

Mega irrigation systems

The challenge

Agriculture is largest water user, especially irrigated agriculture. Within irrigation, mega systems (> 500,000 ha) consume most water. Located along many of the world's large rivers in arid areas - the Indus, the Ganges, the Nile, the Amu Darya - they are spread over several hundred thousand to millions of hectares. For example, Pakistan's Indus Basin Irrigation System is one of the largest integrated irrigation systems and extends up to 14 million hectares. But these systems are faced with challenges of an entirely different order than those facing other water systems. Currently, the state of mega systems is poor as the Water Productivity is low, environmental degradation occurs, inequity exists, and maintenance is inadequate.

Mega irrigation systems

- Are of great national economic and social importance
- Have a huge distance between head and tail
- Need beyond average expertise
- Form the entire landscape, more than irrigation system itself

Key tasks of mega irrigation systems

The main tasks within mega irrigation systems are (i) Water distribution (at main canal level, secondary canal level, and distribution at field level); (ii) operation and maintenance on the main irrigation and secondary system as well as on the drainage system; and (iii) water resources management, such as avoiding water logging and conjunctive management.



Sheikh Zayed canal of New Valley project, Libyan desert, Egypt by Rémi H

Management

Mega irrigation systems leave a heavy footprint on the entire landscape - not only the canals and drains, but also on the roads, bridges, urban settlements and residential property. They determine what happens in agriculture as well as other sectors. But the management of large irrigation systems is not usually spatial.

The Gezira: a history of changes

Established in 1925 under the Sennar Dam, a global engineering marvel, the Gezira is the largest irrigation system in sub-Saharan Africa. Gezira is located in the rich soil zone of central Sudan and consumes one third of the country's share of water from the Nile. The mega system experienced challenges in water management, both in supply and uses.

Four big changes in policies, followed by a change in objectives of the scheme, resulted in cumulative effects. Daytime irrigation



Gezira Scheme, Sudan. NASA image provided courtesy of NASA/GSFC/METI/ERSDAC/JAROS, and the U.S./Japan ASTER Science Team. Caption by Rebecca Lindsey.

was changed to continuous irrigation (day and night). The cotton crop was diversified with other crops and these other crops were intensified, putting the system under pressure. The value of water rates and methods of collection influenced operation and maintenance. Also, all engineering staff was withdrawn, leaving the systems in the hands of agriculturalists instead. All attempts unfortunately resulted in low performance and low yield which discouraged farmers from attending to irrigation and contributing effectively in water management. As a mega irrigation scheme, Gezira needs to be turned into a mega multipurpose scheme.

Way forward

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Mega irrigation performance indicators

- Irrigation efficiency
- Adequacy of services
- Reliability of services
- Water productivity
- Multifunctionality

Background picture: Construction site (2010) of the syphon that delivers water from the new valley project under the Toshka spillway in Egypt by By Steffl heffl

The Great Egyptian Water Productivity Hackathon

Team up, hack out solutions to get more per drop