

Water supply and sanitation



coba
GROUP

ENGINEERING AND ENVIRONMENTAL CONSULTANTS



PRESENTATION

COBA is a multinational and multidisciplinary group of Engineering and Environmental Consultants, founded in 1962.

The Group provides engineering consultancy services ranging from basic and planning studies, technical, environmental and economic feasibility studies, design and construction design as well as project management and works supervision, to operation follow-up and behaviour monitoring.

The Group has offices/subsidiaries in three continents and experience in more than fifty countries and encompasses several companies in accordance with functional specializations or geographical areas.

The competences acquired along the last six decades, together with the state-of-the-art employee expertise, the stability of its permanent staff and the comprehensive international experience allow to find out the best solutions for the full satisfaction of public and private Clients' needs and expectations.

During its existence, the Group has participated together with public authorities or private developers, in the feasibility of multidimensional projects, some of them being structuring projects and with major impacts on the improvement of peoples' life conditions in the several countries where it worked.

At present, the Group has a wide number of competences and technical areas that allow the composition of multidisciplinary teams who share knowledge and experiences in the execution of projects.

ORIGIN AND EVOLUTION

COBA started its activity in 1962 in different areas of engineering but it was only in 1969 that its market sectors were firstly broadened to water supply systems, while working for CAL – Companhia das Águas de Lisboa (currently “Empresa Portuguesa das Águas Livres”, company responsible for the water supply to the city of Lisbon). COBA participated in the “Strengthening of the Water Supply to Lisbon from the Vila Franca de Xira Pumping Station lasted until the end of the 70s.

Following this Project, the strengthening of the Water Supply from the Castelo de Bode reservoir started, with the Project of the Castelo de Bode - Vila Franca de Xira Supply Main, which was developed and carried out in the 80s. .

As water is an indispensable resource to life, the preservation of its quality for the supply of populations must go through the correction/elimination of the factors which most damage its sources, in particular those associated with sanitation. Therefore, the creation of effective domestic and industrial wastewater and waste treatment systems has been a great scientific challenge and a growing line of action all over the world.

In the 70s, COBA started operating in the sanitation sector, with the elaboration of the sanitation Master Plans in the Algarve and Beira Alta regions in Portugal.

The activity in these two sectors – drinking water and wastewater – has grown in Portugal and spread out to a number of foreign countries such as Angola, Algeria, Brazil, Equatorial Guinea, Morocco and Mozambique.

The development of this sector throughout the years has led COBA to participate in water supply and sanitation systems in big cities with hundreds of thousands and millions of inhabitants, but also in small urban and rural sectors. Some of these projects are historical milestones pertaining to this sector and have determined the growth of the company in specialised human resources, whether it is number or in specific areas.

We can refer, for instance, the water supply and/or wastewater systems to the cities of Lisbon, Oporto (in Portugal), Algiers, Oran (Algeria), Luanda, Ondjiva, Malange, Kuito, Huambo, N'Dalatando, Dundo, Saurimo, Menonge, Caála and Ganda (in Angola), Maputo (in Mozambique), Bata (in Equatorial Guinea) and Fortaleza (in Brazil).

AREAS OF INTERVENTION

•A diverse action in the field of planning and design of water supply and wastewater systems results from the joint effort of multidisciplinary teams available in the Natural Resources and Equipment Department, as well as in other Departments of the Company. Among this diverse action, we highlight:

- Hydrological studies
- Inventory and water resources planning
- Drinking water supply systems and wastewater and rainwater drainage systems planning
- Conception and design of water intake, conveyance and distribution systems and corresponding pumping systems and reservoirs
- Conception and design of wastewater and rainwater networks
- Conception and design of drinking water and wastewater treatment systems
- Design of drainage systems of road and railway infrastructures
- Designs of underwater outlets
- Studies and designs of river hydraulics, river training and flood protection
- Environmental Impact Assessments
- Geographic Information System
- Planning and organisation of system management services
- Staff training
- Supervision of Construction works.

FIELDS OF ACTIVITY

HYDRAULIC UNDERTAKINGS

Concrete, Earth-fill and Rock-fill Dams. Weirs and Reservoirs Water Conveyance Systems. Hydraulic Structures.

POWER GENERATION AND TRANSMISSION

Hydroelectric Power Plants. Photovoltaic power plants and wind farms. Small Hydropower Plants. Power Plants Rehabilitation and Modernization. Substations High Voltage Transmission Lines. Cooling Water Systems for Thermoelectric Plants.

WATER SUPPLY AND WASTEWATER SYSTEMS

Catchment, Transport and Distribution of Potable Water. Water Treatment Plants. Drainage Systems. Wastewater Treatment Stations. Pumping Stations.

AGRICULTURES AND RURAL DEVELOPMENT

Irrigation and Drainage Systems. Rural Roads. Production Systems. Mapping and Basic Information.

TRANSPORTATION INFRASTRUCTURES

Roads and highways. Railways. Passenger and Freight Railway Stations. Metro and Light Rail. Airports. Bridges and other engineering structures.

ENVIRONMENT

Environmental Impact Assessment. Environmental Management, Monitoring and Auditing. Pollution Control. Landscaping. Land Management. Recovery of Degraded Areas. Waste Landfills.

GEOTECHNICAL STRUCTURES

Tunnels and Caverns. Slopes in Fill and Cut Section. Special Foundations Breakwaters. Embankment Works.

MARITIME AND FLUVIAL WORKS

Wharfs. River Training. Quay Rehabilitation. Flood and Flow Control.

