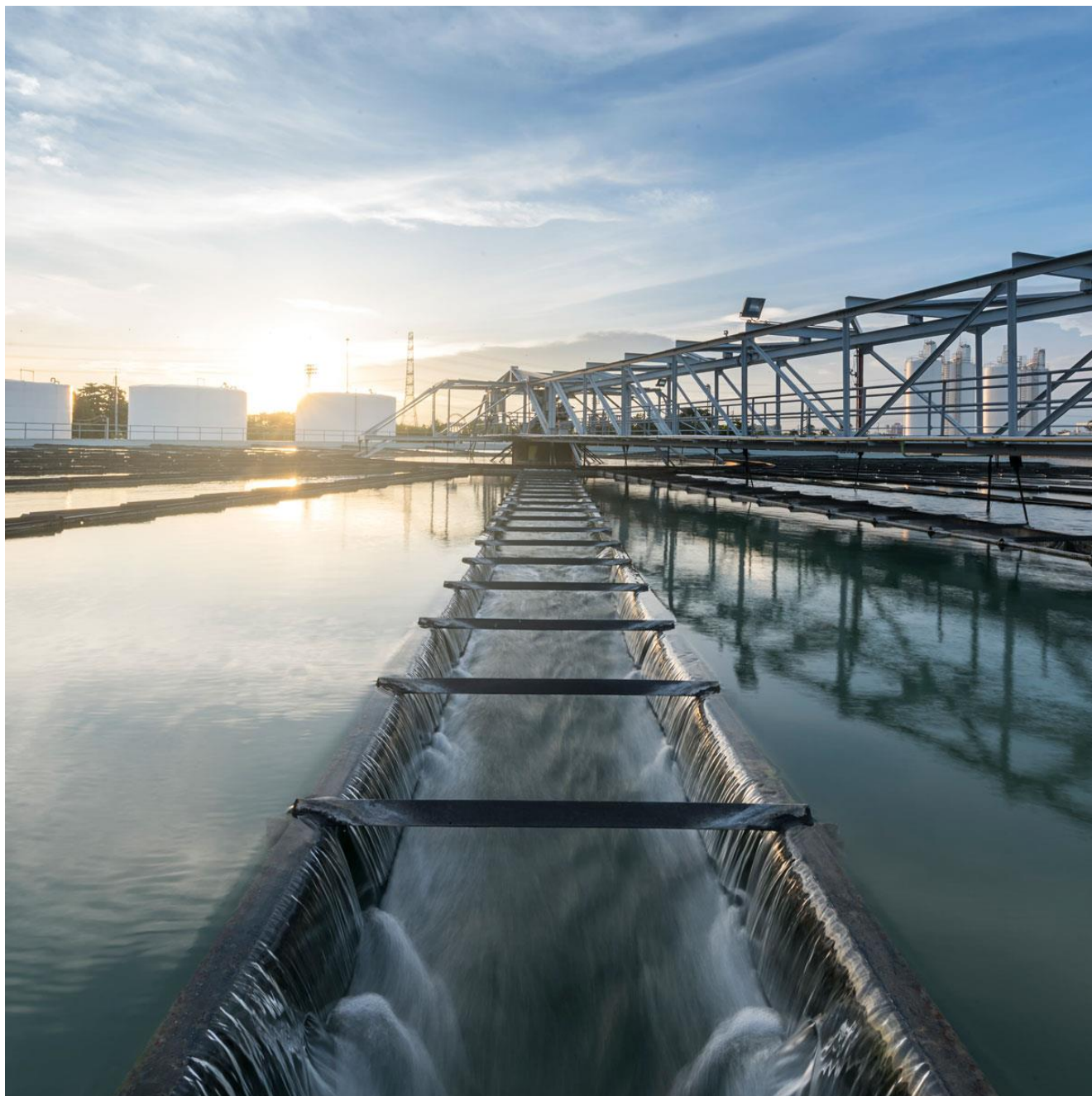


SELECTED REFERENCES

WATER & WASTEWATER



COWI GROUP

COWI A/S

PM

RUAS

COUNTRY

Bangladesh

PERIOD

2022 - 2028

CUSTOMER

Dhaka Water Supply and Sewerage Authority (DWASA)

WTP SAIDABAD III

Dhaka Water Supply and Sewerage Authority (DWASA) is diversifying the current water resource dependence on groundwater to one more heavily based on surface water. This diversification started with the construction of Saidabad I WTP (2002) and Saidabad II (2012) with a total capacity of 450,000 m³/d. Three "mega projects" are now underway to increase the surface water supply by a further 1,400,000 m³/d: Saidabad III (see below); Gandharpur I (ADB, AFD and EIB funded); and Padma I (Chinese funded).

The Saidabad WTP Project Phase III (the Overall Project) comprises the following three components:

Component 1: A new raw water intake at Meghna River at a point with good water quality and transmission system to convey 950,000 m³ /day⁶ to water treatment plants at Saidabad in Dhaka;

Component 2: New Water Treatment Plant (WTP) of 450,000 m³/day capacity and sludge treatment facility with capacity to treat sludge generated from Saidabad I, II and III WTPs (the WTP Project);

Component 3: Extension of the primary and secondary distribution networks that carry the treated water to consumers.

COWI GROUP

COWI A/S

PM

KLM

COUNTRY

Egypt

PERIOD

2021 - 2026

CUSTOMER

European Investment Bank (EIB)

TOTAL INVESTMENT

220 M EUR

PROJECT IMPLEMENTATION CONSULTANT (PIC) FOR THE KITCHENER DRAIN PROJECT WASTEWATER COMPONENT

Egypt's population is increasing by about 2 million individuals per year. This rapid increase in population is straining the country's infrastructure endowment and public service delivery as well as the competition for water resources that are becoming scarcer. Low sanitation coverage in combination with sub-optimal wastewater treatment results in severe water pollution problems, the spread of waterborne diseases and the degradation of the environment. The Government of Egypt attaches a high priority to the safe disposal of wastewater in rural areas and in 2015 launched the National Rural Sanitation Programme (NRSP), which aims at providing universal access to sanitation in rural Egypt, through financing investments in the areas deprived of sanitation infrastructure (wastewater treatment plants (WWTPs), sewage networks and pump stations). The NRSP identifies the Kitchener Drain catchment area as one of the priority catchment areas in Egypt. The Kitchener Drain is the main agricultural drain passing through three Governorates (Dakahlia, Gharbia and Kafr El-Sheikh). The Kitchener Drain is one of the highest polluted drains in the Delta region, collecting domestic wastewater (insufficiently treated and untreated) from numerous villages within the three governorates and industrial wastewater discharged from industrial activities, as well as municipal solid waste disposed of along the banks of drains. The population in the project area is mostly rural and totals about 6 million capita of which nearly half (46%) does not currently have access to sewerage services. Currently, a large part of the polluted water from the Kitchener Drain is used for irrigation purposes, causing environmental and health problems and severely damaging the agricultural economy of the area.

Addressing these problems is the objective of this project which is implemented by the Holding Company for Water and Wastewater (HCWW) and the Water and Sanitation Companies in Dakahlia, Gharbia and Kafr El-Sheikh (WSCs) under the responsibility of the Ministry of Housing, Utilities, and Urban Communities (MHUUC). More specifically, the project will increase sanitation coverage in the rural areas of the Kitchener Drain catchment by 25.4% (either through connection to a centralised sewage network or by providing improved on-site sanitation facilities) and provide an additional 71,000 m³/d of wastewater treatment capacity along with the rehabilitation of up to 24 existing WWTPs in the catchment area.

Infrastructure investments include:

- Construction of centralised wastewater collection systems (including wastewater networks) covering 69 unserved villages with a population of around 400,000 people
- Construction of 1 new WWTP and associated sewerage networks
- Expansion of 6 existing WWTPs
- Rehabilitation of 24 existing WWTPs
- Purchase of sewerage evacuation trucks to serve remote rural communities

The purpose of the PIC is to assist the MHUUC/PMU, HCWW and the WSCs to implement Component 1 of the project in a timely and efficient manner. This will involve support along the entire project implementation cycle, including further preparatory studies (particularly the review, verification and update of the existing studies, preparation of a detailed investment plan and preparation of tender documentation, procurement, compliance with environmental and social standards and assurance of health and safety procedures, etc.). Moreover, the PIC is expected to provide capacity building to the implementing entities to ensure that by the end of the project they have improved implementation, operation and management capabilities.

COWI GROUP
COWI UK Limited
PM
PHBU
COUNTRY
United Kingdom
PERIOD
2015 - 2023
CUSTOMER
THAMES WATER

THAMES TIDEWAY TUNNEL - C410

Thames Tideway Tunnel is a major new sewer under construction in London to intercept sewage overflow discharges that currently enter the river during storm events. The storm water discharges result in pollution of the River Thames, and contravenes the European Urban Wastewater Treatment Directive. The scheme will see a new 23km long, 7.2m diameter sewer tunnel up to 65m depth below the River Thames. The tunnel starts in West London and follows the route of the River Thames to Limehouse, and continues northeast to Abbey Mills Pumping Station near Stratford. From there it connects to Lee Tunnel, which transfers the sewage to Beckton Sewage Treatment Works.

The project is divided into three sections – West, Central and East. COWI provided input to the Ferrovia Agroman, Laing O'Rourke Joint Venture during tender stage. The FLO JV was subsequently awarded the Central contract on the project, the largest value of the three construction contracts on offer. The COWI scope of works comprises two 45m deep shafts involving piled, segmental and sprayed concrete lining methods, together with 14 different tunnels (2.4m to 4.8m diameter) with segmental or sprayed concrete linings which will be constructed between 15m and 60m below ground level.

