

MODERNISING IRRIGATION INFRASTRUCTURE & MANAGEMENT

Shaping our world



Modernising Irrigation Infrastructure and Management – A Modern Approach

Irrigated agriculture is essential for global food security. Irrigation projects are the largest consumers of surface water and groundwater resources in the world, with water deficits in many river basins becoming critical. Rapid population growth, environmental degradation, climate change, competition from urban and industrial users, and public perceptions of waste and pollution are forcing a revolution in the way water resources for irrigation are allocated and managed.

Irrigation modernisation is a core component of Tractebel's strategy for effectively balancing these future competing water needs.

The integration of irrigation modernisation is based on our specialized expertise in irrigation, civil engineering, agronomy, hydraulic and hydrological modelling. Included are land use planning, construction, environmental assessment, and economic and financial feasibility analyses.

The complexity of programs to upgrade medium to large-scale canal and pump irrigation systems requires consulting services by experienced professionals. Their inter-relationships with physical constraints, economic and socio-political pressures throughout the project cycle of design, implementation, construction and commissioning.

Our approach to irrigation modernisation uses sophisticated design understanding and modern management principles to develop

designs and operation plans that are nevertheless as simple as possible.

Implementing modernisation projects to achieve efficiency, equity, and sustainability is a challenging task. Progressively, our expertise enhances with the increasing use of drip/micro irrigation, automated control systems, renewable energy sources, and computerized management systems. Every project completed by our inter-disciplinary water professionals increases our expert capacity.

Irrigation project modernisation is the process of upgrading infrastructure, operations and management to improve water delivery services and productivity of agricultural stakeholders. This process utilizes specific actions and tools to achieve objectives, focusing on the concept of water delivery service provided by the irrigation project to the farm.

Tractebel's modern approach to irrigation design and engineering integrates concepts and knowledge from advanced hydraulic engineering, water resources engineering, agronomy, and institutional reform, to implement successful multi-disciplinary projects.



Minipe Anicut on Mahaweli River, Sri Lanka

The Need for Modernisation

Irrigation performance remains unsustainably low worldwide. Many irrigation projects perform well below their potential, and improvements are urgently needed.

The progress achieved in many projects over the last decades is being reversed due to problems with waterlogging, salinisation, over-extraction of aquifers, environmental degradation, and infrastructure deterioration.

Perfecting Irrigation Performance

The perpetuation of current irrigation practices will lead to worsening environmental and economic conditions for many developing and middle-income countries.

Traditionally, rehabilitation efforts in irrigation projects have tended to focus on urgent construction needs through the execution of deferred maintenance.

