

National Water Research Center

Fum Ismailia Canal, P.O. Box 74, Shoubra El - Kheima 13411, Cairo, Egypt

Tel: (202) 4444 7353 - (202) 4444 6180

Fax: (202) 4444 6761



Profile



Achieving Sustainable Development Goals (SDGs)

NWRC: Four decades of facing scarcity and securing water for the future.

In 1978 National Water research center was established with a formation of twelve research institutes covering the entire spectrum of water sciences.

National Water Research Center (NWRC)

The National Water Research Center (**NWRC**) is the leading national research institution. It has a mandate of producing scientific knowledge needed by policy makers, public and private sectors.

Expertise and knowledge of the Egyptian water resources system, up-to-date research infrastructure and facilities, and time extended data archives are NWRC's assets and means to perform high quality applied research.

Over the last four decades NWRC's research findings and results have been contributing to the protection, management, and development of the national water resources system.

Yet, NWRC is striving to be an international center of excellence facing water resources challenges and problems by providing scientifically sound, practical, socially accepted, economically affordable, and environmental friendly solutions.

Research Areas and Expertise

Water, as a natural scarce resource, is envisaged to be the common thread among the three national goals: economic growth, social well-being and healthy population.

At **NWRC**, we adopt an inter- disciplinary approach, to address the unique water resources system and its peculiar water management problems, keeping in mind these national goals.

Such approach is strongly reflected in the diversity of water-related research activities at **NWRC's** institutes.

Through twelve research institutes, **NWRC** serves the Ministry of Water Resources and Irrigation (MWRI) to advance and expedite the implementation of the national water policy.

As MWRI's research and development arm, we tackle key water policy and management issues, empower informed decision-making, and enrich understanding through engagement, education, and applied research.

NWRC is mandated to provide innovative pioneering solutions and communicate them to the end users; thus, enhance research uptake.

Its role as a national organization goes beyond MWRI, since it assists the other ministries as well as the private sector facing water related difficulties through facilitated access to wide and profound expertise.

NWRC's twelve institutes have their specific, yet complementary, mandate, function and research areas.

NWRC Research Facilities

NWRC established a wide spectrum of research facilities; enabling its researchers to conduct high quality research and produce knowledge based on accurate results measurements.

NWRC researchers have an access to advanced ICT, software applications and online journals including Water Science Journal; this leads to new insights and intriguing research questions. Moreover, NWRC hosts a well-equipped and furnished training Centre, in HRI, enabling knowledge and experience transfer to national and regional trainees.

Experimental Stations

NWRC institutes host more than 20 experimental stations and pilot fields spread through different hydrological regions of Egypt.

Some of these stations/fields are established to serve a single institute; others serve multi research objectives.

Laboratories

Over the years NWRC administrations managed to establish well-equipped indoor and mobile laboratories. Except for Central Laboratory for Environmental Quality Monitoring most of the labs are institute oriented, serving specific research focus and objective.