BIM Level 2 outputs are a mainstay of the design delivery. Data rich models are improving the construction procurement and delivery, and will facilitate end user operation and maintenance. Detailed design of vertical shafts and connecting tunnels involving piled, segmental and sprayed concrete lining methods

COWI GROUP
COWI A/S
PM
THRR
COUNTRY
Ukraine
PERIOD
2020 - 2022
CUSTOMER
Chernivtsivodokanal

MUNICIPAL WATER INFRASTRUCTURE PROJECT CHERNIVTSI, PHASE 2 AND 3

Chernivtsi is undergoing a major improvement in water supply and sanitation infrastructure services, which KfW has supported since 2009. In 2010 COWI was entrusted with the preparation of a feasibility study for Chernivtsi, with main focus on development of the water supply services. The project ended up with the definition of an implementation project.

Chernivtsi City Council and KfW now intend to continue with Phases 2 and 3 of the project. COWI, with three local sub-consultants led by UTA, was awarded this project.

RECIPIENT

TOTAL FEE

EUR 2.574.156

The project covers the further development of the water supply services and development of wastewater services for Chernivtsi, having about 265,000 inhabitants. The services comprised basic and optional services, the latter being launched subject to a Financing Agreement is concluded and the Consultants were performing the basic services properly, as determined by the Client and KfW. The services comprise as follows:

Basic Services:

> Component A: Update of Feasibility Study for Phase 2 and Feasibility Study for Phase 3, preparation of an ESIA and preparation of design proposals for Phases 2 and 3 in accordance with Ukrainian procedures; and

> Component B: Preparation of Project Stage "P" designs in accordance with Ukrainian legislation and procedures, preparation of an Environmental and Social Management Plan (ESMP) and obtaining state expertise approvals.

Optional Services:

> Component C: Preliminary design concept on connection of the amalgamated communities along the water main to Chernivtsi;

> Component D1: Preparation of Tender Documents for FIDIC Yellow and/or RED Book contracts, including preparation of Project Stage "R" designs in accordance with Ukrainian legislation and procedures and obtaining state expertise approvals;

> Component D2: Construction management and supervision of Phases 2 and 3 implementation; and

> Component E: Feasibility Study on connection of the amalgamated communities along the water main to Chernivtsi.

The projects includes a large stakeholder engagement component.

Physical investments of Phases 2 and 3 include rehabilitation of groundwater intakes and water treatment (both were only considered in an initial assessment of possible investments), water transmission mains (ca. 12 km, gravity and pressure mains, DN 500-1000), extension of distribution network (ca.41 km, DN 100-600), rehabilitation of wastewater pumping stations (replacement of pumping equipment), rehabilitation of sewers (ca. 30 km, DN 160-1000) and rehabilitation of WWTP (72,000 m³/day) incl. sludge management. In addition an improved pressure management system and SCADA system will be implemented.

Estimated construction costs: 44.55 MEUR.

COWI GROUP

COWI A/S

PM

PGR

BOTV

COUNTRY

United Arab Emirates

PERIOD

2012 - 2017

CUSTOMER

Impregilo SpA

TOTAL FEE

2.3 M EUR

TOTAL INVESTMENT

308 M EUR

ABU DHABI DEEP TUNNEL SEWER - STRATEGIC TUNNEL ENHANCEMENT PROGRAMME (STEP 3)

The Abu Dhabi Strategic Tunnel Enhancement Programme (STEP) is to provide a major improvement in the capacity of Abu Dhabi's waste water system. The programme includes a new deep gravity sewer tunnel 45 km in length taking the main sewer flows from Abu Dhabi to a new treatment works outside the city and a series of link sewers connecting into the deep tunnel. The tunnel varies in diameter from 4.5 meters to 5.5 meters and is to be constructed with seven earth pressure balance (EPB) TBMs which are launched and operated from seven deep shafts.

STEP T-03 represents the final section of the entire STEP Program. The main structures included in the STEP T-03 are the following:

> main collector (Deep Sewer Tunnel) excavated by means of n^o2 Earth Pressure Balance (EPB) TBMs of a total length of 9.7 km, with a primary lining made of pre-cast concrete

segments and secondary lining cast in situ together with high-density polyethylene (HDPE) membrane.

> n° 4 access / service shafts with diameter of 16.50m and depth varying from 60 to 80 m together with the connections to the main tunnel.

T03: COWI carried out the detailed design for 9.7 km of deep, bored tunnel, four deep shafts that vary from 60 meters to 80 meters in depth and all ancillary works.

COWI carried out also the Construction Quality Control Service.

COWI GROUP

COWI A/S

PM

UVA

COUNTRY

Denmark

PERIOD

2016 - 2026

CUSTOMER

HOFOR A/S (Greater Copenhagen Utility)

RECIPIENT

HOFOR A/S

TOTAL FEE

EUR 5.000.000

SVANEMØLLE STORMWATER TUNNEL

The project covers technical consultancy on hydraulics and regulatory approval in connection with the planning and outline design of a cloudburst tunnel to divert rainwater away from a 22 km² area in the northern part of Copenhagen. This area includes Bispebjerg, Ryparken and Dyssegård. The project further covers preliminary and detailed design of the project.

The project consists of 9 deep shafts which is connected by tunnels, leading to the last shaft from where the water is discharged. The project also cover the feeder sewer systems at shaft locations.

The hydraulic studies include the production of a detailed overall hydraulic model, flood projections, identification of areas to be drained into the tunnel, calculation of the necessary tunnel capacity, calculation of volumes of water and materials to be diverted, and final detailed design of the tunnel and associated cloudburst projects.

The most extensive regulatory element includes an approval plan with an overview of critical applications, input to waste water plans, area reservations, an EIA, application documents, and involvement in regulatory processes with e.g. municipalities, the Danish Coastal Authority etc. In connection with the project, studies were carried out of the impact on nature, groundwater, flow characteristics, water quality, soil contamination, noise, vibration, urban spaces and recreational facilities in the area. The regulatory part of the project focused especially on public involvement, citizens' rights and private property law.

The design of the project covers all civil works, hydraulics and installations for the project. Shafts will be constructed by the use of deep retaining walls, with a permanent inner lining. Tunnels will be constructed as pipe jack tunnels and segmental lined tunnels.

COWI provided technical consultancy on hydraulics and regulatory approval in connection with planning and outline design and subsequent detailed design. The hydraulic studies included all services required to calculate the necessary tunnel capacity and the volumes of water and other material to be diverted. The regulatory element included an approval plan with an overview of critical applications, input to waste water plans, area reservations, EIA, application documents, and involvement in the regulatory process with e.g. municipalities, the Danish Coastal Authority etc. COWI analysed the impact on nature, groundwater, flow characteristics, water quality, soil contamination, noise, vibration, urban spaces and recreational facilities in the area. The process focused especially on public involvement, citizens' rights and private property law.

COWI GROUP

COWI A/S

PM

LAFN

COUNTRY

Denmark

KOLDING Å STORM SURGE AND STORMWATER MITIGATION

The city of Kolding is exposed to flooding from both storm surges and high tide in Kolding Fjord and large volumes of water in Kolding Å, due to heavy rainfall. Kolding Municipality has therefore wanted to mitigate flood risk with a lock and pump station at the outlet of Kolding Å. All suggested solutions include a sluice / pump project, which will ensure that water can be retained and diverted from Kolding City at extreme flows in the stream and

PERIOD
2017 - 2019
CUSTOMER
Kolding Municipality

during storm surge. The pumps can thus keep up with the flow of water in the stream while the sluice is closed due to high tide. The project is being carried out in a community between Kolding Municipality, Blue Kolding and Kolding Harbor.

COWI has assisted the Municipality of Kolding in preliminary design, suggesting various ideas for designing a comprehensive solution that will mitigate the threat of storm surge as well as flooding from cloudburst and high tides in Kolding stream, by means of a sluice, pumping station, dikes and partial retention of water upstream. COWI has also assisted in setting up MIKE Hydro / MIKE11 model for the entire floodplain, carried out hydraulic analysis of combined events including cloudburst, extreme flows in combination with high tide, and analyzed and designated possible water retention areas.

COWI GROUP
COWI Qatar

PM
AAAK

COUNTRY
Qatar

PERIOD
2018 - 2021

CUSTOMER
HBK / Porr JV

RECIPIENT

MUSAIMEER PUMPING STATION AND OUTFALL TUNNEL

The purpose of the Musaimeer Pump Station and Outfall (MPSO) project is to receive stormwater runoff and groundwater flows from the Abu Hamour Tunnel in Doha and to provide a pumping station, a marine outfall tunnel and a diffuser field to dispose of the flows into the sea. Water flows are collected in the southern and western parts of Doha over a total catchment area of about 170 km².

The Musaimeer Pump Station project involves a 19.7 m³/s wet well pumping station and ten 6.6 kV submersible pumps and motors as well as support facilities such as electrical, hydraulic and mechanical rooms, laboratory, control room, office, kitchen and living quarters.

Technical Facts

- > Pumping station with 40m deep sump
- > 10 no submersible pumps (total pumping range from 1.9 to 19.7 m³/s)
- > Detailed design of a groundwater and storm water pumping station
- > The design and optimisation of the entire MEP and structural engineering package consisting of pump station building, substation, standby generator etc.
- > The optimisation of the hydraulics of the wet well sump as per ANSI HI 9.8, by conducting both CFD Study and Physical Modelling
- > The marine hydraulic modelling including:
 - Wave Modelling (MIKE SW)
 - Hydrodynamic Modelling (MIKE HD-FM) and near field dispersion modelling (by CORMIX) for diffuser configuration

COWI was responsible for transforming the preliminary design into detailed design of the pumping station. The hydraulic design of the pumping station included detailed pump design, material selection, design of roller gates and screens for 25 mWC, scoping and contracting with sub-consultants for CFD modelling and surge analysis. CFD modelling followed the ANSI HI 9.8 guidelines. COWI was also responsible for overall monitoring of the hydraulic and mechanical design. The project also included hydraulic design interfacing with the upstream stormwater tunnel and downstream marine outfall tunnel including water hammer analysis.