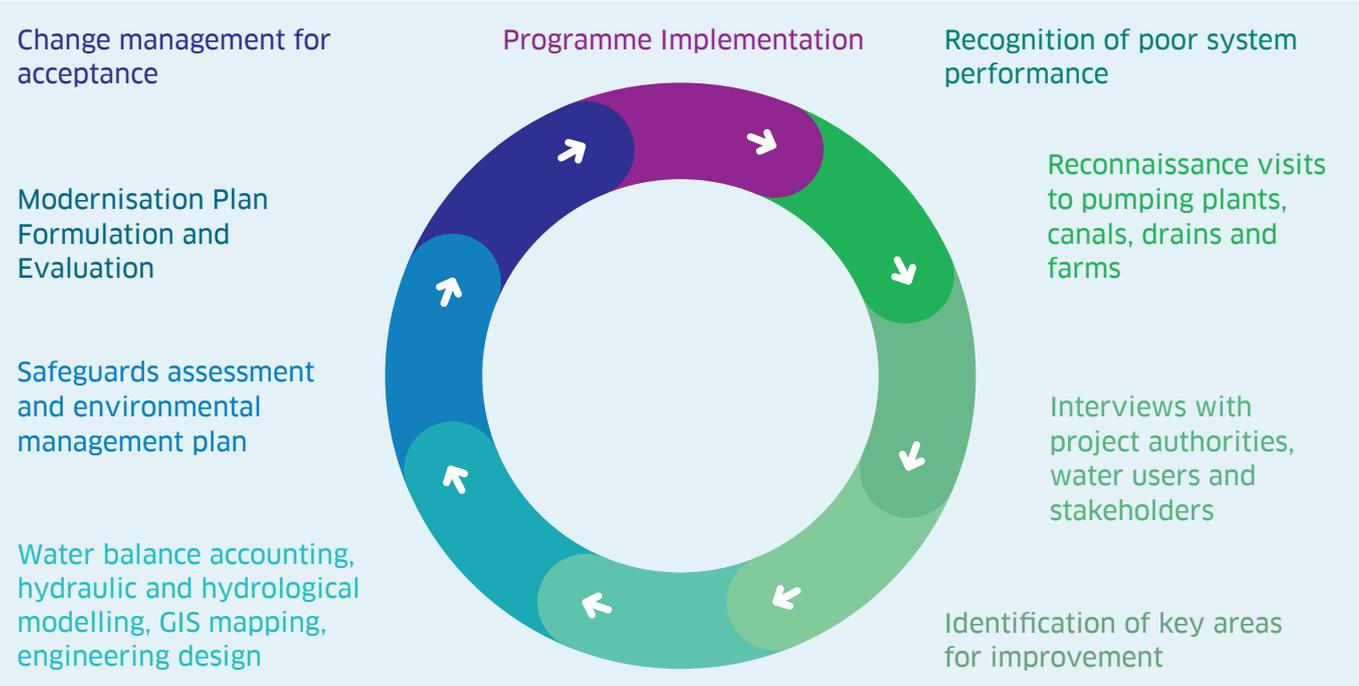
Solutions for Environment and Health

Future investments in the irrigation sector, however, will follow the lead of experience in the U.S., Australia, Spain and elsewhere.

These programs have also been targeting solutions for environmental problems and improving the health of natural ecosystems. Ecological benefits can include an increase in the stream-flows for fish and other endangered species.

Better irrigation practices also contribute to improvement in the water quality of irrigation return flows, reduced salinisation of land and improved sanitation for cities (since rivers provide higher flows rates of clean water for dilution).

Rehabilitation programs often attempt merely to restore deteriorated irrigation projects to their original state, usually retaining outdated modes of operation and obsolete technologies. Often this is done without considering that the deterioration may be a symptom of poor irrigation technical design and planning. This typically results in a continuous, vicious (and expensive) cycle of rehabilitation, deterioration, rehabilitation, deterioration, etc.



The Modernisation Process

Bringing a modernisation project to realization requires:

- A comprehensive process covering detailed technical and institutional assessment
- Analysis of current and future water demands
- Identification of constraints and risks
- Preparation of engineering designs, determination of the costs
- Benefits of alternatives
- Formulation of a prioritised set of actions that is consistent with legal and policy frameworks

Our staff have the knowledge, experience, and commitment to excel at every step.

Efficient, Economic Water Delivery Service

Each irrigation project is different. Some projects require more hardware changes than operational changes. Some require more developing changes than hardware changes. The great

opportunity lies in developing the right combinations to provide excellent and efficient water delivery service in a simple, economical manner.

Wide Range of Scientific Expertise

Ecological and social issues related to irrigation are now receiving increased attention. The proper incorporation of modernisation is a result not just a technical issue – the necessary wide range of disciplines includes socio-economics, gender issues, participatory management etc. The economically feasible and environmentally sustainable technical solutions devised by Tractebel address all these aspects.

Renewable Hybrid Systems are Key

Pumping stations require inputs of high amounts of energy and regular maintenance budgets.