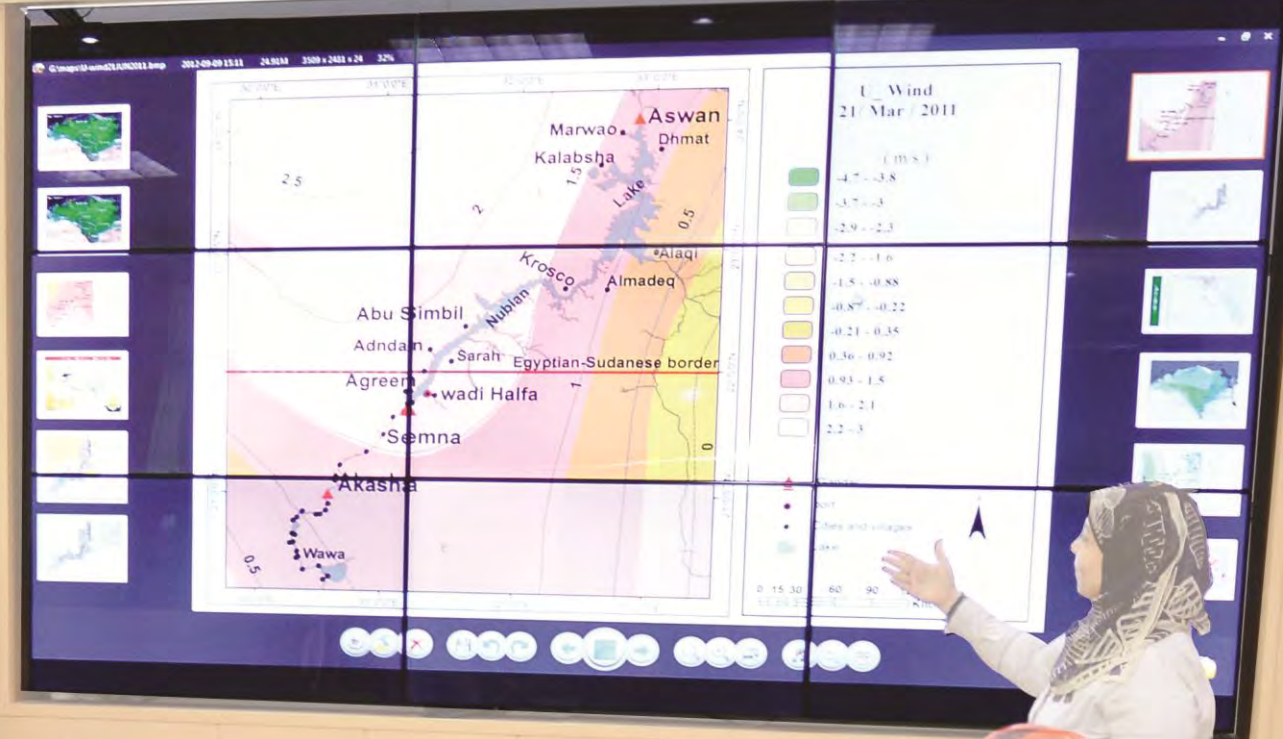
Regional Training Center

It has been established since 1995, to provide a three month "River Engineering" diploma for Nile Basin countries participants (more than four hundreds).

The delivered courses cover different topics including morphology and river engineering, design of hydraulic structures, river basin hydrology, water resources economics, environmental impact assessment, water quality monitoring and management.

The Center also offers a number of short tailor-made courses on different topics of large interest for the Arab, African countries with special focus on the Nile basin Countries each year.

The center is highly equipped with all training facilities including; lecture rooms, computer lab, accommodation facility, restaurant, etc.



Observation and Monitoring Networks

NWRC operates and maintains few national monitoring networks and surveying programs, through its institutes.

Measurements of these networks and programs are carried out at the highest precision levels so that research results and findings' uptake is maximized.

Produced long time series and large sets of spatial data enables NWRC's researchers to carry out trend and spatial analyses; thus make correct predictions either in time or space.

Water Science Journal

Water Science Journal (WSJ) has been published by NWRC since the early 80's.

By the end of 2013, it was transferred to an open access online journal produced and hosted by Elsevier.

Water Science Journal addresses both basic and applied water research, and policy issues of prime interest to the water community.

The scope of the journal encompasses high quality scientific papers and original research studies in all Water Resources related fields.

In 2014, WSJ was granted the 'Highest performance journal' award according to several indicators set by Elsevier.

Staff

At **NWRC**, we are fortunate enough to have a diverse team of highly experienced research staff (600 members) working on a broad array of interesting and unique water research related fields.

The majority are engineers; nevertheless, **NWRC** team includes agronomists, socio-economists, hydro-geologists, chemists and biologists, who are pivotal to its integrated research activities.

Currently, in NWRC we are very proud of having about 40% of our research workforce as female researchers.

NWRC staff are recognized for distinction and more than 30 researchers received the Academy of Scientific Research and Technology State Encouragement Award.

Few researchers also received Sultan Bin Abdel Aziz Prize for research advancement and innovation.

International Cooperation and Links to Water Organizations

Building on a legacy of over 50 years in the international water and environment sector, combined with the knowledge of our staff, we bring a shared purpose of discovering and delivering exciting solutions that meet future challenges. NWRC is cofounder and member of most renowned international organizations working in water and water related fields. Among these organizations are the International Water Resources Association (IWRA), World Water Council (WWC), International Commission on Irrigation and Drainage (ICID), and International Commission On Large Dams (ICOLD). It is also a member of the Mediterranean Water Institute (IME), and a founder of the Arab Water Council (AWC).

NWRC has been cooperating with CIHEAM through IAM-Bari and UNESCO-IHE. It also represents the Government of Egypt in the Shared Nubian Sandstone Aquifer Authority.

Furthermore, a number of twinning agreements have been signed and are already functional with a number of universities in different countries including USA, Canada, Japan, UK, Germany, Italy, and the Netherlands, etc.