MINING INDUSTRY

Environmental Studies. Design of Tailings Dams and Related Structures. Safety Assessment of Tailings Dams. Design Review of Tailings Dam Closure. Operations Maintenance and Monitoring Manual for Tailings Dams. Risk Analysis. Mine Closure Plan. Training.

BUILDINGS

Residential and Services Buildings. Industrial Buildings. Steel and Mixed Industrial Structures. Rehabilitation and Restoration of Ancient Buildings.

CARTOGRAPHY AND CADASTRE

Geographic Information Systems (GIS). Digital Cartography. Thematic Cartography. Thematic Cadastres. Land Acquisition.

SAFETY CONTROL AND REHABILITATION

Expertise, Monitoring. Inspection and Reinforcement of Dams and Transportation Infrastructures. Works Instrumentation. Project Maintenance and Operation.

PROJECT MANAGEMENT AND CONSTRUCTION SUPERVISION

Project Management. Cost Management. Site Supervision. Quality Assurance/Quality Control.

MASTER PLAN REVIEW AND ENGINEERING DESIGNS FOR THE STRENGTHENING OF THE SAURIMO WATER SUPPLY AND SANITATION NETWORKS | Angola

Client /Owner: DNA - Direcção Nacional de Águas.

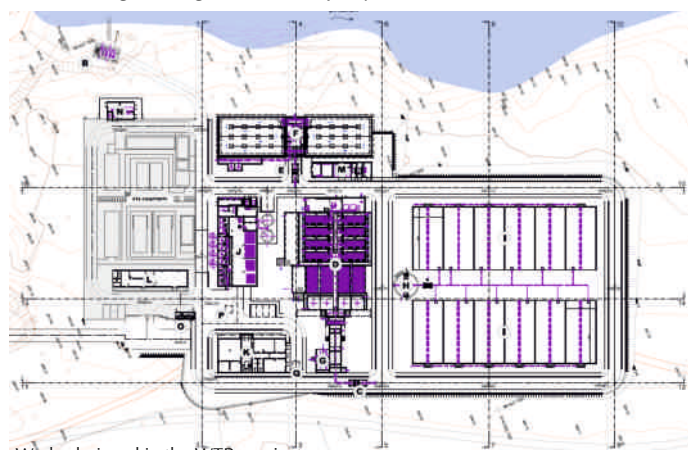
Ministry of Energy and Water of the Republic of Angola

Phases of the Study: Review of the Master Plan; Basic Studies; Environmental Impact Assessment and Tender Documents (2012 – 2014)

Studies undertaken in association with Consulprojecto

DESCRIPTION

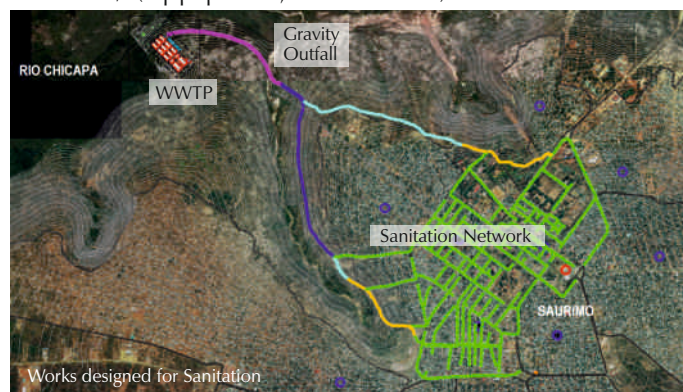
The Master Plan Review aimed at the study of the population projection until the year of 2030 (350,600 inhabitants) and the water needs of the city of Saurimo (27,700 m³/day), the assessment of the available water resources in the region, the technical and economic analysis and socio-environmental alternative analysis with respect to: system origin, point of arrival, water supply pipeline alignments, hydraulic system layout and phasing of the construction works. Out of the three possible alternatives which were identified for the strengthening of the water supply, the alternative solution pertaining to the strengthening of the Chicapa system was chosen.



Works designed in the WTP precinct

Works designed for the Water Supply: Raw Water Pumping Station equipped for a flow of 0.48 m³/s; Water Treatment Plant (WTP); Reservoir (3,500 m³) and Treated Water Pumping Station for a flow of 0.425 m³/s (located in the WTP's precinct). Remaining works: Water Mains (12 km-long, in HDPE with ND 710 and ND 500) between the WTP and Distribution Centres CD1 and CD2, each of them is composed of a ground mounted reservoir (5,000 m³) and a Water Tower (300 m³); Distribution network with 180 km of HDPE pipelines with diameters ranging from ND 90 to ND 600.

Works designed for Sanitation: 35 km of HDPE pipelines with diameters ranging from ND 200 to ND 500 and a Wastewater Treatment Plant (WWTP) by aerated lagoon treatment, designed for a flow of 66 l/s (eq. pop. of 16,000 inhabitants).



MASTER PLAN REVIEW AND ENGINEERING DESIGNS FOR THE STRENGTHENING OF THE N'DALATANDO WATER SUPPLY AND SANITATION NETWORKS | Angola

Client: DNA - Direcção Nacional de Águas. Ministry of Energy and Water of the Republic of Angola

Phases of the Study: Master Plan Review; Basic Studies; Environmental Impact Assessment and Tender Documents (2012 – 2014)

Studies undertaken in association with Consulprojecto.

DESCRIPTION

The Master Plan Review aimed at the study of the population projection until the year of 2030 (200,000 inhabitants) and the water needs of the city of N'Dalatando (25 000 m³/day), the assessment of the available water resources in the region, the technical and economic analysis and socio-environmental alternative analysis with respect to: water source, point of arrival, water supply pipeline alignments, hydraulic system layout and phasing of the construction works.

