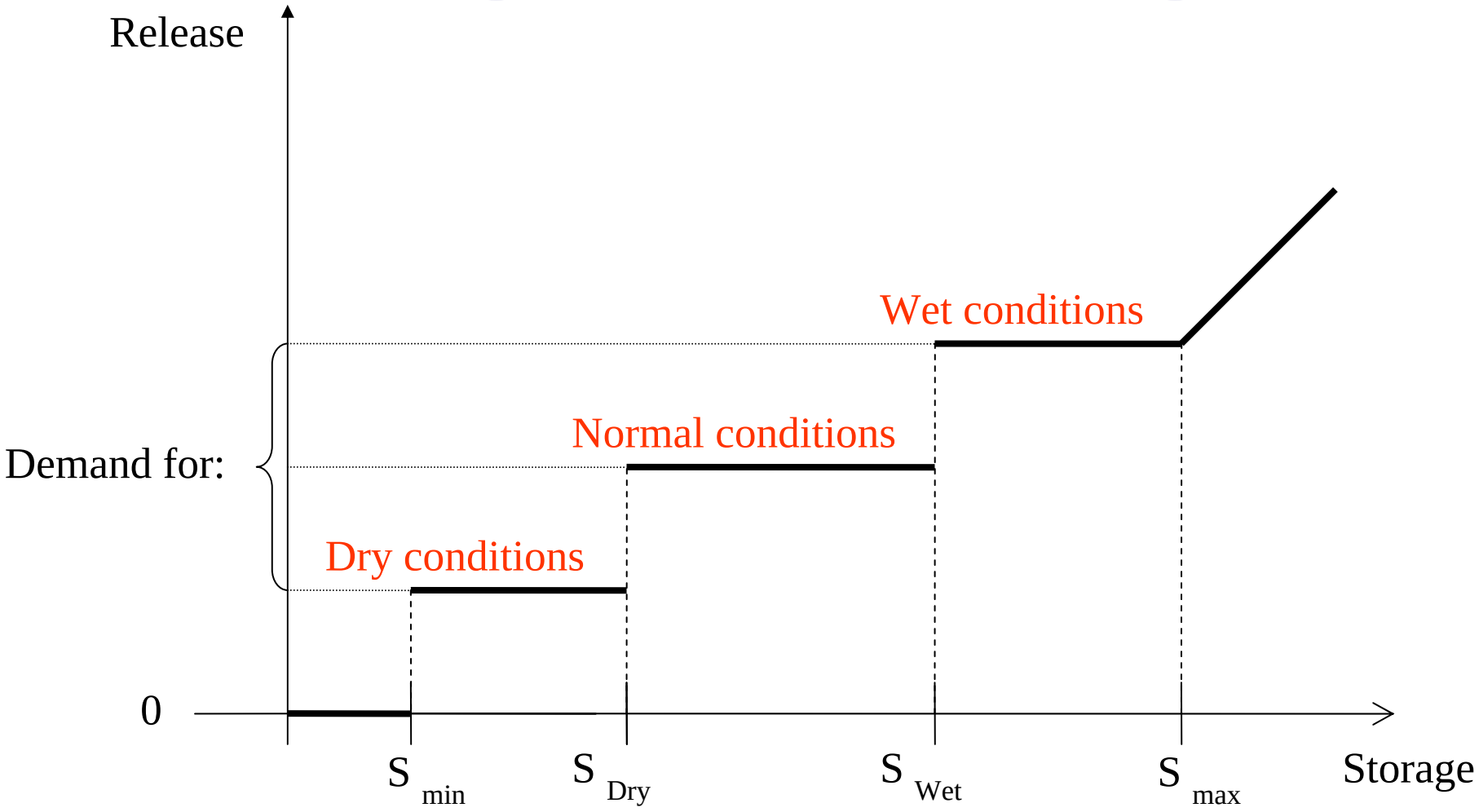
Storage Zones



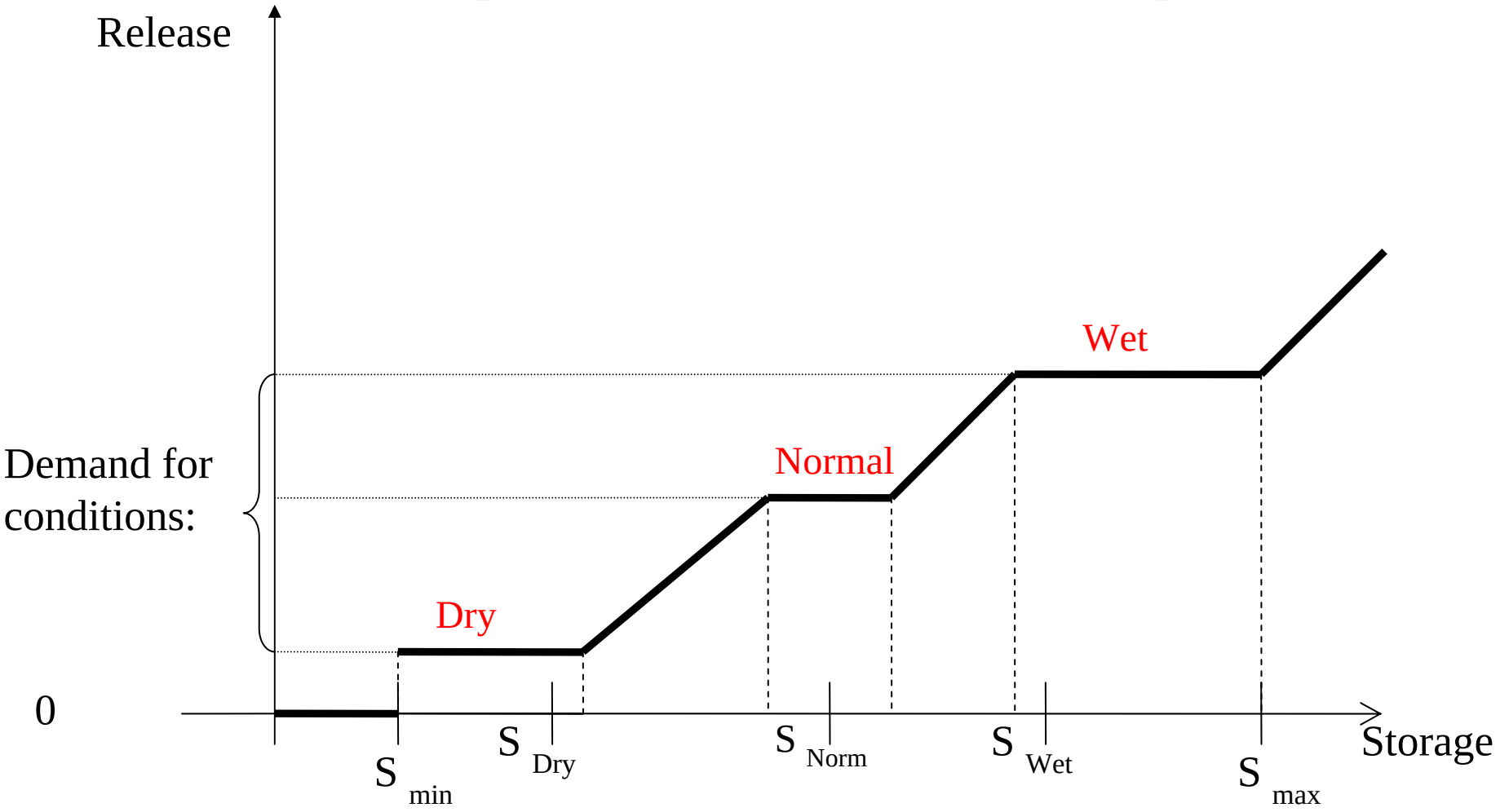
Decision Rules Used (2)



Traditional Operating Policy



Improved Operating Policy



Approach to Policy Selection (1)

- Policy Alternative defined through:
  - Agricultural water demands
  - Decision rules for determination of water transfer from the river to the users
  - Decision rules for determination of water transfer to reservoirs
  - Parameters of Rule Curve for determination of water release from reservoir
  - Rule for determination of water allocation between rivers