Institutes



Water Management Research Institute (WMRI)

- Guidelines for optimal on-farm water management schemes and practices
- Soil, water and crop interactions in agricultural areas
- Socio-economic aspects of on-farm water management policies

Drainage Research Institute (DRI)

- Design criteria for subsurface field drainage networks in problematic areas
- Assessment and evaluation of methods, materials and technologies for implementation, maintenance and operation of drainage systems
- Criteria and guidelines for the reuse of drainage water in irrigation
- Design and operation of the national water quality monitoring network
- Off/in-stream engineered wetlands for wastewater treatment



Water Resources Research Institute (WRI)

- Investigation of rainfall harvesting in Wadi Systems
- Design criteria and performance assessment for flash flood control/protection works and storm drainage networks
- Forecast of River Nile annual natural flow
- Impacts of Upper Nile socio - economic development
- on inflow to Nasser Lake

Nile Research Institute (NRI)

- Hydrologic and morphologic changes of Lake Nasser and along the River Nile
- Protection and development of the River Nile banks and islands
- Safety measures and guidelines for river navigation routes and fleets
- Routine monitoring of water and sediment quality in Lake Nasser and along the River Nile

Hydraulics Research Institute (HRI)

- Physical and mathematical hydraulic modelling of River and the irrigation canals
- Calibration of major hydraulic structures and pump stations
- Regional Capacity building programs for open channel hydraulics and river basin management

Channel Maintenance Research Institute (CMRI)

- Investigation of problems associated with channel head, distribution and conveyance losses
- Development and investigation of different methods for control and management of aquatic weeds
- Identification and assessment of channel maintenance and rehabilitation methods



Groundwater Research Institute (GwRI)

- Description of the occurrence, geometry and characteristics (quantity and quality) of groundwater aquifers
- Surface-groundwater interaction and conjunctive use policies Well fields design and protection guidelines
- Systematic monitoring, data analysis, and assessment of groundwater development policies

Construction Research Institute (CRI)

- Design criteria and safety guidelines for hydraulic structures
- Evaluation and testing of new construction
- Materials and technologies
- Assessment of hydraulic structures performance by new non-destructive and dynamic testing
- Canal lining and bank stability under problematic soil conditions

Mechanical and Electrical Research (MERI)

- Performance analysis of the MWRI's electro-mechanical system
- Evaluation and monitoring of hydro-power stations' performance
- Investigation and assessment of renewable energy systems utilized for water pumping Assessment of automated control gates' and power distribution systems' operation

Survey Research Institute (SRI)

- Development and application of up-to-date technologies in geodesy and hydro graphic surveys
- Optimal design of gravity and reference networks
- Adoption remote modern geo measurement technologies and geographic information systems for water management
- Development of cost-efficient spatial surveying and data analysis techniques

Coastal Research Institute (CoRI)

- Estimation of morphological changes along the Egyptian coasts
- Design criteria and guidelines of cost-effective and environmental friendly shore protection measures and structures
- Evaluation of Integrated Coastal Zone Management (ICZM) under various climate change scenarios

Environmental and Climate Change Research Institute (ECRI)

- Evaluation of climate change long-term impacts on water resources and related environmental systems
- Determination of optimal use and management schemes of water resources under various climate change scenarios
- Identification of optimal adaptation measures and policies related to water resources

Central Laboratory for Environmental Quality Monitoring (CLEQM)

- Provision of timely, high quality analytical services at the national and regional levels for water, soil, plant and fish
- Diagnosis of environmental problems in the area of environmental chemistry, microbiology and aquatic toxicity
- Establishment and update of water quality protection guidelines and standards, in cooperation with **NWRC** institutes

Strategic Research Unit (SRU)

- Adoption of advanced tools for comprehensive and integrated water resources system analysis
- Coordination of multidisciplinary joint research activities among NWRC institutes



Stations



Artificial Recharge Stations

GWRI has installed four recharge experiments in El-Bustan (30.45 Acres), Burg El Arab (2.1 Acres), Abu Simbel (94.5 Acres) and Abu Rawash.

The purpose of these experiments is to study and compare the viability of recharge techniques. Burg El Arab station is provided with two injection wells (shallow and deep), while Abu Simbel has two other types of wells (gravity and injection) as well as infiltration basin.

El-Bustan is the most developed recharge station, as it comprises four large infiltration basins and a deep gravity well.