Works designed for the Water Supply. Phase 1: Mucari WTP System

- Raw water intakes in the Camuache and Cambumba Rivers (total flow of 56.5 l/s); Raw Water Conveyance Pipelines (5.7 km, in HDPE and with diameters ranging between ND 400 and ND 315); Water Tanks (150; 700; 500 m³) and light cover of Mucari's WTP slow filters. Phase 2: Lucala System – Lucala River Intake designed for 310 l/s; Lucala River Water Treatment Plant for 310 l/s, Treated Water Reservoir (3,500 m³) and Treated Water Pumping Station designed for 239 l/s. Remaining works: Water Supply Pipelines (34 km in Ductile Cast Iron, ND 500; 4.3 km in HDPE ND 400 and 4.1 km in HDPE, ND 700); conveyance reservoir (5,000 m³) and distribution reservoir (extension of R1 in 5,000 m³ and new reservoir with a capacity of 15,000 m³). Distribution network composed of 3 km-long pipelines in HDPE and

diameters ranging between ND 90 and ND 200.

Works designed for Sanitation: 33 km-long pipelines in HDPE and diameters ranging between ND 200 and ND 630; Wastewater Treatment Plant (WWTP) – Water treatment by extended aeration activated sludge, for the flow of 186 l/s and eq. pop. of 47,106 inhabitants.



Mucari WTP (COBA Project 2004/2006)



STRENGTHENING OF THE WATER SUPPLY TO THE TOWN OF ONDJIVA | Angola

1st PHASE:

Santa Clara – Ondjiva Conveyance System

Preliminary Design and Tender Documents: 2004

Supervision of the Construction Works: 2005/07

3rd PHASE:

Water Supply and Wastewater Drainage Works of Ondjiva and towns of the Kunene Region

Final Design Analysis and Approval, Technical Assistance and Supervision of Construction Works: 2008/15

2nd PHASE:

Cunene River Intake works and Xangongo – Ondjiva Water Conveyance

Preliminary Design and Tender Documents: 2006/08

Final Design Analysis and Approval, Technical Assistance and Supervision of Construction works: 2008/15

Client/Owner: Direcção Nacional de Águas (D.N.A)

Studies undertaken in association with Consulprojecto under the leadership of COBA

Brief description

The system serves an estimated population of 203,300 people (in 2015) and encompasses the following infrastructures:

- SANTA CLARA CONVEYANCE SYSTEM

- Ponto de Entrega (Namibia) – Santa Clara pipeline. Conveyance pipeline with a length of about 300 m and Ø 160 mm;
- Santa Clara ground mounted reservoirs, with a total capacity of 1,000 m³, in two cells;
- Santa Clara water tower, with a total capacity of 100 m³ and a height of 20 m;
- Santa Clara pumping station, encompassing two pumping systems, one for Ondjiva and another one for Santa Clara, with rated capacities of 17 and 5 kW, respectively;
- Santa Clara – Ondjiva conveyance pipeline, with a length of approximately 41 km and Ø 250 mm;
- Connecting works to the existing reservoir with a capacity of 500 m³ of the Ondjiva Main Distribution Centre.

CUNENE RIVER INTAKE WORKS AND XANGONGO – ONDJIVA WATER CONVEYANCE

- Xangongo WTP, with a total design flow of 564 l/s;
- Xangongo ground mounted reservoir, with the total capacity of 10,000 m³;
- Surface water intake at Xangongo, for a maximum flow of 564 l/s;
- Xangongo intake Pumping Station, equipped with 3 submersible units with a total rated capacity of 186 kW;
- Xangongo Pumping Station, with rated capacities of 750 kW and 60 kW;
- Xangongo-Mônguá-Ondjiva conveyance pipeline, with a length of 100 km in HDPE and Ø 630 mm;
- Mônguá Ground Mounted Reservoir, with a capacity of 2,000 m³;
- Mônguá Water Tower, with a capacity of 150 m³;
- Mônguá Pumping Station, with rated capacities of 600 kW and 15 kW;
- Missão de Mônguá reservoir, with a capacity of 1 000 m³;
- Bulanganga Reservoir, with a capacity of 2,000 m³;
- Ondjiva Ground Mounted Reservoir, with a capacity of 10,000 m³;
- Ondjiva Water Tower, with a capacity of 600 m³;
- Ondjiva Distribution Centre Pumping Station, including 7 pumping sets with rated capacities ranging between 11 kW and 75 kW.



WATER SUPPLY AND WASTEWATER DRAINAGE CONSTRUCTION WORKS OF ONDJIVA AND TOWNS OF THE KUNENE REGION

- Final Design Analysis and Approval, Technical Assistance and Supervision of the following works:
- Anhanca Water Supply, L= 34.3 km; Ø 125 to 200 mm;
- Hongo and Chiede Water Supply, L= 35.2 km; Ø 125 to 200 mm;
- Water supply to Humbe and settlements in the vicinities L= 10.2 km; Ø 50 to 140 mm;
- Chiulo Water Supply L = 21 km; Ø 110 mm;
- Water distribution networks of several settlements in Anhanca and hamlets, Humbe and hamlets, Mônguá, Missão Mônguá, Bulanganga, Chiede, Muolo and Okafano, with Ø 25 to Ø 150 mm;
- Ndjamba, Luengue, Omuolo, Humbe and Bulanganga Water Towers;
- Xangongo water distribution network; L = 31.5 km; Ø 25 to 250 mm;
- Xangongo wastewater drainage network; L = 16.5 km; Ø 110 to 250 mm;
- Xangongo wastewater pumping station, with rated capacities of 30 kW;
- Xangongo wastewater treatment plant; Q = 1,207 m³/day;
- Ondjiva water distribution network; L = 31.5 km; Ø 25 to 250 mm;
- A, B and C Ondjiva Water Tanks, with capacities of 450, 360 and 450 m³;
- Ondjiva wastewater drainage network; L = 12.4 km; Ø 110 to 250 mm;
- Ondjiva wastewater pumping stations (EB1, EB2, EB4 and EB5) with rated capacities between 2.5 kW and 9.5 kW;
- Ondjiva Wastewater Treatment Plant; Q = 2x2,500 m³/day (25 000 PE).