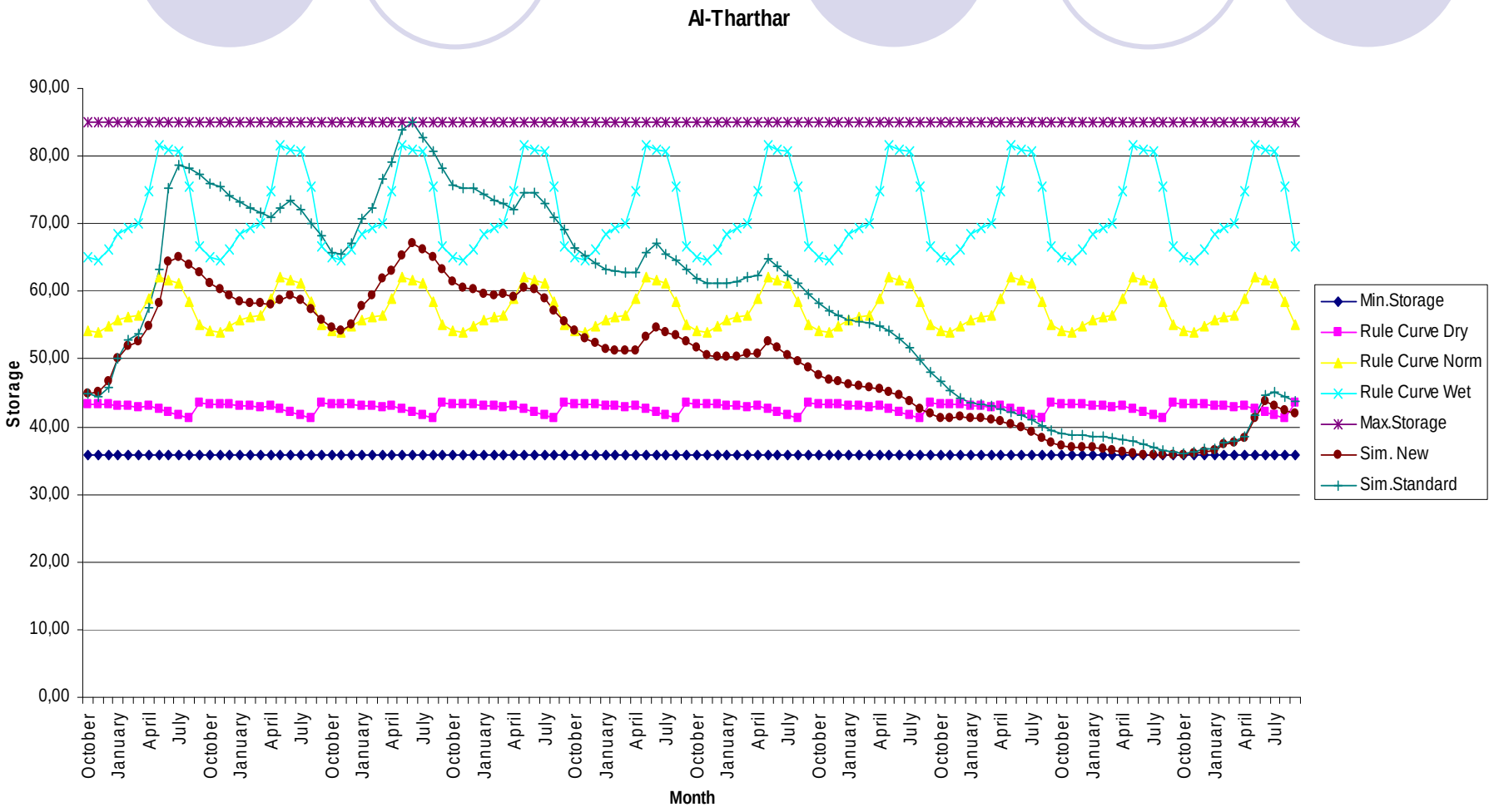
Approach to Policy Selection (2)

- Simulation of the system operation performed for each Policy Alternative
- Results of the operation evaluated using 32 criteria specifying:
  - Differences between reservoir target releases and releases determined according to chosen Policy
  - Differences between water demands and water transfer to selected water users
  - Maximum and minimum storage of the reservoirs
  - Maximum and minimum releases from reservoirs
  - Maximum and minimum interbasin water transfers
  - Minimum agricultural yield factor