- > Tender Design for the Design & Build Competition
- > Preliminary & Detailed Design
- > Hydraulic Modelling
- > Marine Modelling

TOTAL INVESTMENT
230 MEUR

COWI GROUP

COWI UAE

PM

VIZE

COUNTRY

United Arab Emirates

PERIOD

2017 - 2021

CUSTOMER

MWH UK, Dubai

Municipality - Drainage
and Irrigation Department**TOTAL FEE**

EUR 6.000.000

TOTAL INVESTMENT

300 MEUR

**DUBAI STORM DRAINAGE - DEEP TUNNEL STORM WATER SYSTEM
(DTSWS) – CONTRACT 233-02**

DTSWS collects groundwater and storm water from the Dubai World Central area, Al Maktoum International Airport, EXPO 2020 area and adjacent communities and transfers the captured flow to the sea. The area covered by this storm water system adds up to approximately 400 square kilometers. The entire DTSWS system can handle 6.5 million cubic meters of water and is able to discharge a body of water, similar to the volume of an Olympic swimming pool each minute. The tunnel has a diameter of 10m and a depth of 45m.

The system collects the groundwater and rainfall in a network of drains near the surface, from which it will be conveyed by gravity down to the tunnels, via collector drains. Through the tunnels the water will be led to a pumping station, which pumps the water to the outfall.

The DTSWS has been designed to minimize the impact on the environment by use of sustainable system components and reducing the energy requirements significantly for the entire system.

The proposed works under this Project consist of the following key elements:

- > Main Tunnel by TBM Method between CS4 and Pumping Station = 10m ID, 10.430m in length
- > Micro tunnels between CS4 and the Jacking shaft = Twin 3m ID, 385m in length
- > NATM launching tunnels at launching shaft CS5
- > Construction of shafts CS5, CS3, DS3, CS4
- > Construction of chamber at shafts CS5, CS3, DS3, CS4 with connecting box culverts
- > One chamber at DWC North Outfall Connection
- > MEP works at shafts CS5, CS3, DS3, CS4
- > 10.4 km of 10-meter-inside diameter tunnel to collect groundwater and storm water runoff and convey the captured flows to the sea.
- > Detailed design of tunnels and shafts
- > Temporary works design
- > Durability Assessment
- > Environmental services
- > Geotechnical services
- > Hydraulic Design (CFD Analysis & Physical model tests)
- > Stakeholder Management

COWI GROUP

COWI A/S

PM

KVH

COUNTRY

Ukraine

PERIOD

2019 - 2020

CUSTOMER

Danida Sustainable

**FEASIBILITY STUDY FOR ZAPORIZHZHIA WASTEWATER AND SLUDGE
TREATMENT PLANT**

Zaporizhzhia is a large industrial Ukrainian city with a population of about 750,000 inhabitants. Zaporizhzhia Vodokanal has been facing an operational, social and therefore an increasing political problem related to the handling of surplus sludge generated at the Wastewater Treatment Plant WWTP-1, catering for the part of the city occupying the left bank of Dnipro River, covering about 70% of the total urban population. The WWTP-1 has a current capacity of about 400,000 P.E.

Infrastructure Finance
DSIF

TOTAL FEE
EUR 357.289

TOTAL INVESTMENT
17,620,000 EUR

A full fledged feasibility study of WWTP-1 was launched addressing not only the sludge management aspects, but also operational issues relating to effluent quality and stability, and feasibility assessments of a possible transfer of all wastewater generated at the Right Bank of Dnipro River to the WWTP-1.

The detailed feasibility study comprised:

- > Detailed technical investigations of the wastewater and sludge treatment facilities
- > Socio-economic studies
- > Strategic vision for future wastewater treatment in Zaporizhzhia
- > Identification of a road map and building blocks of projects to reach the strategic vision
- > Project identification and identification of financing envelope options
- > Final identification of a bankable investment project envisaged for funding by DSIF, NEFCO and Zaporizhzhia City Council
- > Preliminary designs of the investment project
- > Financial and economic analysis
- > Environmental assessments
- > Preparation of a Feasibility Study Report and a Project Presentation Document
- > Assistance to DSIF in preparation of funding application document

Two cross-cutting issues guided the feasibility study preparation:

- i) Maintaining a holistic approach in the identification of technically founded and prioritized projects; and
- ii) Close liaising with all stakeholders, particularly the local partners in Zaporizhzhia.

Several project workshops were held with involvement of the four key stakeholders (Zaporizhzhia City, Zaporizhzhia Vodokanal, DSIF and NEFCO).

The identified project includes:

- > Rearranging / reconstruction of biological process tanks and aeration system arrangements;
- > Pre-dewatering of bio-sludge, digestion of sludge with gas utilisation, and final dewatering of sludge;
- > New SCADA system and upgrade of measuring and control equipment; and
- > A large asset management and O&M Training component.

Estimated Total Implementation Cost: 17,620,000 EUR

Preparation of a draft DSIF Project Concept Document for DSIF internal application of funds for project implementation.

- Project management
- Wastewater treatment planning
- Wastewater treatment conceptual designs
- Socio-economic assessments
- Environmental assessments
- Financial and Economic analysis

- Implementation and Procurement planning

COWI GROUP

COWI A/S

PM

ATE

SIPA

COUNTRY

South Africa

PERIOD

2017 - 2023

CUSTOMER

The Foreign and Commonwealth Development Office (FCDO)(formerly DFID)

TOTAL FEE

GBP 31.210.019

CLIMATE RESILIENT INFRASTRUCTURE DEVELOPMENT FACILITY, PHASE II (CRIDF-2)

Climate Resilient Infrastructure Development Facility (CRIDF), Phase I, was mandated to design, mobilize finance for, and build climate resilient, pro-poor and transboundary water projects. COWI supported the identification, planning, design and capacity development across the SADC Region to support stronger regional cooperation within the 13 transboundary river basins and its population of about 95 million people. Water insecurity across these basins is high – with frequent droughts interspersed by flooding. Reliable access to water for drinking, sanitation, agriculture and industry is already limited, constraining human development and economic growth. Given projected scenarios for greater water demand (resulting from population growth and economic development) and more variable water supply (due to the impacts of climate change) riparian states are required to strengthen their cooperation over shared rivers to protect and achieve development gains. The overall objective of CRIDF is to transform the way water infrastructure is planned, developed and managed in SADC. Within this context, CRIDF1 (also implemented by COWI) delivered, and CRIDF2 will continue to deliver, climate resilient water infrastructure interventions that include:

> Water Infrastructure Projects:

Identification and development of infrastructure projects through the entire cycle from scoping, feasibility and detailed design, procurement through to implementation. The projects covers the whole water cycle from monitoring stations (gauging stations) for data collection, urban water supplies and sanitation and community livelihoods projects (mainly solar powered irrigation schemes) CRIDF supports the in-country procurement, financing and supervision systems for infrastructure projects that, once completed, would be owned and managed by national and local authorities, water/energy utilities and beneficiary associations. The projects are used as platforms to further engage stakeholders, introducing climate resilience and transboundary concepts into national and regional policies. Subsequently the lessons and evidence from the projects are disseminated through stakeholder networks in an effort to replicate success, and mainstream climate resilience and pro-poor considerations into water development and management practices. Where feasible power supply is provided through renewable energy installations, such as solar.

> Infrastructure financing arrangements:

In addition to funding CAPEX for projects from its own budgets, CRIDF mobilizes infrastructure finance interventions to complement the infrastructure preparation work. This work focuses on investigating and securing innovative finance arrangements and funding partners for the implementation of the infrastructure projects that CRIDF will have prepared. By doing so, CRIDF seeks to leverage the maximum available support to catalyse transformation in joint planning and implementation of climate resilient infrastructure.

> Technical assistance to stakeholders:

CRIDF provides extensive technical assistance to the relevant stakeholders, ranging from long-term advice to key institutions, to a rapid advisory service to respond to ad hoc requests. Such technical assistance aims at influencing the comprehensive planning and management of water infrastructure projects in the shared river basin context.

> Building cooperation:

The overarching objective of CRIDF’s strategic interventions is that projects should be transformational in terms of their impact on building climate resilience for the poor in

southern Africa. CRIDF actively promotes changing the enabling environment in which CRIDF and other climate resilient infrastructure projects are designed, managed, implemented and operated, with a key aim to build cooperation through regional climate resilient economic growth, thereby shifting the way decision makers think, plan, operate and maintain water infrastructure.

> Strategic Communications:

CRIDF has a comprehensive communication strategy that aims at stakeholders are informed about the background and the results of CRIDF using different communication avenues. CRIDF has produced a broad range of communications materials to share their work to bring transformational change to Southern Africa through improved transboundary water resources management from written briefs, brochures, case studies video documentaries. CRIDF combines different types of written materials, website news stories, resource centre for downloads and communication campaigns for effective dissemination.