MALANGE, KUITO, ONDJIVA, HUAMBO AND N'DALATANDO WATER SUPPLY AND SANITATION MASTER PLANS | Angola

Client /Owner: Direcção Nacional de Águas (D.N.A.)

Master Plan: 2002/2004

Studies undertaken in association with Consulprojecto under the leadership of COBA

DESCRIPTION

The studies aimed at the elaboration of the Water Supply and Sanitation Master Plans of the cities of Malange (584,000 inhabitants), Kuito (140,000 inhabitants), Ondjiva (283,000 inhabitants), Huambo (874,000 inhabitants) and N'Dalatando (205,000 inhabitants) and associated engineering preliminary designs.

The cities possess an ancient and rudimentary water supply and an incipient sanitation network. Only Huambo was partly covered by a sewage network (without treatment).

-Scope of Services:

- Preparation of master plans for water supply and sanitation, within a time period of 10 years;
- Evaluation of the sanitary and socio-economic impact of the proposed schemes, expected benefits and communitarian participation;

-Execution of preliminary engineering studies associated to priority rehabilitation / expansion works, and preparation of the Terms of Reference for the engineering Final Designs;

-Identification of technologic alternatives in light of the available technical, financial and human resources (operation and maintenance)

This contract includes Technical Assistance to D.N.A., by supplying international and local specialists for expertise missions.



LUANDA SANITATION MASTER PLAN | Angola

Client /Owner: ELISAL – Empresa de Limpeza e Saneamento de Luanda

Master Plan: 1995

Master Plan Review: 2006/2008

Studies undertaken in association with Sogreah

DESCRIPTION

The study covers the geographical area of Greater Luanda up to the Bengo River, North of Luanda, and Kwanza River, South of Luanda. The estimated population is about 5.8 million inhabitants, expected to reach 13 million people in the horizon of 2025.

The purpose of this study was the update of the guidelines established in 1995, taking into account the new urban data of the city, with the goal of achieving modern sanitary and environmental standards that are appropriate to the size and projection of the city of Luanda at a national and international framework.

The study incorporated the new interventions planned for the city of Luanda, up to 2025, attempting to combine the proposed actions with other infrastructural plans, namely the water supply and road networks.

The review of the Master Plan focused primarily on the collective sanitation systems and on issues such as the treatment and sewer outfalls in the recipient environment, which in this case, is the sea.

Scope of Services:

- Description of current situation of the sanitation infrastructures;
- Definition of a study area compatible with the horizon year 2005;
- Study of population estimation up to the horizon year 2025;
- Evaluation of hydraulic pollutant loads and study of the recipient environment;
- Definition of sanitation methods in the different areas of the city;
- Study and location of the necessary treatment works;
- Definition of hydrologic and hydraulic design criteria of the main infrastructures of the wastewater and rainwater drainage systems;
- Suggestion of a priority action plan with cost estimation and phasing.





CHELIFF-KERRADA CONVEYANCE SYSTEM - WTP AND WATER SUPPLY SYSTEM TO THE MAO CORRIDOR | Algeria

LOT 3.1: Water Supply to The Mostaganem-Arzew-Oran Corridor (MAO) for the water supply to the Cities of the Wilayas of Mostaganem and Oran

Client/Owner: Teixeira Duarte/ETRHB / Agence Nationale des Barrages et Transferts Joint-Venture

Final Design and Technical Assistance: 2005/09

DESCRIPTION

The conveyance system aims at the water supply to a population of about 2,500,000 inhabitants. It encompasses the following infrastructures:

- Conveyance pipeline between the Sidi Lahdjel water treatment plant and the Oran reservoir, involving approximately 88.5 km of pipelines with diameters of 1,800 mm and 2,200 mm. The Macta crossing is accomplished through a 2 x ND 1,400 m section;
- Pumping station, with 4 + 1 groups with a total capacity of 3.6 MW and flow of 4.0 m³/s and a pumping pipe between the two reservoirs Oran I and Oran II with a length of 4,100 m and ND 1,400 mm;
- Mostaganem Reservoir, a buried reservoir with a capacity of 120,000 m³ (two cells with dimensions of 102.4 m² each and a clearance of 7.0 m);
- Oran buried Reservoirs (2), with a total capacity of 150,000 m³ each, divided into two identical cells with the dimensions of 136.6 x 102.4 m² and a clearance of 7.0 m.
- Equipment:** 16 isolation valves with automatic shutdown system, ND 1,200 mm to DN 2,000 mm; 1 shut-off valve ND 1,800 mm; 1 float valve ND 400 mm; 5 horizontal axis electro pump groups with a capacity of 900 kW; 6 compressed air reservoirs (6 x 100 m³); 2 Monovar control valves ND 800 mm.



DRINKING WATER SUPPLY SYSTEMS TO THE CITIES OF BEJAIA, TIZI OUZOU AND CHLEF (LOT B) | Algeria

Client: Algérienne des Eaux (ADE).

