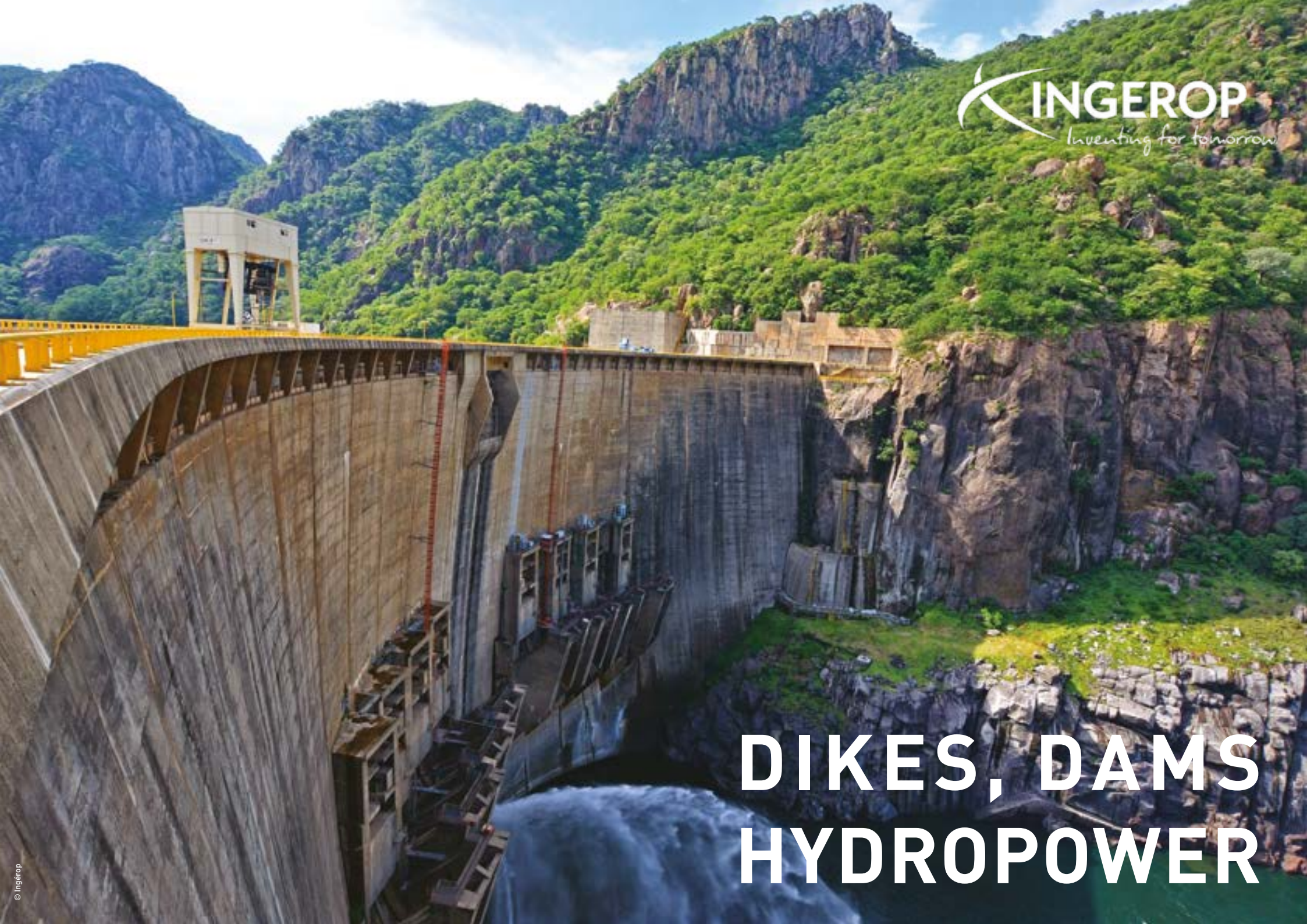

INGEROP
Inventing for tomorrow
DIKES, DAMS
HYDROPOWER
© Ingérop

The tradition of excellence

Rehabilitating or designing new dams, dikes, hydropower and fluvial training works, solving technical challenges, promoting enviromentally sustainable approaches etc. We propose innovative and tailor-made solutions for your projects.