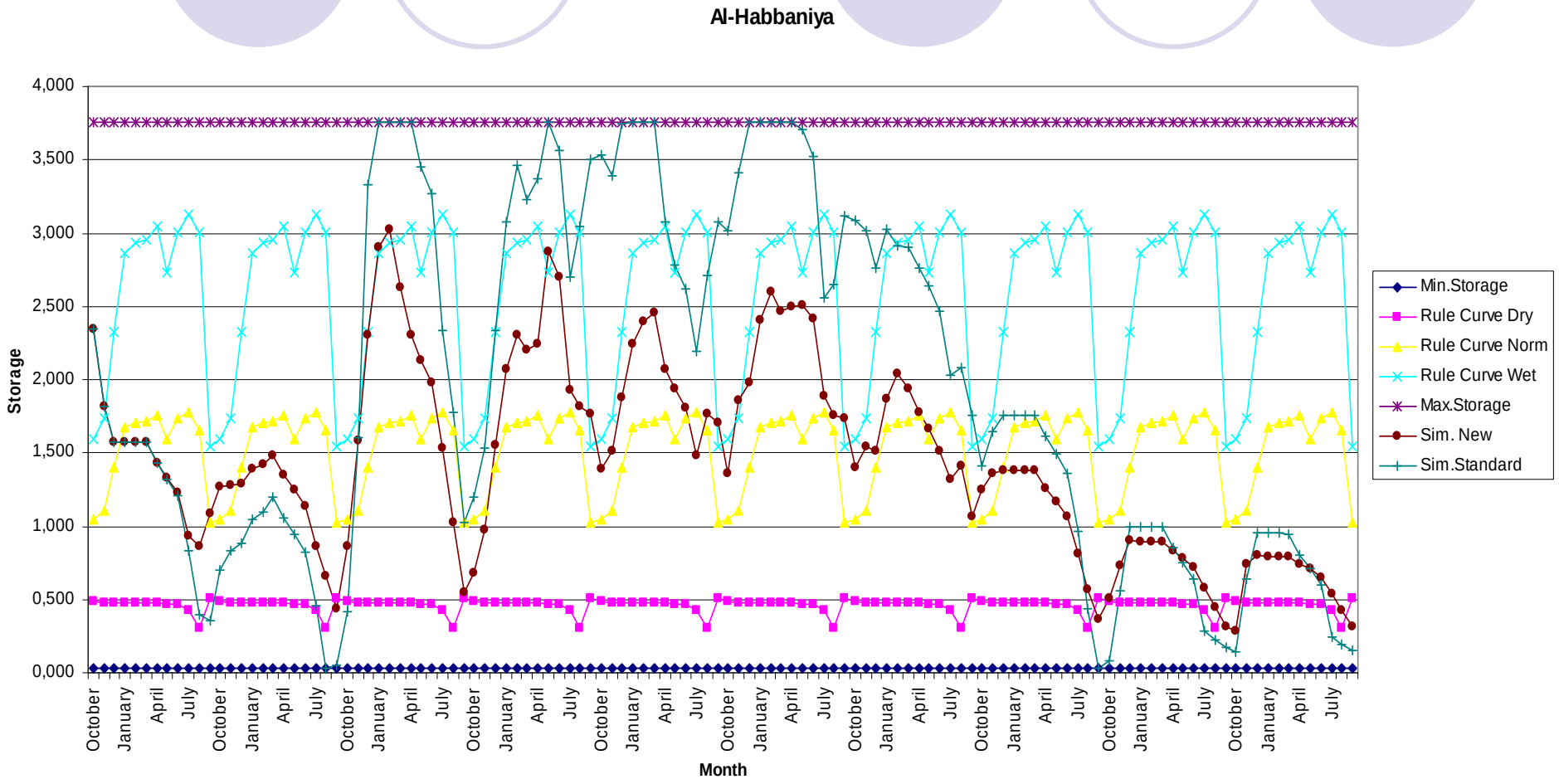
Approach to Policy Selection (3)

- Holistic analysis of simulation results
- Analysis of simulation results using MCAA
- Learning from the MCAA results
- Changes of performance indicators, operating policies, …

Simulation Results for Al-Tharthar



Simulation Results for Al-Habbaniya



Further Steps

- MCAA for available simulation results
- Learning from MCAA results
- Adjustments of operating policies
- Adjustments/replacements of performance criteria
- Selection of the best Operating Policy
- Search for more efficient cropping patterns

Thank you !