> Monitoring and Learning Framework:

CRIDF has a functioning monitoring and learning framework that serves a dual purpose; i) to provide sufficient accurate data to programme management for decision making purposes (programme monitoring) and ii) to monitor and scrutinise programme process and implementation to provide evidence based outputs. CRIDF's monitoring and learning approach is based on the OECD DAC criteria of Relevance, Effectiveness, Efficiency, Impact and Sustainability. In addition, given the regional and facilitative nature of CRIDF the approach take into considerations the OECD DAC criteria for humanitarian aid and will add Coherence, Connectedness and Coordination. A detailed monitoring plan details the monitoring work, parameters, tools, responsible persons, and timing of data collection and frequency of reporting.

COWI GROUP

COWI A/S

PM

GJE

GJE

KJ

COUNTRY

Malta

PERIOD

1991 - 2009

CUSTOMER

Government of Malta /
EIB

TOTAL FEE

EUR 4.092.442

WASTEWATER AND WASTEWATER TREATMENT PLANNING, DESIGN AND IMPLEMENTATION ON MALTA AND GOZO

The project was carried out in three phases. Phase 1 was awarded by the Drainage Department under the Ministry of Environment in international competition, while Phase 2 was performed in a direct award contract by the Drainage Department as a follow up/extension to Phase 1. Phase 3 was an extension to Phase 2, where the client was still the Drainage Department but now part of Water Services Cooperation.

Phase 1, 1991-1992: Preparation of Sewerage Master Plan for Malta and Gozo covering 350,000 people:

- Assessment of population, land-use, tourism, industries and design loads and design criteria;
- Assessment of marine environment, reuse of sludge and effluent, environmental legislation, capacity build-ing, cost recovery and tariffs; and
- Training in Mouse calculations and ancillary programmes

Phase 2, 1993-1997: Implementation for sewerage master plan for Malta and Gozo (Value of services EUR 1,459,288):. Design, preparation of ten-der documents, tendering and construction supervision for implementation of:

- Extension of sewage treatment plant with reuse of effluent (8,000 to 17,000m³/day) and 5 year O&M

Two new pumping stations (300 to 500m³/hour);

- Improvement and extension of existing pumping stations (900 to 8,000m³/hour);

- New sewer outfall for Gozo down to 85m below sea level;
Several hydro-brakes, underground retention reservoirs and sewer mains; and

- Extensive Mouse calculation to determine design of hydro-brakes, pumping stations, retention volumes and pipelines

Phase 3, 2002 to 2009: Implementation of new sewage treatments plants for Malta North and Gozo :

Site investigations, design, technical specifications, preparation of tender documents, tendering and construction supervision (incl. permanent Resident Engineer) for implementation of two sewage treatment plants. Each plant has a capacity of 45,000 pe and about 50% of the effluent will be reused for irrigation and second class industrial water. The contracts included Operation & Maintenance for 5 years after completion. Tender documents were based on PRAG for Instructions to Tenderers and on FIDIC Yellow Book for Conditions of Contract.

COWI GROUP

COWI A/S

PM

PQHM

COUNTRY

Kenya

PERIOD

2016 - 2018

CUSTOMER

Athi Water Services Board
(now Athi Water Works
Development Agency)

TOTAL FEE

EUR 835.708

TOTAL INVESTMENT

EUR 708 MEUR

INTEGRATED SANITATION MANAGEMENT PLAN FOR NAIROBI AND SELECTED SATELLITE TOWNS

Athi Water Services Board (AWSB) intended to employ Consultants to provide services for the updating of the 1998 Master Plan for Sewers, Wastewater Treatment and Sanitation that was carried out for the City of Nairobi and to expand the scope of the Master Plan to include selected Satellite Towns and to cover all urban areas including the ones which will not be covered by conventional sewer systems, but need other kinds of sanitation management to assure that at least basic sanitation services are provided everywhere in urban areas. The objective was to develop an integrated sanitation management (read masterplan) plan (ISMP) for Nairobi and selected satellite towns with a planning framework until 2040.

The purpose of the project is to identify the most appropriate sanitation services for all populated areas in Nairobi and 7 selected Satellite Towns: Limuru, Karuri, Kiambu, Kikuyu, Ngong, Ongata Rongai and Mavoko.

More than 40 per cent of households in Nairobi do not have access to safe sanitation. Instead they dispose of wastewater in septic tanks, soakage pits or into open drains. The Athi Water Services Board called for an update and asked COWI to identify the most appropriate sanitation services for all populated areas in Nairobi and in seven satellite towns.

As an initial step, COWI carried out an assessment of the existing sewerage and wastewater treatment infrastructure and prepared specifications for an immediate, urgent works programme for the rehabilitation of projects in the short term. COWI developed a Sewerage Development Strategic Framework and analysed options for future wastewater treatment. This was followed by the identification and formulation of a phased investment schedule for sewerage and wastewater treatment development. COWI also prepared detailed designs of short-term works, preliminary designs of medium-term works, as well as preliminary environmental impact assessments and the prepared the Integrated Sanitation Management Plan, including financial and economic analyses.

The study was carried out together with SAMEZ Consultants, Kenya as sub-consultant.

> Project management

> Review of Previous Studies incl. Feasibility Study

> Assess inventory and condition surveys and environmental audit

> Wastewater treatment and process planning and engineering (500 – 20,000 m³/d)

- > Sewerage network analysis incl. sewer network model
- > Sewerage planning and engineering (DN 250 - 600) incl development of Sewerage Investment Programme
- > Master plan
- > Detailed design and tender documents (FIDIC/WB Harmonised Version) for Immediate Urgent Works Programme
- > Preliminary and conceptual designs of Stage I and II Programme, respectively
- > Procurement (FIDIC/WB Harmonised Version) and implementation planning
- > Financial and economic analysis and planning
- > Environmental and social impact analysis
- > Operation and Maintenance audit
- > Institutional analysis incl. assessment of institutional framework and review of sewerage management arrangements

COWI GROUP

COWI A/S

PM

LEN

COUNTRY

South Africa

PERIOD

2013 - 2017

CUSTOMER

DFID

TOTAL FEE

GBP 25.000.000

CLIMATE RESILIENT INFRASTRUCTURE DEVELOPMENT FACILITY, PHASE I (CRIDF-1)

The Climate Resilient Infrastructure Development Facility (CRIDF), Phase I, was mandated to design, mobilize finance for, and build climate resilient, pro-poor and transboundary water projects. COWI supported the planning, design and capacity development across the SADC Region to support stronger regional cooperation within the 13 transboundary river basins and its population of about 95 million people. Water insecurity across these basins is high – with frequent droughts interspersed by flooding. Reliable access to water for drinking, sanitation, agriculture and industry is already limited, constraining human development and economic growth. Given projected scenarios for greater water demand (resulting from population growth and economic development) and more variable water supply (due to the impacts of climate change) riparian states were required to strengthen their cooperation over shared rivers to protect and achieve development gains. Within this context, CRIDF delivered water infrastructure interventions that included:

- > Small-scale Water Infrastructure Projects
- > Infrastructure financing arrangements
- > Technical assistance to stakeholders
- > Building co-operation
- > Project Identification and screening
- > Stakeholder Engagement
- > Legal Compliance
- > Technical Designs
- > Project and Procurement Management
- > Technical Assistance

COWI GROUP

COWI A/S

PM

LLM

STORMWATER TUNNEL ØSTERBRO, COPENHAGEN

-Investment value 14,615,213 EUR.

COUNTRY
Denmark
PERIOD
2013 - 2018
CUSTOMER
HOFOR A/S
TOTAL FEE
EUR 1.340.000

The Østerbro Water Tunnel is a 700 m long water tunnel with a diameter of 2.5 m with outlet to the Kalkbrænderihavn. The tunnel is located at 8-13 m depth and is established as pipe jacking, except for an approximately 20 m long 2,5 x 3,0 m sea outfall culvert.

The Stormwater Tunnel is part of Copenhagen Municipality's plans for radical climate adaptation and drainage security of Copenhagen. The project is part of the specific execution of the municipality drainage plan for Outer Østerbro. The tunnel connects the rain and torrential rain water from about 1 km² catchment area between Lyngbyvej Jagtvej / Strandboulevarden and railway. The Water Tunnel constitutes the hydraulic downstream part of the overall plan for securing the drainage of the hinterland in order to separate the drainage water from the sewage system to extent possible.

As part of the project detailed hydraulic analyzes and modelling were carried out for documenting the project's operation and performance of Municipal and HOFOR's requirements to limit flooding.

The project was implemented in partnering between the Client HOFOR A/S and the Contractor NCC/ SMET Oesterbro Tunnel Consortium I/S with COWI as HOFOR's adviser/consultant. COWI assisted the Client with the development of the project, hydraulic modelling, conceptual and detailed design, tendering, stakeholder management and application of authority approvals. Assistance to HOFOR's construction management and supervision team was also part of COWI's services.

The final projects detailed design has been agreed in a project optimization phase in a close, open and constructive dialogue based on the three parties experience and knowledge. The project was tendered according to EU procurement procedure.

The project was completed in November 2018.

Construction cost of the project is estimated to EUR 14.6 million.

- > Project development in partnering and project management
- > Conceptual design
- > Hydraulic modelling
- > Preparation of tender documents
- > Tendering and contracting
- > Stakeholder management
- > Handling of contact to authorities for project approvals
- > Detailed design in a dialogue-based process with the Client and the Contractor comprising detailed design of tunnel and structures, environmental investigations, geotechnical investigations, etc.
- > Various specialist consultancy
- > Assistance to HOFOR's construction management and supervision team

COWI GROUP
COWI A/S
PM
JAPN
COUNTRY
Denmark
PERIOD
2012 - 2018

EGEBJERG WASTEWATER TREATMENT PLANT

Technical assistance to the water and waste utility in Svendborg to meet requirements for wastewater treatment:

- > Egebjerg wastewater treatment plant: Detailed design, tendering and supervision for construction of Egebjerg Wastewater treatment plant (20,000 PE).
- > Upgrading of Egebjerg wastewater treatment plant to receive wastewater from tannery (Scanhide): The public wastewater treatment plant is upgraded to receive and treat sulphur and chromium wastewater from the tannery's chromium recycling plant. In

CUSTOMER
RECIPIENT
TOTAL FEE
DKK 4.000.000

addition to wastewater treatment, the project involved occupational health and safety issues.