Ingerop's expertise covers all kinds of dams

Osplass dam - South Africa
Dam heightening

Summary

Ingerop group

Dikes and locks

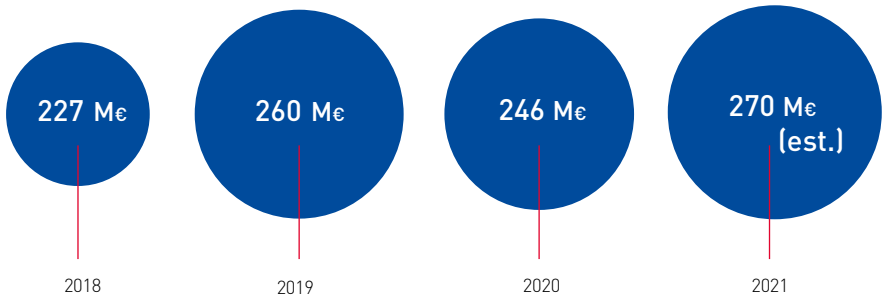
Dams

Hydropower

Helzelmere dam- South Africa
Dam heightening and stabilisation works, new Piano Key Weir spillway

Ingerop in key figures

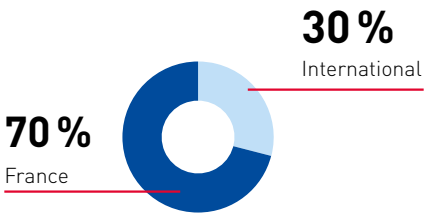
TURNOVER



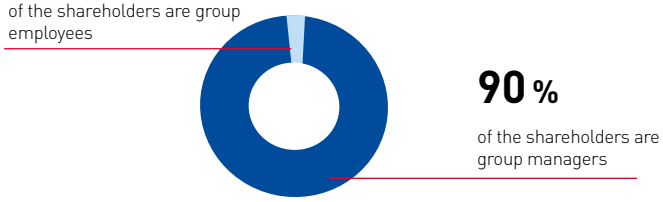
ORDER BACKLOG

Totalling 17 months of activity

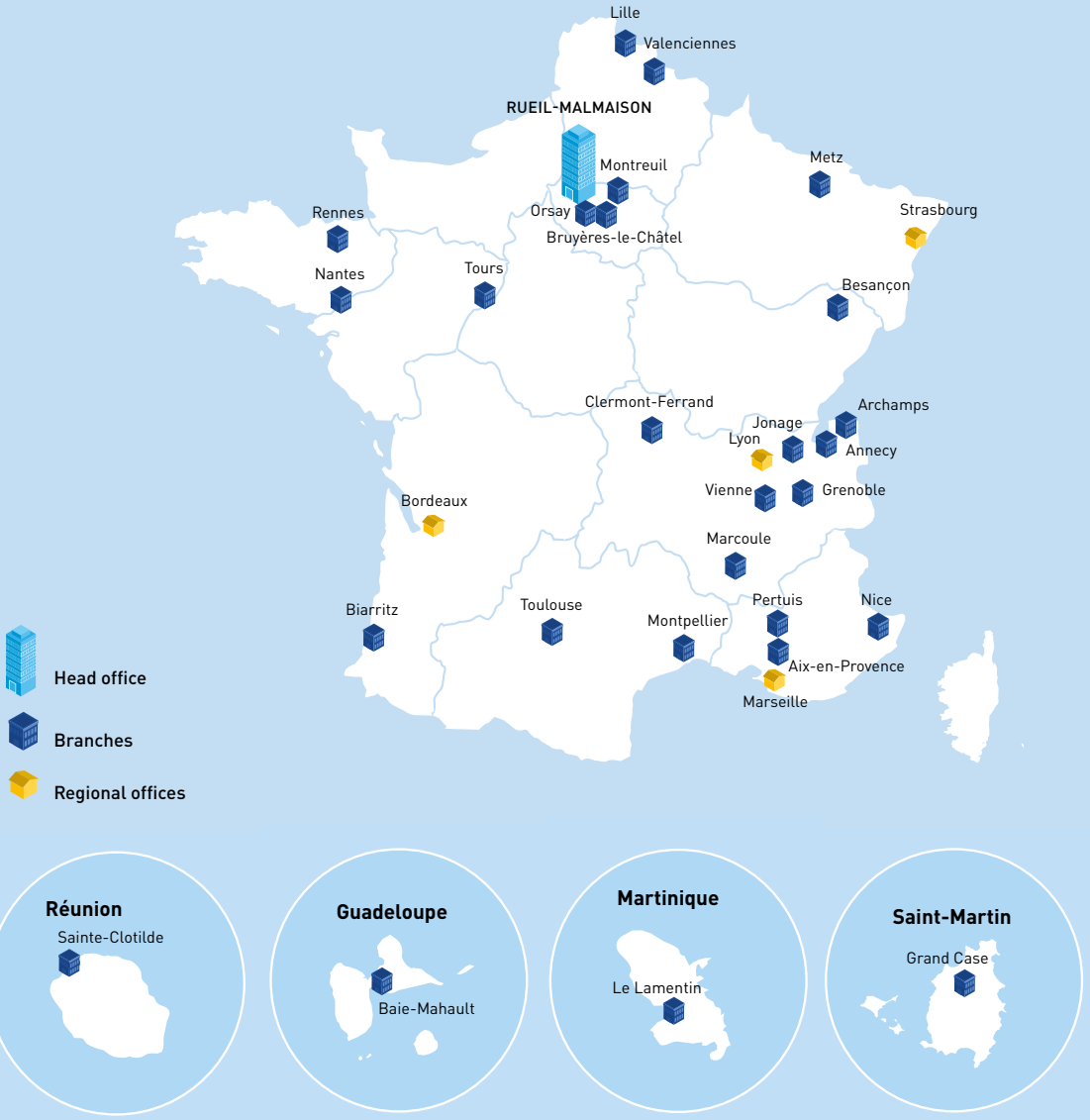
BREAKDOWN BY LOCATION



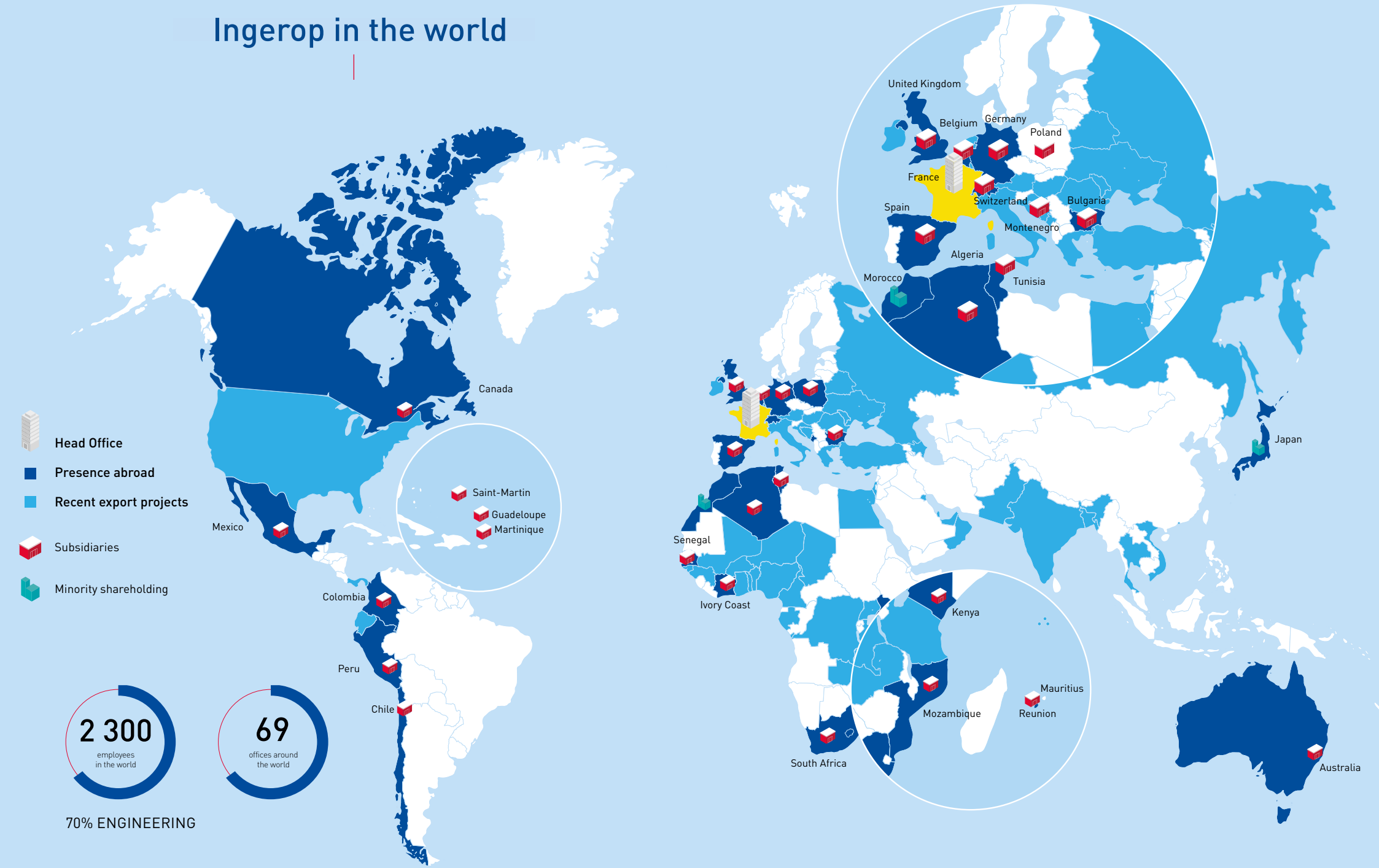
AN INDEPENDENT AND INCLUSIVE GROUP



FRANCE



Ingerop in the world



2 300
employees in the world

69
offices around the world

70% ENGINEERING

DIKES AND LOCKS

Seine–Nord Europe Canal (lots n.2 and n.4, locks and systems lot), France

Société du Canal Seine Nord Europe

2020–2028

Preliminary and detailed design, works supervision (in JV)

The Seine–Nord Europe Canal is a high-capacity (grand gabarit) canal in France that will link the Oise River at Compiègne with the Canal Dunkerque-Escaut, east of Arleux (a new 107 km inland waterway). It is the French part of a proposed Seine-Scheldt canal that would ultimately connect the Rhine and Seine basins inland. The aim is to expand trade flows in a fuel-efficient and ecologically sustainable manner