Rehabilitation and Diagnosis Studies: 2005/2009

Studies undertaken in association with EPAL (company responsible for the water supply to the city of Lisbon)

DESCRIPTION

In the scope of this project, demographic projection studies of the cities of Béjaïa (235,200 inhabitants), Tizi Ouzou (122,000 inhabitants) and Chlef (307,000 inhabitants) were carried out, as well as water need assessments in order to determine the design flows of the distribution networks for different horizons. Besides the aforementioned studies, this project also encompassed the following tasks: study of the current situation, hydraulic operation simulations with the model EPANET for the diagnosis of each of the distribution networks and identification and analysis of the intervention measures with the purpose of physical improvement and exploitation of the water supply and drinking water distribution systems for the current situation and future sceneries, in the medium and long term, by involving strengthening and widening interventions in the water distribution networks.

Phases of the study:

- Mission A: Cartography and Cadastre pertaining to the existing system's data.
- Mission B: Diagnosis of the existing distribution network and elaboration of the Terms of Reference of the works deemed necessary.
- Mission C: Diagnosis of the existing water supply system.
- Mission D: Preparation of a Master Plan of the water supply network, including calibration of a mathematic model of the network.
- Mission E: Assistance in the Technical and Commercial Management (Auditing and Recommendations). Elaboration of Operation Guidelines.
- Mission F: Elaboration of the Terms of Reference in order to guarantee a water distribution network based on a Delegated Management Model

City of Tizi Ouzou



City of Chlef



City of Béjaïa



SOUF VALLEY SANITATION SYSTEM | Algeria

Lagoon Wastewater Treatment Plants: Guemmar, Magrane and Reguiba

Client/Owner: Teixeira Duarte, S.A./Office National de l'Assainissement

Final Design and Technical Assistance: 2006/2009

DESCRIPTION

The wastewater treatment plants (WWTP) of Guemmar, Magrane and Reguiba are part of the Souf Valley Sanitation System and have the following characteristics:

WWTP	CITIES SERVED	POPULATION SERVED	AVERAGE DESIGN FLOW	WATER ARRIVAL AT WWTP	TREATMENT TYPE
GUEMMAR (WWTP 2)	Guemmar, Taghzout e Hassani Abdel-Krim e Debila	79 620	14 332 m ³ /dia (166 l/s)	WASTEWATER IN THE WWTP (EE Guemmar – 190 l/s + EE Haasai Abdel-Krim – 190 l/s)	Three lines of two aerated lagoons – serial (optional), followed by a maturation lagoon
MAGRANE (WWTP 3)	Sidi Aoun, Magrane e Hassi Khelifa	72 286	13 011 m ³ /dia (150 l/s)	WASTEWATER IN THE WWTP (EE Magrane – 300 l/s + EE Sidi Aoun – 50 l/s)	Three lines of two aerated lagoons – serial (optional), followed by a maturation lagoon
RÉGUIBA (WWTP 4)	Réguiba	28 491	5 121 m ³ /dia (59 l/s)	WASTEWATER IN THE WWTP (EE Réguiba – 150 l/s)	Three lines of two aerated lagoons – serial (optional), followed by a maturation lagoon



MASTER PLAN FOR THE USE OF LAGOON WASTEWATER TREATMENT PLANTS | Algeria

Client/Owner: Direction de l'Assainissement et de la Protection de l'Environnement (DAPE)

Master Plan: 2007/2010

DESCRIPTION

In the scope of this Master Plan, demographic projection studies of 62 villages of 22 wilayas for the horizon years between 2010 and 2030 were carried out (total population of 575,000 inhabitants), as well as calculation of design flows of the wastewater treatment plants (WWTP) from the water supply intakes, water losses, fees to connect to the water supply network, peak coefficient and infiltration flow and characterisation of the wastewater quality, on the basis of water analysis missions in 12 villages.

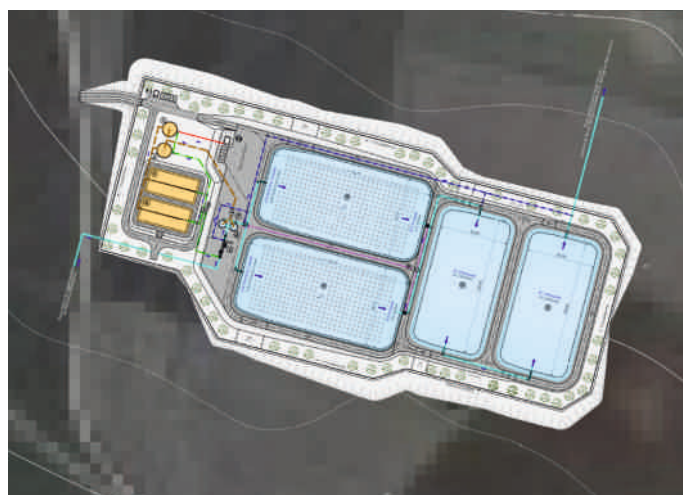
This study encompassed 60 WWTPs and the definition of project criteria for design aiming at a proper treatment envisaging the reutilisation for agricultural purposes or the release into the receiving environment. Furthermore, a technical and economic analysis of alternative solutions was carried out, which considered the investment and operational costs of 7 alternative lines of lagoon treatment: optional lagooning, macrophyte lagooning, anaerobic lagooning, optional lagooning with primary decanter, macrophyte lagooning with primary decanter, optional aerated lagooning and aerated lagooning.

Among the 7 alternative solutions of treatment, the following were chosen:

- Macrophyte lagooning with primary decanter (52 WWTPs);
- Optional lagooning (7 WWTP);
- Anaerobic lagooning (1 WWTP).