> Upgrading of hydraulic capacity at Egebjerg wastewater treatment plant: The hydraulic capacity is enhanced by an optimized return sludge-channel and establishment of new sedimentation tank and equalization basin. Treatment processes were optimized and treatment capacity was increased.

COWI's services comprises a wide range of assignments, including:

- > Project management
- > Development of treatment processes
- > Process calculations
- > Detailed design
- > Preparation of tender documents
- > Tender evaluation and contract negotiations
- > Construction supervision
- > Commission
- > Remedial actions and handing-over

COWI GROUP
COWI A/S
PM
ODA
COUNTRY
Denmark
PERIOD
2012 - 2018
CUSTOMER
BIOFOS A/S
TOTAL FEE
EUR 1.706.712

SLUDGE DEWATERING AT LYNETTEN AND DAMHUSÅEN WASTEWATER TREATMENT PLANTS

The project comprised replacement of the sludge dewatering at Lynetten wastewater treatment plant (750,000 PE) and at Damhusåen wastewater treatment plant (300,000). The sludge dewatering plants involved amongst others seven decanter centrifuges, polymer dosage plant for both dry- and wet polymer, pumps, screw conveyor, sludge silos, SCADA installations etc. Furthermore, the project comprises refurbishment of existing dewatering buildings and construction of foundation for technical equipment and machinery. A challenge to the project is that both plants shall be in operation at all times while the replacement and reconstruction is ongoing in the existing facilities and buildings.

Each of the three centrifuges on Lynetten wastewater treatment plant is designed for a capacity of 2,400 kg DS/h and a hydraulic capacity of 60 m³/h. The centrifuges are designed to increase the sludge to 30% DS. The sludge transport system is based on 24 bar positive pumps and high-pressure pipe systems.

At Damhusåen wastewater treatment plant, two pre-dewatering centrifuges and two dewatering centrifuges are included in the project. The two pre-dewatering centrifuges has a design capacity of each 1,000 kg DS/h and a hydraulic capacity of 80 m³/h. The two dewatering centrifuges have a design capacity of 1,000 kg DS/h and a hydraulic capacity of 25 m³/h. Sludge from both plants are processed in a sludge dryer to increase the DS to 35% before it is incinerated.

Each of the three centrifuges on Lynetten wastewater treatment plant is designed for a capacity of 2.400 kg DS/h and a hydraulic capacity of 60 m³/h. The centrifuges are designed to increase the sludge to 30% DS. The sludge transport system is based on 24 bar positive pumps and high-pressure pipe systems.

At Damhusåen wastewater treatment plant two pre dewatering centrifuges and two dewatering centrifuges are included in the project. The two pre dewatering centrifuges has a design capacity of each 1,000 kg DS/h and a hydraulic capacity of 80 m³/h. The two dewatering centrifuges has a design capacity of 1.000 kg DS/h and a hydraulic capacity of 25 m³/h.

COWI's services comprises:

- > Functional tendering for parts of the project
- > Detailed design for parts of the project
- > Preparation of tender documents
- > Construction supervision
- > Site management
- > Commissioning, handing-over and defect liability period (planned to be from Jan. 2016 to March 2017)
- > CE-labelling

COWI GROUP

COWI A/S

PM

CHJ

COUNTRY

Albania, Bosnia and Herzegovina, Montenegro, Serbia

PERIOD

2009 - 2014

CUSTOMER

European Commission, DG Enlargement

TOTAL FEE

EUR 7.660.047

INFRASTRUCTURE PROJECTS FACILITY – TECHNICAL ASSISTANCE WINDOW (IPF TA) (IPF-2) WITHIN THE ENVIRONMENTAL SECTOR

The Western Balkans Investment Framework (WBIF) was launched in 2009 with the objective of pooling grant resources in order to leverage loans for the financing of priority infrastructure and socio-economic development in the Western Balkans.

The selected investment projects are supported via the Infrastructure Projects Facility – Technical Assistance Window (IPF TA) contracts, one of which COWI A/S was lead on (IPF-2).

The specific project purpose was to ensure the effective and rapid preparation of bankable infrastructure investment projects which had been identified in the beneficiary countries as important and prioritised by the WBIF Steering Committee. Investment projects were supported within the following four sectors: transport, environment, energy and social infrastructure (buildings).

Each investment project was prepared in close cooperation with one of the WBIF investment partners (EIB, EBRD, KfW, CEB, EC).

The TA support comprised: identification studies, project scoping, prefeasibility and feasibility studies, economic and financial analyses, environmental impact assessments, social impact assessment, conceptual, project designs, tender documents and technical assistance to PMU/PIU/PITs. The TA also included training of beneficiary institutions and visibility activities.

A total of 36 individual investment projects were assigned for TA support under IPF-2, all of which were completed. The investment projects fell within four sectors: environment (9), transport (6), energy (10) and social infrastructure (buildings) (11).

The IPF-2 TA was contracted by the European Union, EC DG Enlargement (EuropeAid/128073/C/SER/MULTI). The contract was signed in November 2009 (no. 2009/224-490) and an addendum was signed in October 2011 (no. 2011/273-396). Total contract value was EUR 29,707,133 and the implementation period was from November 2009 till June 2014.

This project provided technical assistance (TA) for preparation of infrastructure projects within the environmental sector comprising: project scoping, feasibility studies, economic and financial analyses, environmental and social impact assessments, project designs (conceptual/preliminary/detailed), tender documents, procurement support and supervision of works. The TA also included training to beneficiary institutions and visibility activities.

The following sub-projects were completed:

- > Detailed design and tender documents for Shengjin sewerage network (TA2-ALB-ENV-01)
- > Detailed design and tender documents for the extension of Kavaja wastewater treatment plant (WWTP) and Golemi sewerage network (TA2-ALB-ENV-03)
- > Feasibility study for the improvement of flood protection infrastructure in Albania – Mati River (TA3-ALB-ENV-03)
- > Technical assistance for water and sanitation (WATSAN) projects in 15 municipalities in the Federation of BiH (TA3-BIH-ENV-02)
- > Technical assistance for the procurement and monitoring of Bijeljina wastewater treatment plant (WWTP) implementation (TA3-BIH-ENV-03)
- > Non-revenue water reduction plan pilot study for the Municipality of Tuzla and master plan for water supply to the settlements north of Tuzla (WB5-BIH-ENV-15)
- > Technical assistance for the construction of regional landfills in Montenegro (WB4-MNE-ENV-11 and WB4-MNE-ENV-12)
- > Technical assistance for flood risk management measures for the Republic of Srpska in BiH (WB5-BIH-ENV-17)

COWI GROUP

COWI A/S

PM

CHJ

COUNTRY

Albania, Bosnia and Herzegovina, Croatia, the former Yugoslav Republic of Macedonia, Montenegro, Serbia, Kosovo, Turkey, Iceland

PERIOD

2009 - 2014

CUSTOMER

European Commission, DG Enlargement

RECIPIENT

TOTAL FEE

EUR 29.707.133

INFRASTRUCTURE PROJECTS FACILITY – TECHNICAL ASSISTANCE WINDOW (IPF TA) (IPF-2)

Investment value -3,700,000,000 EUR. The Western Balkans Investment Framework (WBIF) was launched in 2009 with the objective of pooling grant resources in order to leverage loans for the financing of priority infrastructure and socio-economic development in the Western Balkans.

The selected investment projects are supported via the Infrastructure Projects Facility – Technical Assistance Window (IPF TA) contracts, one of which COWI A/S was lead on (IPF-2).

The specific project purpose was to ensure the effective and rapid preparation of bankable infrastructure investment projects which had been identified in the beneficiary countries as important and prioritised by the WBIF Steering Committee. Investment projects were supported within the following four sectors: transport, environment, energy and social infrastructure (buildings).

Each investment project was prepared in close cooperation with one of the WBIF investment partners (EIB, EBRD, KfW, CEB, EC).

The TA support comprised: identification studies, project scoping, prefeasibility and feasibility studies, economic and financial analyses, environmental impact assessments, social impact assessment, conceptual, project designs, tender documents and technical assistance to PMU/PIU/PITs. The TA also included training of beneficiary institutions and visibility activities.

A total of 36 individual investment projects were assigned for TA support under IPF-2, all of which were completed. The investment projects fell within four sectors: environment (9), transport (6), energy (10) and social infrastructure (buildings) (11).

The IPF-2 TA was contracted by the European Union, EC DG Enlargement (EuropeAid/128073/C/SER/MULTI). The contract was signed in November 2009 (no. 2009/224-490) and an addendum was signed in October 2011 (no. 2011/273-396). Total contract value was EUR 29,707,133 and the implementation period was from November 2009 till June 2014.

This project provided technical assistance (TA) for the preparation of infrastructure projects within the four sectors, comprising project scoping, feasibility studies, economic and financial analyses, environmental impact assessments, social impact assessment, conceptual, preliminary and main design of projects, tender documents preparation (typically following FIDIC models), other procurement support and technical assistance to PMU/PIU/PITs. The TA also included training of beneficiary institutions and visibility activities.