It is also provided with a network of piezometers, to monitor the change in groundwater level and salinity.

Basin, injection and other recharge techniques are tested in these sites.

Irrigation and drainage Experimental Stations

WMRI and **DRI** run over ten experimental research stations/pilots (with areas ranging from 2.1 to 126 Acres) supplied from different sources: irrigation canals, groundwater aquifer, drains (after treatment or blending with fresh water).

They were selected to represent the variations in climate, soil texture, and main crops cultivated in the entire country.

In these stations/pilots several field irrigation and drainage systems/schemes as well as agriculture practices have been tested and evaluated.

Most of them are furnished with pumps, agriculture equipment and tools, water treatment facilities, small meteorological stations and sometimes Lysimeter.

Grass Carp Production and Weed Management Stations

CMRI manages two research stations for fish breeding and weed control investigations, at Delta Barrage (4000 square meters) and Bahteam region (3000 square meters).

Delta barrage station is annexed with biological laboratories as well as flumes for performing hydraulic or weed management experiments.

Hatcheries are setup for grass carp production and related researches, while the open channel flume is installed to test different alternatives for weed control screens upstream of hydraulic structures.

Coastal Research Stations

CoRI has two main research stations: Abu-Quir and Ras El Bar; and four secondary ones: Rosetta, Burg El-Burullus, El-Arish and Hurghada.

Abu Quir station is furnished with sedimentation, sea water quality, and oceanography specialized laboratories.

In addition to that, it has a 40.0×1.2×1.2 meter flume to check the stability and efficiency of the coastal structures.

Wadi Natroon Station

It is a joint research station (126 Acres) where **MERI**, **WMRI**, and **CMRI** are conducting their research experiments.

MERI implemented a standalone concentrated photovoltaic solar system (30 KW capacity) to evaluate the performance of solar PV tracker system.

The produced energy is used for operating the irrigation pump and desalination unit (200 liter/hr).