Phases of the Study:

- Mission 1: Collection and analysis of baseline information
- Mission 2: Lagooning types
- Mission 3: Environmental Impact Assessment
- Mission 4: Elaboration of plans pertaining to the definition of the WWTPs
- Mission 5: Reports elaboration





GREATER MAPUTO WATER SUPPLY SYSTEM | Mozambique

Client/Owner: FIPAG – Fundo de Investimento e Património do Abastecimento de Água

Feasibility Study, Final Design and Tender Documents: 2011/2013

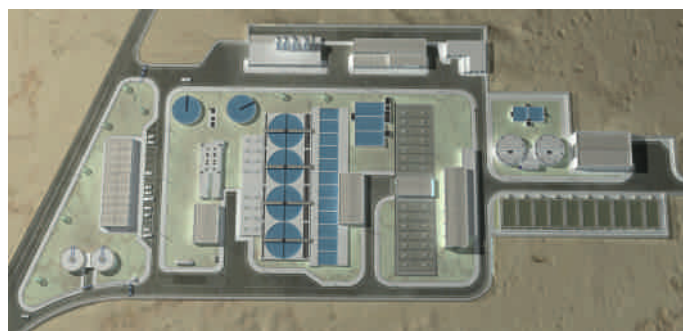
Funding: World Bank

Studies undertaken in association with under the leadership of COBA.

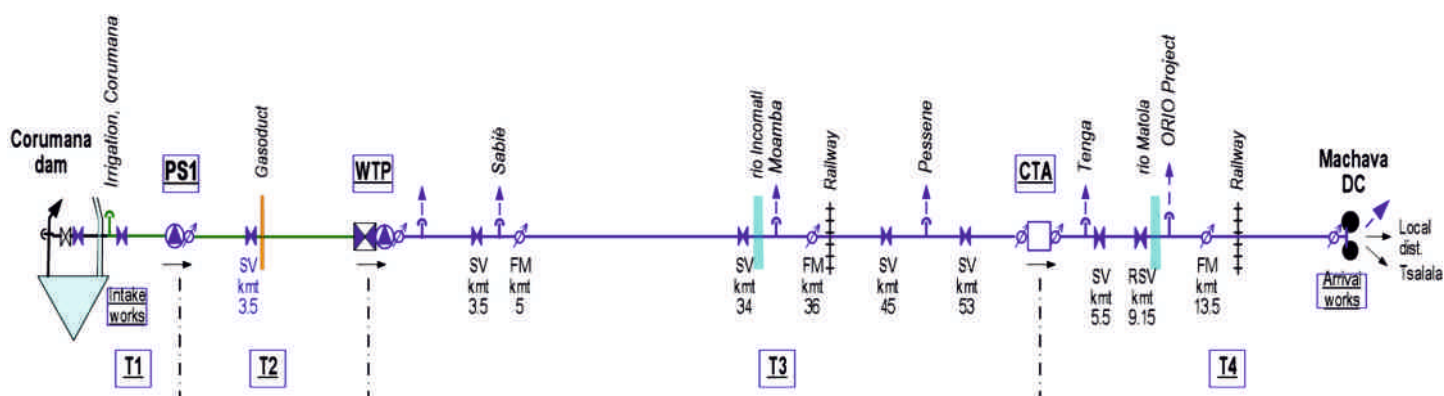
DESCRIPTION

The studies carried out aim at addressing the growth of water needs in Greater Maputo and comprise the following infrastructures:

- Conveyance pipeline, between the Corumana dam and the Machava Distribution Centre (Maputo), with a length of approximately 94 km and a maximum flow of 1.4 m³/s;
- Pumping Station PS1: Pumping Station 0.70 m³/s and prepared for a future total capacity of 1.4 m³/s, pumping between the dam and the WTP (12 km);
- Pumping Station PS2: Pumping Station 0.70 m³/s and prepared for a future total capacity of 1.4 m³/s, pumping between the WTP and the CTA reservoir (Control tank) (57 km), with downstream gravity conveyance (24 km);
- Water Treatment Plant (WTP), located at 11 km from the Corumana dam, designed to 60,000 m³/day and prepared for doubling its capacity in a second stage. Treatment: Ozone pre-oxidation treatment (PSA system), remineralisation, coagulation/flocculation, lamellar decantation, filtration in conventional down flow single, disinfection with chlorine gas and final pH correction;
- Treated water reservoir: ground mounted reservoir with a capacity of 5,000 m³ (2 x 2,500 m³), prepared to store an addition 1 x 5.000 m³ in the future;
- Control tank (CTA): ground mounted tank, with a capacity of 5,000 m³ (2 x 2,500 m³), prepared to store an addition 1 x 5.000 m³ in the future;
- Remote Control System (CTMS): command centre in the WTP, PLC in strategic points, fibre optic cable, throughout the conveyance and radio connection to the ADEM's dispatch centre in Maputo.



Water Conveyance System Layout



CASTANHÃO-FORTALEZA WATER CONVEYANCE SYSTEM | Brazil

Studies for the evaluation of the water requirements satisfaction in the Fortaleza

Client/Owner: Secretaria dos Recursos Hídricos do Estado do Ceará (Ceará State Secretariat of the Water Resources)

Definition of Alternatives and Final Design: 2000/03

Funding: World Bank (PROGERIRH Programme)

Studies undertaken in association with VBA and HARZA under the leadership of COBA

DESCRIPTION

The anticipated water requirements in the project's influence area are estimated at about 600 million m³/year, both for human consumption and for feeding several irrigation projects. The population to supply in the project horizon (2030) is calculated in 5,000,000 inhabitants.