The following projects were completed:

Environment

- > Detailed design and tender documents for Shengjin sewerage network (TA2-ALB-ENV-01)
- > Detailed design and tender documents for the extension of Kavaja wastewater treatment plant (WWTP) and Golemi sewerage network (TA2-ALB-ENV-03)
- > Feasibility study for the improvement of flood protection infrastructure in Albania – Mati River (TA3-ALB-ENV-03)
- > Technical assistance for water and sanitation (WATSAN) projects in 15 municipalities in the Federation of BiH (TA3-BIH-ENV-02)
- > Technical assistance for the procurement and monitoring of Bijeljina wastewater treatment plant (WWTP) implementation (TA3-BIH-ENV-03)
- > Non-revenue water reduction plan pilot study for the Municipality of Tuzla and master plan for water supply to the settlements north of Tuzla (WB5-BIH-ENV-15)
- > Technical assistance for the construction of regional landfills in Montenegro (WB4-MNE-ENV-11 and WB4-MNE-ENV-12)
- > Technical assistance for flood risk management measures for the Republic of Srpska in BiH (WB5-BIH-ENV-17)

Social infrastructure

- > Review of feasibility study, detailed design and tender documents for research and development infrastructure facilities in Serbia (TA3-SER-SOC-01)
- > Support to the PIU and preliminary and main design for buildings C and D for judiciary facilities in Serbia (TA3-SER-SOC-02)
- > Support to the PIU and preliminary and main design and tender documents for the High Court of Belgrade (Palace of Justice) (WB6-SER-SOC-08)
- > EIA and energy supply study for Tirana University Hospital Centre (TA-ALB-04)
- > Technical assistance and design supervision for Idrizovo Prison Reform Project (prisons in Skopje, Kumanovo, Tetovo and Idrizovo) (TA-MKD-01)
- > Feasibility study and project definitions for Banja Luka medical facility, research centre and school including guidelines for education of nurses and other healthcare professionals in Republika Srpska (BiH) and preparation of the preliminary design (WB5-BIH-SOC-03)
- > Technical assistance for health provider institutions (HPI) in the former Yugoslav Republic of Macedonia, including feasibility study for 40 HPIs and supervision of detailed design for the hospitals in Skopje and Shtip (TA3-MKD-SOC-01)
- > Feasibility study, preliminary and detailed design and tender document preparation for South East European Centre for Entrepreneurial Learning (SEECCEL) in Zagreb (WB5-REG-SOC-01)

- > Support for the construction of INTEGRA sport and cultural facility, Mostar, BiH (WB7-BIH-SOC-05)
- > The Gardarsholm Sustainability Centre: Business plan, preliminary design and needs assessment for supplies (Iceland1)
- > Prefeasibility study for the Regional Refugee Housing Programme (RHP)

Transport

- > Feasibility study and main design including tender document preparation for the track overhaul of the Podlugovi-Sarajevo railway section on the Vc corridor (TA2-BIH-TRA-02)
- > Feasibility study for short term option (overhaul of existing line for designed speeds) including preliminary design and prefeasibility study for medium to long term options (modernisation for 160km/h speed double track and electrified line) for the rehabilitation of railway route 10 (TA-KOS-02)
- > Feasibility study including preliminary design for the rehabilitation of key railways links (east-west) in Kosovo* (WB5-KOS-TRA-06)
- > Feasibility study and main design including tender document preparation for the track overhaul of the Doboje-Maglaj and Jelina-Zenica railway sections on Corridor Vc (WB5-BIH-TRA-14)
- > Technical assistance during the construction of the Brcko by-pass (WB6-BIH-TRA-15)
- > Feasibility study including preliminary design for the Tirana by-pass – Kashar-Vaqarr-Mullet, (WB7-ALB-TRA-12)

Energy

- > Feasibility study Tirana 2 – Rashbull 220kV line and new 220/110kV substation in Rogozhina (TA3-ALB-ENE-01)
- > Feasibility study for the construction of a 120MVA substation 220/110kV in Tirana 3 and reinforcement of 110kV Tirana Ring (WB4-ALB-ENE-01)
- > Feasibility study update for the improvement of district heating Phase 2 – CHP in Pristina, Kosovo* (TA3-KOS-ENE-03)
- > Feasibility study and ESIA for the Elbasan-Bitola 400 kV transmission line (WB4bis-REG-ENE-01)
- > Feasibility study and ESIA for the interconnection of Serbia with Bulgaria for a gas transmission pipeline (WB4-SER-ENE-04)
- > Cost-benefit analysis for LNG evacuation pipelines Omišalj – Zlobin – Rupa (Slovenija) (WB5-HR-ENE-02)
- > Prefeasibility study for the southern gas pipeline interconnection of BiH and Croatia (WB6-REG-ENE-08)
- > Conceptual solution, feasibility study, EIA, SIA and conceptual design for an LNG regasification vessel (WB5-HR-ENE-01)
- > Feasibility study and EIA and SIA for the Ionian-Adriatic gas pipeline (IAP) (WB5-REG-ENE-03)
- > Identification study - fuel switching and system expansion for district heating in Gjakova, Kosovo* (WB8-KOS-ENE-11)

*This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

COWI GROUP

COWI A/S

PM

KVH

COUNTRY

North Macedonia
(formerly Macedonia or
FYROM Macedonia)

PERIOD

2013 - 2015

CUSTOMER

Ministry of Transport and
Communications (MoTC)

TOTAL FEE

EUR 940.611

CONSULTANCY SERVICES FOR THE ELABORATION OF A FEASIBILITY STUDY FOR WATER AND SEWERAGE PROGRAMME PHASE II, MACEDONIA

Feasibility study for water and wastewater services in large and medium sized municipalities of Macedonia: Bitola, Gevgelia, Gostivar, Kavadarci, Kočani, Negotino and Radoviš, with a total population of about 370,000.

The feasibility study comprised three phases:

Phase 1: Data collection and assessment of the present situation. Detailed baseline studies and investigations into socio-economics, technical, financial, institutional, health and environmental situation, including detailed water balance studies based on NRW assessments, climate related impact assessments, hydraulic modelling and pressure zoning strategies.

Phase 2: Elaboration of the project concept. Conceptual planning including preparation of affordable investment plans and improved operation concepts leading up to conceptual engineering.

Phase 3 Detailed formulation and design of investment packages. Final development of implementation programme comprising preliminary designs at feasibility study level to KfW and local guidelines and procedures and technical, financial, economic and environmental assessment of the proposed programme.

Total investments: 11.4 MEUR, whereof 3.5 MEUR in an advance implementation phase. All investments focusing on the water supply component of the investment needs (incl. including intake weirs, water distribution pipelines (350km, DN 90-800) and house connections), with a small investment in wastewater.

The Project was carried out with GEING and GFA as sub-consultants.

- Project Management
- Field investigations
- Diagnostic baseline studies of current situation
- Concept analyses including conceptual designs
- Feasibility study including water network analysis and preliminary designs
- Proposal for investment programmes
- Needs analysis for technical assistance during project implementation and operation of the systems

COWI GROUP

COWI A/S

PM

VIZE

COUNTRY

Qatar

PERIOD

2013 - 2017

CUSTOMER

Salini Impregilo S.p.A.
QATAR BRANCH

TOTAL INVESTMENT

100 MEUR

ABU HAMOUR SURFACE AND GROUND WATER DRAINAGE TUNNEL

The overall project comprises the design and construction of a storm water tunnel and associated access shafts along the route of the proposed F-Ring Road from Musaimeer Street to the New Doha International Airport area in Doha, Qatar. The tunnel forms a link to allow discharge of storm flows from an existing shaft in Musaimeer Street to the sea. It will collect storm water runoff from the southern and western parts of the area over a total catchment area of about 170 km². Under a future project a pumping station will be constructed at the downstream end of the tunnel to discharge storm flows via an outfall to the sea. 21 shafts will provide entrance to the tunnel during construction and maintenance.

The main works include a tunnel of 9.5 km length with internal diameter of 3.70 m, from existing shaft AS23 at the western upstream end to proposed shaft AS00 at the eastern downstream end adjacent to the coastline. The envisaged construction method of the tunnel is tunnel boring machine (TBM) method. The tunnel invert lies between elevation of

-16.0 m and -11.5 m and the existing ground elevation varies from +2.4 m to +20.0 m. The TBMs will be launched from access shaft AS11 in the direction towards AS23 and AS00. The segmental lining is designed as precast steel fibre reinforced concrete segments. Access shaft AS11 is the launching shaft for the TBMs.

The main purpose of the launching structures is to launch the TBM and to service the tunnel during construction. The AS11 temporary lining is designed with plain shotcrete and wire mesh. In order to provide a robust structure each strata is supported by rockbolts. The Abu Hamour Surface & Ground Water Drainage Tunnel is located in a hot and humid environment with high concentrations of chlorides and sulphates present in soil and groundwater. The design life for the main AHSO tunnel, shafts and all associated pipelines constructed by microtunnel and pipe jacking shall be 100 years.

The general stratigraphy beneath Doha comprises recent Quaternary marine, aeolian and sabkha deposits overlying the Tertiary Dammam and Rus Formations. The Dammam formation is divided into the upper Dammam including the Simsima Limestone and the lower Dammam including the Midra Shale Series. The deeper Rus Formation comprises two main components, an upper generally chalky limestone overlying an interbedded deposit of evaporite and marl horizons. The Simsima Limestone forms much of the bedrock across Qatar and generally varies from chalky crystalline limestone to dolomitic limestone. The strata is extremely heterogeneous with rapid changes in composition and strength laterally and vertically. The variable degree of weathering has resulted in a highly variable rock in terms of strength and mineralogy. The Midra Shale consists of shale, clay, marl and dolomite. The upper unit of the Rus Formation in Qatar is generally composed of chalky dolomitic limestone occasionally intercalated with thin beds of

attapulgitic clay.