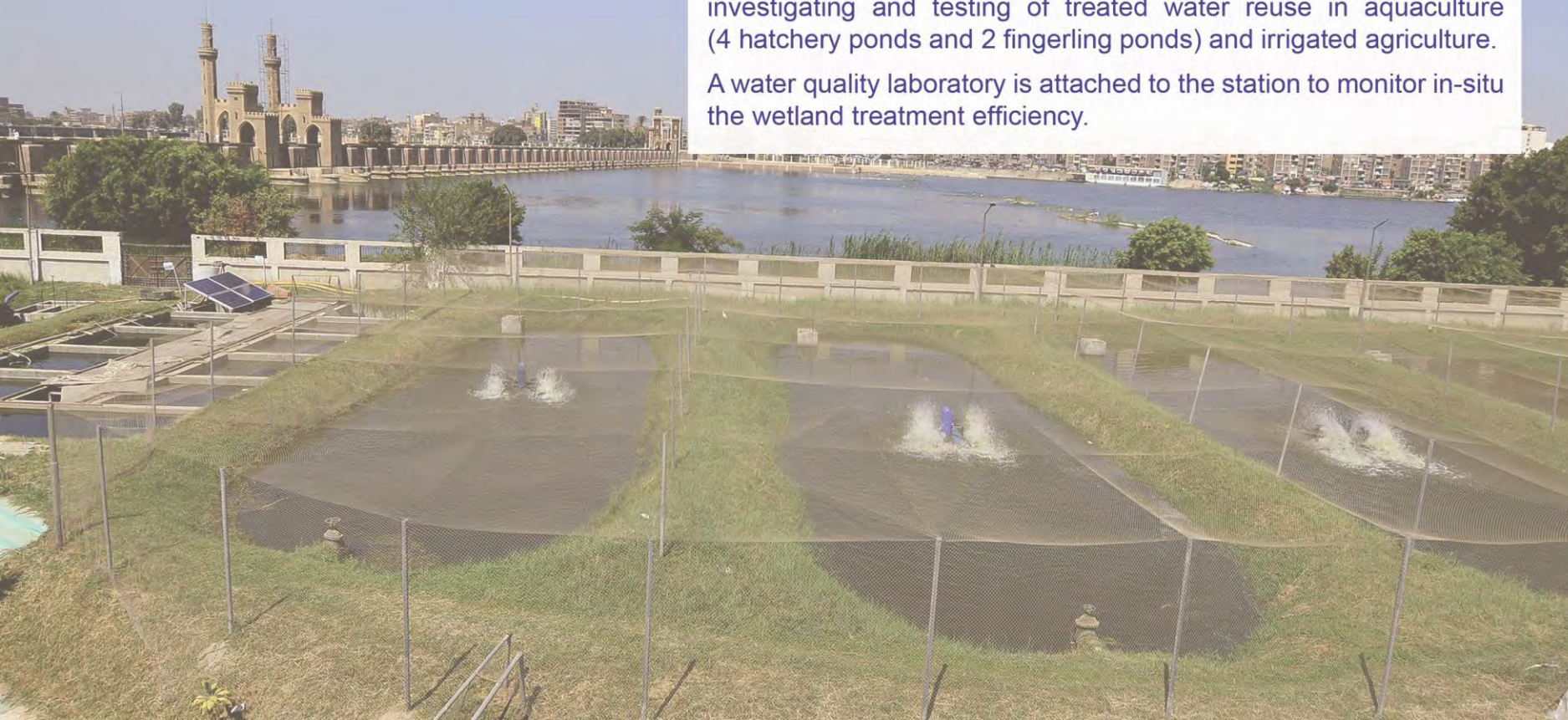
Manzala Engineered Wetland Station

DRI runs the station, where 25,000 m³/day of Bahr El-Baqar drain water is biologically treated by constructed wetland (63 Acres).

It consists of an intake spiral pump, two sedimentation bonds associated with drying beds, ten surface flow beds, and two reciprocating (subsurface flow) cells.

The rest of the station area (147 Acres) is utilized in investigating and testing of treated water reuse in aquaculture (4 hatchery ponds and 2 fingerling ponds) and irrigated agriculture.

A water quality laboratory is attached to the station to monitor in-situ the wetland treatment efficiency.



Laboratories



Central Laboratory for Environmental Quality Monitoring (CLEQM)

CLEQM provides highly accurate results through the use of state-of-the-art analytical techniques and instrumentation: LC-MS-MS, ICP-MS, ICP-OES, IC DX500, GC-ECD, GC-MS, GC-FID, real time PCR...etc.

Methods applied in CLEQM are internationally certified methods such as: United States Environmental Protection Agency (USEPA) and the American Public Health Association (APHA), as well as local country standards. CLEQM is an internationally accredited facility since 2005 through the Canadian Association for Laboratories Accreditation (CALA).

The system ensures a full-scale enforcement of QA/QC program under ISO/IEC 17025/2005 (general requirements for the competence of testing and calibration laboratories). Recently CLEQM has been inaugurated to become UNESCO Category II center.

Soil Mechanics and Foundations Engineering Laboratory

Through this laboratory CRI furnishes integrated geotechnical engineering services such as consulting, testing, monitoring, and modeling.

Indoor and in-situ high precision testing equipment are used to determine the basic soil properties as well as the advanced and specialized parameters of different soil and rock types.

It encompasses instruments such as computer controlled triaxial compression machines, mobile mechanically-controlled drilling rigs provided with the necessary accessories to conduct the Standard Penetration Test, Static Cone Penetration Test, a field Vane Shear device, and Mobile Dutch Cone Penetrometer (20 tons).

Structural Modeling Laboratory

CRI investigates soil - structure interaction, and monitors the behavior of both existing and new structures during and after construction through this laboratory.

It is equipped with field monitoring instruments such as piezometers, inclinometers and Soundex systems to measure horizontal and vertical displacements, and strain gages.

All monitoring tools are furnished with the required data acquisition systems and software.



Properties of Materials Laboratory

It operated by CRI to determine physical and mechanical properties of construction materials and their relationship to structural elements.

In addition to that, it helps in designing concrete mixes and suggesting QA/QC programs.

Geo-synthetic Testing Laboratory

Under controlled laboratory conditions CRI conducts extensive regular checks of geo-synthetic (sheets or membranes) key performance criteria according to international standards and norms.

It is equipped with universal testing machine (UTM), apparent opening size, thickness device, permittivity apparatus, Xenon-Arc type apparatus and bursting strength tester.

Aquatic Life Analysis Laboratory

Through this laboratory, CMRI performs aquatic weeds' analysis, fish physiological analysis, and its associated diseases.

Such analyses are used to assess the impacts of water channels' pollutants on aquatic living organisms and biological control efficiency.

Sedimentation Mobile Laboratory

It is operated by CMRI to determine the physical characteristics of bed and suspended sediment.

The laboratory handles suspended-sediment concentration analysis, fine/sand separation, and particle size distribution in addition to complete chemical analysis.