The Castanhão-Fortaleza Water Conveyance System encompasses conveyance structures with an extension of about 202 km and a pumping station for the transport of a maximum flow of 22 m³/s, from its source at the Castanhão dam to the Gavião dam in the Metropolitan Region of Fortaleza. Diversion structures were anticipated along the conveyance system for human supply and irrigation.

The Castanhão pumping station, located upstream the Water Conveyance System comprises 8 vertical-axis and changeable speed electro-pump groups, with a total capacity of 17.2 MW. The two pressure pipelines have a diameter of 2,500 mm and a length of about 3.0 km.

The gravity conveyance system is mainly formed of a canal with a bottom width of 5.0 m and a height of 3.0 m (162 km), of sections with a diameter of 2 x 2,500 mm (39 km) in the crossing of the streams, with several structures along its alignment for the runoff control and operation safety (gates, surface and bottom outlets, bridges, footbridges, etc).

Among the designed special structures, we stress out: a canal for the purpose of stocking water (capacity of 250,000 m³ and a length of 1.0 km), a baffle drop structure prepared for the installation of a mini power plant, the bridge for crossing the Barrabuiú River (length of 250 m), the tunnel to connect the Riachão and Gavião dams reservoirs (length of 1.1 km).

A second water conveyance system was designed – the Gavião-Pecém conveyance system – for the strengthening of the supply to the new port area and the industrial area of Pecém, which comprises an intake at the Gavião Dam, a pumping station and approximately 55 km of pipelines with a diameter of 1,800 mm, designed for the anticipated transport of 6 m³/s.

Scope of the services:

- Assessment of the water requirements and sources in the region of the metropolitan basins of Fortaleza;
- Definition of alternatives to meet those requirements;
- Selection of the most feasible alternative, from a technical, economic and environmental point of view (EIA/RIMA);
- Preparation of the respective Final Designs.





MULTIMUNICIPAL WATER SUPPLY SYSTEM TO THE NORTHERN REGION OF GREATER OPORTO | Portugal

Client/Owner: IPE – Águas de Portugal / Águas do Cávado, S.A.

Preliminary Study: 1995/96

Final Design: 1996

Technical Assistance: 1997/2000

Studies undertaken in association with PROCESL

DESCRIPTION

The System serves a population of approximately one million people in the Greater Oporto metropolitan region.

COBA carried out the studies and designs of the following infrastructures:

Water intake, treatment and pumping to the water conveyance system

- Water Intake at the Cávado River and raw water reservoir with a capacity of 180,000 m³ (2 x 90,000 m³);
- Treated water reservoir RR1 with a capacity of 20,000 m³ (2 x 10,000 m³);
- Pumping Station with a capacity of 3 x 1,450 kW;