- > Tender Design
- > Preliminary & detailed design
- > Technical follow-up during construction supervision

COWI GROUP
COWI A/S

PM
KLM

COUNTRY
Benin

PERIOD
2013 - 2017

CUSTOMER
The Dutch Ministry of
Foreign Affairs

TOTAL FEE
EUR 9.180.883

TECHNICAL ASSISTANCE FOR THE MULTI-ANNUAL PROGRAMME FOR WATER AND SANITATION (PPEA)

No investment value. For the Multi-annual Programme for Water and Sanitation, the overall objective of the programme was to strengthen the capacities of the institutional and organizational government structures, improve the level of services of these structures, and increase staff competencies in the fields of water, sanitation and health. This included development of water availability (quality and quantity); reducing water related risks (e.g. overfishing, pollution of groundwater, flooding, erosion); increase food and nutrition security of the population; improve equitable and sustainable access to safe drinking water in rural and urban areas; and strengthening hygiene awareness and increasing access to basic sanitation equitably and sustainably.

COWI provided technical assistance to six components of the programme, these included: integrated water resources management (IWRM); water and food security; drinking water supply in rural areas; drinking water supply and wastewater management in urban areas and sub-urban areas; and cross-sector aspects including gender, good governance, accountability and climate change.

- > Institutional Strengthening: Support to the establishment and the development of the National Institute of Water and Environment. This included general support for establishing the institutional framework at the national level and in the Ouémé basin.

- > Integrated Water Resources Management (IWRM): Support to the implementation of the national IWRM plan. This included support for improving management of hydraulic structures, and undertaking a diagnosis of hydro-agricultural management and methods.
- > Strategic/Master Planning: Support to the development and implementation of the Master Plan for Water Development and Management.
- > Coastal Zone Management: For specific activities in the coastal zone, COWI facilitated the creation of a stakeholder platform, a Delta Committee and a number of thematic working groups to coordinate the various activities for the preparation of a Delta Plan and an associated decision support system. To support these processes, the work conducted through the different working groups and included areas such as hydraulic modelling of the delta area (sea, lagoon and incoming river flow from the mainland), information management and updates of inventory, etc. Based on the Delta Committee's Global Vision for the Delta, various scenarios were examined. The vision was consolidated by concurrently updating and sharing results of the diagnostic studies as these were being completed and through this process raising the awareness of the stakeholders.
- > Economics and Financing: COWI assisted in undertaking an economic and financial analysis of operations of water utilities. Support to Investment planning by developing proposals and cost estimates for rehabilitation works water and sanitation infrastructure, and cultural promotional techniques.
- > Decentralisation: Strengthening cooperation between decentralised region and states. Furthermore COWI provided support for the construction of decentralised water sources. This included support to decentralised implementation of the strategy for the Promotion of Hygiene and Sanitation.
- > Urban and Rural Water and Sanitation: Supported the development of a Sanitation Master Plan for the Parakou area. Support for the implementation of latrines in a "sustainable" way by including the concepts of gender and equity.
- > Water Quality: Support activities to maintain water quality.
- > Stakeholder participation: Support activities to promote intercommunity relations and support to the establishment of drinking water consumer associations.
- > Private sector: Support for improving performance of the private sector and support for promoting and facilitating the formation of Public-Private Partnership.

Salient Achievements: COWI participated in the creation of the National Water Institute (INE), in which the delta plan was anchored, which is the scientific body for hydraulic modelling in Benin. Furthermore, COWI was together with various stakeholders part of putting into practice enhanced integrity procedures in the water sector resulting in institutional improvement.

COWI GROUP

COWI A/S

PM

CAMI

KVH

COUNTRY

North Macedonia

(formerly Macedonia or FYROM Macedonia)

PERIOD

2011 - 2015

WATER AND SEWERAGE PROGRAMME MACEDONIA - PREPARATION OF DETAILED DESIGN AND TENDER DOCUMENTS, ASSISTANCE TO PEA IN TENDERING AND CONTRACTING AND CONSTRUCTION SUPERVISION

KfW is funding a water and sewerage programme in Macedonia covering large and medium sized municipalities of Bitola, Gevgelija, Gostivar, Kavardaci, Kocani, Negotino, Radovis and Tetovo, with a total population of about 450,000.

The first phase of the programme comprised implementation of an immediate priority investment programme up to a volume of 65 EUR/house connection, of which KfW finances 50 EUR/house connection.

The project comprised:

- 1) Identification, prioritisation and selection of Phase 1 investments;

CUSTOMER
Ministry of Transport and
Communication
TOTAL FEE
EUR 915.404

- 2) Detailed design and preparation of tender documents according to FIDIC and national procurement laws, comprising works and supply contracts;
- 3) Assistance to the Project Executing Agency (PEA) in tendering and contracting;
- 4) Assistance to the PEA in site supervision of the works; and
- 5) Assistance to the PEA during the defects liability period and handing over.

Totally, 17 works/supply contracts were implemented at a total investment cost of 6.5 MEUR.

Works contracts comprised: pipe rehabilitation, replacement of valves and fittings, new water mains, new reservoirs and pump replacement.

Supply contracts comprised: water meters, leak detection equipment, and control and measuring equipment including SCADA system.

The project was carried out with GEING as sub-consultant

- 1) Project management;
- 2) Water and wastewater engineering;
- 3) Mechanical and electrical engineering;
- 4) Investment planning;
- 5) Detailed designs according to FIDIC Red Book and Macedonian laws and regulations;
- 6) Tender Dossiers preparation, tendering and contracting using FIDIC formats;
- 7) Supervision of works and supply contracts;
- 8) Handing over and defects liability assistance.

COWI GROUP
COWI A/S
PM
LJE
COUNTRY
Armenia
PERIOD
2010 - 2011
CUSTOMER
EBRD
TOTAL FEE
EUR 137.982

SMALL MUNICIPALITIES WATER - DUE DILIGENCE

The Project objective was to improve municipal water supply and wastewater services of the Armenian Water and Sewerage Company (AWSC), a state owned corporation. The strategy was to rehabilitate reliable water and wastewater services throughout the country. The operation would primarily benefit lower-income groups, as the Company operates in the poorer areas of the country.

22 towns and villages scattered throughout the country were earmarked in the terms for technical, financial and environmental/social due diligence. Detailed data on existing water and wastewater services in all 22 towns were collected based on comprehensive technical and financial questionnaires. Beside information on existing services, the questionnaires also contained questions about condition and coverage of existing services. Finally, the questionnaires were designed to give detailed information of technical requirements for improved 24 hours services for the entire population in the 22 projects towns: Long list of projects. The individual long lists were ranked in priority order and discussed with the central office of the Armenian Water and Sewerage Company, whereupon a final list of high priority projects for EBRD loan (20 mill. EUR) were defined.

The priority projects covered water supply improvements in 15 towns, wastewater projects in one town and both water and wastewater projects in further one town. Totally, 17 towns were selected for service improvements under the EBRD loan.

Financial models were developed to calculate impact on tariffs caused by the new investments and O&M for the investments. Affordability investments further suggested level of subsidy in order to secure sustainability of the services and utilities. Environmental and social due diligence analyses were prepared for the agreed projects.

- Project Management.
- Assessment of existing water and wastewater services.
- Assessment of financial performance of the utilities.
- Recommendations of utility improvements.
- Preparation of technical and financial due diligence reports.
- Preparation of environmental and social due diligence reports
- Definition of high priority projects for EBRD finance (total budget 20 mill. EUR)

COWI GROUP
COWI A/S

PM
PGR
BOTV

COUNTRY
United Arab Emirates

PERIOD
2012 - 2017

CUSTOMER
Impregilo SpA

TOTAL INVESTMENT
308 M EUR

TOTAL FEE
2.9 M EUR

ABU DHABI DEEP TUNNEL SEWER - STRATEGIC TUNNEL ENHANCEMENT PROGRAMME (STEP 2)

The Abu Dhabi Strategic Tunnel Enhancement Programme (STEP) is to provide a major improvement in the capacity of Abu Dhabi's waste water system. The programme includes a new deep gravity sewer tunnel 45 km in length taking the main sewer flows from Abu Dhabi to a new treatment works outside the city and a series of link sewers connecting into the deep tunnel. The tunnel varies in diameter from 4.5 to 5.5 metres and is to be constructed with seven earth pressure balance (EPB) TBMs which are launched and operated from seven deep shafts.

COWI is carrying out the detailed design of one of the major contracts that comprises 15 km of deep tunnel, six deep shafts that vary from 50 metres to 60 metres in depth and all ancillary works, (the STEP T-02 contract).

> Main collector (Deep Sewer Tunnel) excavated by means of n°3 Earth Pressure Balance (EPB) TBMs of a total length of 15.5 km, excavation diameter 6.30m and finished diameter of 5m, with a primary lining made of pre-cast concrete segments and secondary lining cast in situ together with high-density polyethylene (HDPE) membrane.

> n° 3 temporary shafts, with internal diameter of 16.2m and depth varying from 40 to 60m to be used as TBM launching and service shafts.

> Auxiliary structures for connection of shafts to the main tunnel.

T02: COWI carried out the detailed design for 15 km of deep tunnel, six deep shafts that vary from 50 meters to 60 meters in depth and all ancillary works and QA.