Soil and Fish Breeding Laboratories

Through soil and fish laboratory, CMRI analyzes water samples of fish ponds of grass carp (physically and chemically) and assesses the impact of pollutants on the fish health.

Soil samples of grass carp ponds are analyzed to check their breeding efficiency, while fish samples are physiologically checked to evaluate the health of grass carp breeders.

CMRI has a specialized fish breeding laboratory that consists of basins, aquaria, funnels, sand filters, feed lines, etc. This laboratory is established to examine healthy larva before hatching and examine phyto and zoo-plankton which may affect hatching larva.



Physical Modeling Laboratories

The main one is established at the Delta Barrage campus, within HRI premises, on a space totaling more than 30,000 square meters.

It can accommodate models with footprints as large as 40 x 30 meters, and flows in excess of 2.0 m³/s.

The laboratory (hall) is annexed with in-house model fabrication and instrumentation shops, that can handle the most intricate model-construction requirements.

It is provided with highly accurate data-acquisition and experiment-control devices and instruments.

Different physical models of the hydraulic structures within the irrigation network are constructed and tested in these halls.

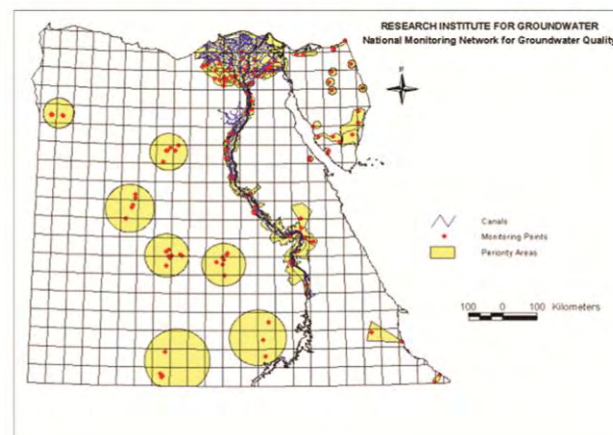
The newest tests were conducted for Dayrout Complex of Regulators, where diverse operating scenarios were tested.

CoRI also has a physical modeling laboratory located in Abu Quir station with flume of 40.0×1.2×1.2 meters; which is used to check the stability and efficiency of many coastal structure.

It is provided with wave generation systems, power system and control room.



Observation and Monitoring Networks



National Water Quality Monitoring Network (NWQMN)

Since 1997, NWQAM has been established to monitor the water quality status of Lake Nasser, River Nile, main canals and drains, as well as groundwater aquifers through NRI, DRI, GWRI and CLEQM.

Samples are being collected on a monthly basis from 158 locations on drains and irrigation canals in the Delta and Fayoum.

The number of sites on the Nile main stem and its two branches is 69, where water is sampled twice a year (winter and summer campaigns) by NRI.

GWRI conducts one campaign per year and collects samples from about 218 observation wells.

In general, water samples are analyzed in CLEQM for 34 parameters that reflect the different sources of pollution, namely agriculture, domestic and industrial waste.



Meteorological Networks

Since 1982, WRRRI manages a meteorological data collection network in Sinai with more than 100 locations.

The collected data include temperature, precipitation, evaporation, relative humidity, solar radiation, wind speed, and wind direction, ... etc.

Water level recorders are also installed at the outlet of some representative experimental basins.

This data is used for the prediction of flash floods in different wadis to suggest the necessary measures to be taken.

ECRI established a meteorological observation network to collect necessary data to be employed in different weather and climate models.

It also has access to more than 70 meteorological stations covering the entire country with a historical record ranges from 30 to 60 years.

The collected meteorological data comprise temperature, precipitation, evaporation, relative humidity, and wind speed, ...etc.

The data is used in WRF, SimCLIM, CLIMEX, EDGCM, IDRISI Selva, etc.



Tide Gauge Monitoring Network

SRI operates a tide gauge monitoring network established in Alexandria, Port Said, Suez and Safaga.

The collected information is shared with CoRI and used in studying the influences of the medium and long term mean sea level changes on the national vertical geodetic datum of Egypt.

Groundwater Monitoring Network

Since the eighties of the previous century GWRI implemented and run a network of more than 2000 observation wells to monitor the groundwater level and salinity, distributed all over the Egyptian territories.

Out of those, 218 wells are within NWQMN, where water samples are analyzed for more than 34 parameters once a year.