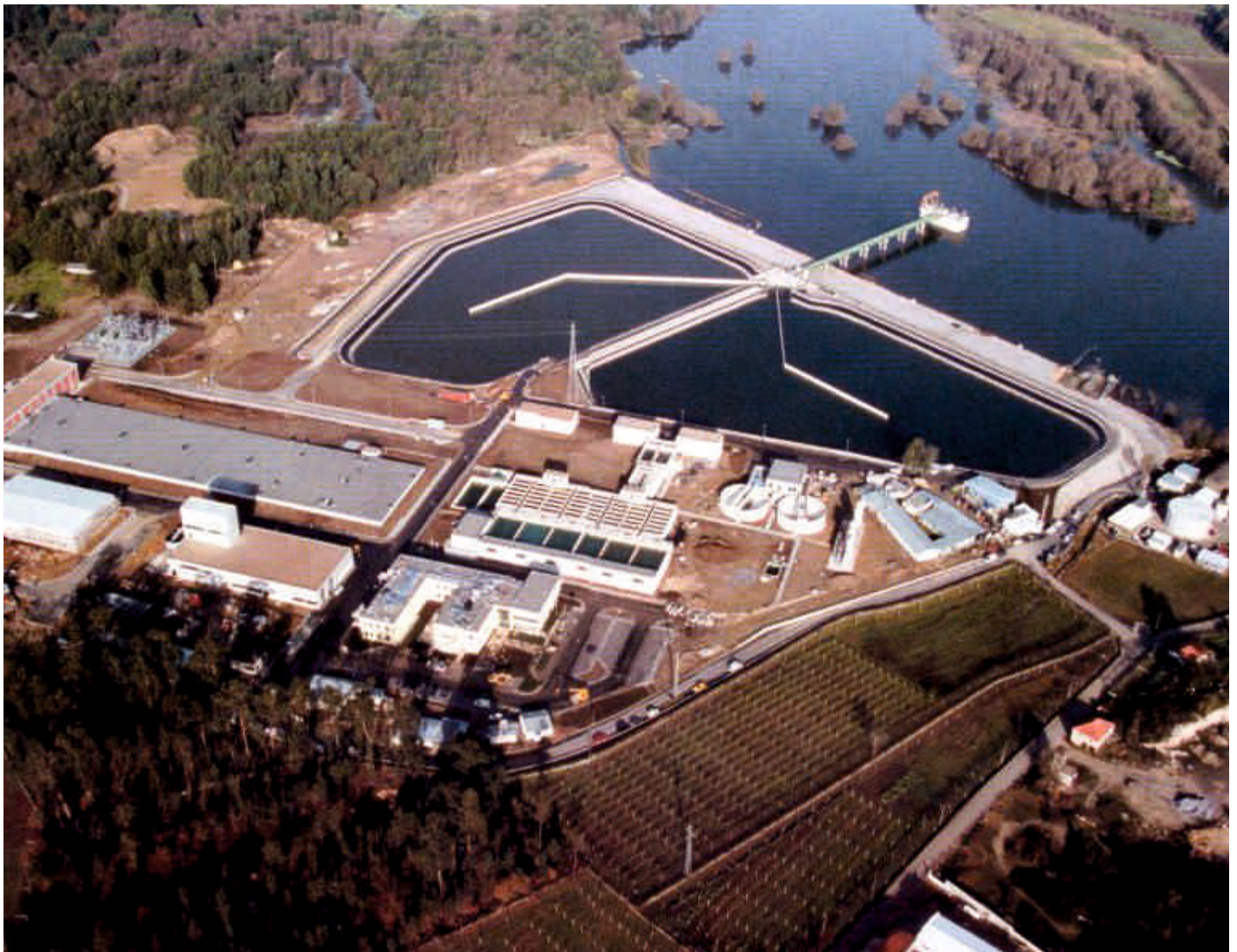
Main pipeline

- Water Main between RR1 and RR2 with approximately 2.5 km and Ø 1,400 mm;
- Treated water reservoir RR2 with a capacity of 5,000 m³ (2 x 2,500 m³).

-Vila Nova de Famalicão Subsystem

- Water Conveyance to Santa Tecla and Joane (pipeline with a length of 13 km and Ø 600 mm with 3 branches: Santa Tecla with a length of 3.4 km and Ø 350 mm; Joane with a length of 1.6 km and Ø 200 mm; Cerite with a length of 1.5 km and Ø 350 mm)
- Reservoir RR3 with a capacity of 5,000 m³ (2 x 2,500 m³)
- Pumping Station EE3 with two independent pumping systems, one for Cerite with a capacity of 80 kW and another one for Santa Tecla with a capacity of 150 kW;
- Joane Reservoir (R2) with a capacity of 1,500 m³ (2 x 750 m³);
- Connections to the Cerite and Santa Tecla Reservoirs.

Furthermore, COBA elaborated the Preliminary Study of the Caniçada Sub-System and the Preliminary Design of the Road Access to the Areas de Vilar Treatment Water Plant.



MULTIMUNICIPAL WATER SUPPLY AND SANITATION SYSTEM OF THE ALTO ZÊZERE E CÔA REGION | Portugal

Client: Águas do Zêzere e Côa, S.A.

Final Design: 2001/2004

Studies undertaken in association with Prosistemas

DESCRIPTION

The Multimunicipal Water Supply and Sanitation System of the Alto Zêzere e Côa Region is expected to serve a population of about 210,000 inhabitants, distributed through the municipalities of Almeida, Belmonte, Covilhã, Figueira de Castelo Rodrigo, Fundão, Guarda, Manteigas, Meda, Penamacor, Pinhel and Sabugal. In the scope of this project, demographic studies of the region and villages were carried out, as well as water needs and origins studies and the definition of project criteria for design. The analysis and technical and economic comparison of alternative solutions has allowed the selection of the proposed solutions of water supply and sanitation.

The structures designed by COBA for the water supply system included 2 intakes (Hydromobile floating intake and mobile in river), 3 refurbishment/extension of the Caldeirão, Capinha and Manteigas WPTs, 5 pumping stations, 3 reservoirs and conveyance pipelines with a length of 230 km (gravity and pumping types). The structures designed by COBA for the sanitation system included 48 WWTPs of activated sludge and macrophytes bed, 35 pumping stations and 110 km worth of mains, outfalls and pumping mains.

PHASES OF THE STUDY:

PRELIMINARY STUDY:

- Basic elements (demography and consumptions, water quality in the origins and distribution systems, industrial and farming pollution and environmental restrictions);
- General Design Criteria (water supply and sanitation);

- Water Supply Systems – Current situation and proposed solution;
- Sanitation Systems – Current situation and proposed solution.

BASIC DESIGNS:

- Water treatment plants;
- Wastewater treatment plants (activated sludge and macrophytes).

WATER SUPPLY FINAL DESIGNS:

- Reservoir and stream water intakes;
- Water supply pipelines and ancillary works;
- Raw water and treated water reservoirs;
- Raw water and treated water pumping stations.

SANITATION FINAL DESIGNS:

- Pipelines, outfalls and ancillary works;
- Wastewater pumping mains and ancillary works;
- Wastewater pumping stations.

DESIGN OF THE AUTOMATION AND REMOTE CONTROL OF THE WATER SUPPLY AND SANITATION

LICENSING PROCESSES (ELECTRICAL COMPOSANTS)

DESIGN OF THE PROTECTION AND LAND PLANNING OF THE WATER ORIGINS SURROUNDING AREAS

TECHNICAL ASSISTANCE TO THE OWNER

S. JORGE WATER TREATMENT PLANT | Portugal

Intake and Water Treatment Plant (WTP) Infrastructures and Main Reservoir of the S. Jorge Water Supply Sub-system

Client/Owner: Águas do Minho e Lima, S.A.

Preliminary Design and Tender Documents: 2005

DESCRIPTION

The S. Jorge WTP is located in Vilar de Lopus, municipality of Arcos de Valdevez, 1 km north from the Touvedo dam Reservoir intake, on the Lima River.

The water produced at the WTP has as objective the water supply to the populations of Arcos de Valdevez, Caminha, Ponte da Barca, Ponte de Lima, Viana do Castelo and Vila Nova de Cerveira, which is expected to grow up to about 260,000 inhabitants.

This WTP is designed for a flow of 500 l/s. For the treatment of this flow, two treatment lines are built, each for nominal capacity of 50 % of the flow. Each of the treatment lines is designed to work with 60% to 100% of the corresponding nominal flow, namely 150 to 250 l/s. A reserve area has been left for the installation of a hypothetical third treatment line.





Rabada WWTP – Construction Supervision

 JULY | 2023



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