COWI GROUP
COWI A/S

PM
CAMI

COUNTRY
Ukraine

PERIOD
2010 - 2011

CUSTOMER
Municipality of Chernivtsi

TOTAL FEE
EUR 455.807

ELABORATION OF A FEASIBILITY STUDY FOR THE PROJECT WATER SUPPLY CHERNIVTSI, UKRAINE

Chernivtsi is a regional centre in the Western part of Ukraine with a population of about 250,000 inhabitants.

With the overall objective of assisting the sustainable development of water and wastewater infrastructure in Chernivtsi Municipality contributing to Ukraine meeting the EU environmental acquis, the Chernivtsi Municipality – financed by a grant from KfW - has embarked on the preparation of a feasibility study.

The feasibility study comprised three phases:

Phase 1: Data collection and assessment of the present situation. Detailed investigations into socio-economics, technical, financial, institutional, health and environmental situation. Large scale field measurements in water supply system forming input for the hydraulic modelling and identification of pressure zoning strategies. Establishment of a detailed water balance. Financial analyses of both Municipality and Water Utility.

Phase 2: Elaboration of the project concept. A concept for the future water and wastewater system was developed with emphasis on evaluations on options for future bulk water supply to the Municipality. Current sources include pumping of water for about 40 km from Dnister River. Also establishment of pressure zoning and detailed plans for combating the very high Non-Revenue-Water of about 70%.

Phase 3 Detailed formulation and design of investment packages. Descriptions, preliminary designs and detailed feasibility assessments (technical, financial and environmental) of chosen concept. Development of financial model and recommendations for tariff policy.

Rehabilitation of the following infrastructure was assessed in the feasibility study: surface and ground water intakes, water treatment plant (90,000 m³/day), transmission mains, water distribution system incl. house connections, reservoirs, pumping stations as well as the wastewater collection and treatment system. Furthermore, the need for leak detection and implementation of a SCADA system was elaborated.

COWI developed hydraulic models of the water supply system (transmission main and city distribution network) as well as technical specifications and preliminary design of metering chambers, pumping stations, water intakes and replacement of water pipes (DN 150 – 1000).

COWI's services comprised:

- > Project Management
- > Field investigations
- > Diagnostic studies of current situation
- > Concept analyses including conceptual designs
- > Hydraulic models of water supply system
- > Feasibility study including water supply and wastewater analysis and preliminary designs
- Proposal for investment programme
- Proposal for administrative set-up for water and wastewater services
- Needs analysis for technical assistance during project implementation and operation of the systems

COWI GROUP
COWI A/S

PM
JFK

COUNTRY
Latvia

PERIOD
2005 - 2006

CUSTOMER
Ministry of the
Environment / UDEKA

RECIPIENT
Daugavpils Udens Ltd.

TOTAL FEE
EUR 1.712.202

DEVELOPMENT OF WATER SERVICES IN DAUGAVPILS CITY, PHASE II, LATVIA

Daugavpils is the second largest city in Latvia with about 120,000 inhabitants. During the years 1996-2001 a first phase of rehabilitation of the water and wastewater systems took place with funding from loans and grants from various IFIs.

COWI was during this Phase 1 project involved in rehabilitation of the main wastewater pumping station, priority wastewater network rehabilitation and upgrading of electrical and automation systems at the wastewater treatment plant.

COWI as lead in consortium with Firma L4 of Latvia is now implementing the Phase II project in Daugavpils, funded by EU and local counterpart funding.

The project comprises planning, hydraulic modelling, design and preparation of tender documents (FIDIC Yellow Book and Red Book) for rehabilitation and extension of water supply and wastewater systems in the city:

- > Preparatory Activities: Review of existing situation, mapping and topographical surveys, field investigations comprising leakage detection, corrosion tests, CCTV, etc;

- > Development and calibration of hydraulic models for the water and wastewater networks including manhole surveys;
- > Outline designs of (i) Kalkuni water production works, (ii) Ziemeli wellfield, 18 Water booster stations, 21 wastewater pumping stations, 2 River crossings, Improvements at Wastewater Treatment Plant, Stormwater pumping station, and sludge treatment improvements;
- > Detailed design of 23 km water pipeline rehabilitation or expansion and 14 km sewer network rehabilitation or expansion;
- > Preparation of Works Tender Documents based on FIDIC Yellow (WWTP) and Red Books (Pipe networks); and
- > Preparation of Service Tender Documents based on EU PRAG.

Total estimated construction cost of Works is 24 mill EUR.

The services comprised:

- > Project Management;
- > Investigations of existing water and wastewater network
- > Hydraulic modelling (including calibration) of water and wastewater networks
- > Designs for FIDIC Yellow and Red Book
- > Tender Documents for FIDIC Yellow and Red Books Works contracts
- > Tender Documents for service contracts (EU PRAG)
- > Capacity building and training

COWI GROUP

COWI A/S

PM

JJ

COUNTRY

Poland

PERIOD

2004 - 2010

CUSTOMER

Szczecin Water and Wastewater Company Ltd. (ZWIK)

TOTAL FEE

EUR 5.849.640

ENGINEER FOR CONSTRUCTION OF GRABÓW AND DOLNY BRZEG PUMPING STATIONS WITH PRESSURE COLLECTORS AND CONSTRUCTION OF SEWERAGE SYSTEM AND WATER SUPPLY SYSTEM FOR LEFT AND RIGHT RIVERBANK OF SZCZECIN

Szczecin is a large city with 415,000 inhabitants situated in north west Poland, where the river Odra meets the Baltic Sea (through Szczecin Bay).

Szczecin is currently implementing the largest Polish investment project focusing on environmental protection: the programme "Improving Quality of Water in Szczecin". The total implementation cost of the project is 288 mill EUR, whereof EU ISPA is funding 190 mill EUR.

The project comprises a complete renovation and expansion of the water and wastewater systems of the city.

COWI is the lead partner in a Consortium who won the largest consultancy contract for construction management, comprising supervision of 4 large works contracts at a construction cost of 106,715,578 EUR:

- > Contract No. 13 – Sewerage, stormwater and water supply system for the left bank of Szczecin. Scope: 61 km sewers and rising mains ø50-1800 mm (hereof 2447 m micro-tunneling and 341 m no dig), 37 km stormwater pipes ø200-1500 mm, 25 km water pipes, extension of water treatment of capacity 2438 m³/h, 8 pumping stations, 20 stormwater treatment units with outlet.
- > Contract No. 15-1- Sewerage, stormwater and water supply system for the right riverbank of Szczecin. Scope: 28 km sewers, 23 km stormwater pipes, 10 km water supply

network, 3 pumping stations, 4 stormwater separators and 5 outlets, 2 sewage receipt stations, mechanical screen.

> Contract No. 15-2 – Sewerage, stormwater and water supply system for the right riverbank of Szczecin. Scope: 20 km sewers, 20 km stormwater pipes, 18 km water supply network, 10 pumping stations; and

> Contract No. 16 - Construction of Grabów and Dolny Brzeg Pumping stations with pressure collectors. Scope: Large pumping stations with design capacities Grabów 1.8 m³/s and Dolny Brzeg 1.2 m³/s, two rising mains, each length 6.2 km ø600-1000 mm and one 9000 m³ retention tank.

Works supervision activities according to FIDIC Conditions for Plant and Design Build 1999 (Yellow Book) and according to Polish Building Law.

The services comprised:

- > Project management;
- > Contract management of four Works contracts
- > Compliance Review of Contractors' detailed design
- > Supervision during construction of 4 large Works contracts (FIDIC Yellow Book and Polish Building Law)
- > Testing, pre-commissioning, commissioning and final hand-over of works

COWI GROUP
COWI A/S

PM
JCK

COUNTRY
Latvia

PERIOD
2005 - 2006

CUSTOMER
Ministry of Environment
Republic of Latvia

TOTAL FEE
EUR 1.039.950

WATER SERVICES DEVELOPMENT IN 12 ZEMGALE REGION MUNICIPALITIES, LATVIA

The overall objectives of the project was to assist 12 municipalities (in total 100,000 inhabitants) in the Zemgale region in Latvia in the preparation, tendering and supervision of investment projects within the water sector. Total construction costs of the investment projects amount to 26 MEUR. The project assists the 12 municipalities in increasing their capabilities for developing new projects for international financial support..

The project comprised a full preparation for a EU Cohesion Fund support for water and wastewater development in the 12 municipalities, including:

- Definition of activities and investment needs for water services development in each municipality;
- > Long-term programme, consistent with full compliance with common service standards and relevant Latvian and EU environmental legislation;
- > Affordable priority investment programme, supported by full financial and economic analysis and municipal decision on defined contribution to the investment programme;
- > Preparation of financial and hydraulic model for each water company;
- > Comprehensive Executive Summary report forming a justification for each selected project and providing the information on the long-term water services development plans of the selected region;
- > Fully completed application form for Cohesion Fund;
- > Conclusions and statements by competent authorities on investment project impact to the environment and nature protection territories; and
- > Tender documentation for service contracts.

The investment projects prepared and tendered were aimed at improving environmental quality, improving wastewater treatment and thus reduce pollution to surface waters and the Baltic sea according to EU Urban Wastewater Directive, providing better drinking water

for people in the Zemgale region according to EU Drinking Water Directive and extending the sewerage and drinking water networks connecting new customers to the networks thus improving the economy of the municipal water / wastewater utility company.

Subconsultant: Udens Inzenieri, Latvia (as of 2007 member of the COWI Group)

- > Project management.
- > Capacity building and training for EU project development
- > Baseline studies for water and wastewater.
- > Master plans for development.
- > Feasibility studies
- > Financial model
- > Institutional assessments of relevant institutions
- > Environmental impact assessments.
- > Support for the preparation of application for funding from the Cohesion Fund.