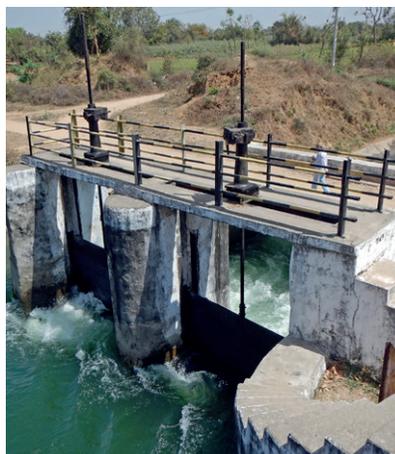
The trend in recent years is towards a reduction in the fossil fuel dependency of irrigation pumping stations. Through the conceptualisation and detailed design of modern hybrid systems, we achieve a reduction in fossil fuels inputs as well as an enhanced flexibility of the water distribution systems.

These renewable energy systems not only provide benefits in terms of reduced running costs, but also in reduced carbon emissions, contributing to international climate change goals.

Water resources planning and engineering for an effectively implemented modernisation project relies on a broad, system-wide understanding: how water is presently being used, how re-allocations would impact established water use patterns, and how specific cost-effective changes can be achieved.



Paddy farmers, India



Branch Canal headworks, Dharoi Irrigation Project, Gujarat



Automated monitoring of canal gates, India

The Benefits

Irrigation modernisation is necessary to overcome the present challenges of water scarcity and to meet the food security needs for an expanding world population in a sustainable manner. The benefits of irrigation project modernisation are cross-sectoral and multi-faceted.

Crop Yield Improvement

- Improved yield per hectare
- Increased yield per unit of irrigation water consumed (water use efficiency)
- Increased cropping intensity
- More land irrigated
- Improved crop quality
- Ability to shift to other high-value crops

Reduced Environmental Degradation

- Smaller river diversions – to maintain in-stream flows
- Better quality return flows
- Less water consumption makes water available for other uses
- Fewer salinity problems
- Fewer drainage problems

Increased Financial Self-Sufficiency of a Project

- Increased revenues for farmers
- Optimised O&M costs
- Lower project-level expenses for the same or better service

Easier Management and Operation of the Project

- Modern management and automation technologies
- By Irrigation Authorities

Less Damage to Structures and Property

- Less damage to canal lining due to fluctuating water levels
- Fewer uncontrolled spills that damage canal banks and surrounding property
- Less rodent damage

Enhanced Social Impact and better Quality of Life

- More social harmony within the project
- Community participation in water management
- Greater participation by women in decision-making
- More food security

Use of Clean Energy

- Powered by renewable energy alone or in hybrid systems
- Reduced carbon emissions and dependency on fossil fuels
- Reduced aquifer exploitation with minimum infrastructure investment



Kuyu Mazar Pump Station, Uzbekistan

- Increasing water demands from irrigators, domestic users, and various commercial interests for allocated quantities and qualities are beyond acceptable levels for environmental needs in many regions.
- There is tremendous need for improved performance of irrigation systems to meet the food supply of the future and to achieve various economic and environmental goals.
- There is clear evidence that irrigation modernisation can successfully provide improved performance.
- Rapid and appropriate irrigation modernisation only succeeds if there are innovative, multidisciplinary, and cost-effective solutions.

We are Tractebel

Tractebel provides a full range of engineering and advisory services throughout the life cycle of its clients' projects, including design and project management. As one of the world's leading engineering and advisory companies and with more than 150 years of experience, it's our mission to actively shape the world of tomorrow. With about 5,000 experts and presence in more than 70 countries, we are able to offer our customers multidisciplinary solutions in energy, water and urban.

Since December 2014, Tractebel Engineering GmbH (former Lahmeyer International) belongs to Tractebel and thus is part of the international ENGIE group headquartered in Paris. Tractebel (Brussels, Belgium) and Tractebel Engineering GmbH (Bad Vilbel near Frankfurt, Germany) cooperate on numerous international projects as one company.

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