between the Seine basin and Belgium, Germany and the Netherlands, while reducing saturation on the A1 motorway in France and reducing the CO2 emissions in the transport sector within this corridor.

Key data of lots n.2, n.4, locks and systems :

- Cost of the works estimated to 2.3 billion Euros
- 76 km of canals
- 2 canal bridges over A29 and A26 highways
- Earthworks height/depth of about 50 m
- 13 to 25 m is the head in the five major locks of the Seine-Nord Europe Canal
- 200 m 12,50 m are the locks dimensions

Flood protection works, Peru

JV Consorcio Rios del Norte (SACEEM and GUINTOLI-NGE Group)

2021 - 2022

Preliminary design review, detailed and construction design, including detailed 2D hydraulic model of the whole area.

Design of flood protection works along Leche and Motupe Rivers, assuming 100-years flood as reference.
The project includes new dikes for a linear of more than 80 km, protections and countermeasures against erosion and local scouring at existing structures (dikes, bridges etc.), other hydraulic structures (intakes, safety weirs, irrigation canals etc.)
The 2D hydraulic model covers more than 1400 km² with a total length of 270 km.

Riedensheim Polder, Germany

Ingolstadt Water Department

2007 - 2020

Preliminary and detailed design (including hydraulic and stability analysis), regulatory dossier, works supervision.

EDR planned the buildings and the technical equipment. The inlet structure is a 6-span weir with a height of approx. 4.5 m and a width of approx. 40 m. The outlet structure is a 2-span weir with a height of approx. 9.5 m.

Part of the Action Plan 2020 – Flood protection works in the Bavarian Region, the project creates a retention volume of about 8 million cubic meters, by reducing the runoff in the Danube and providing protection for downstream areas such as Ingolstadt.

Engetried flood expansion zone, Germany

Water Department of Kempten

2018 – 2020

Preliminary and final design, technical specifications and regulatory dossier

New flood expansion area (V=1.3 Mm3) created by means of a new dike (9 m high by 480 m long dike), with a heterogeneous material. New outlet and ancillary works (roads and dismantling of an existing hydropower plant).

Fahrafeld flood expansion zone, Germany

Triesting Water Department

2019 – ongoing

Preliminary and detailed design, works supervision

New flood expansion zone designed for the centennial flood of the Triesting River. Flood reduction up to 233 m^3/s, retention of the 100-year flood for about 12 hours, volume of 725,000 m^3. Creation of new dikes (maximum height of about 11 m and a length of 2.78 km) and outlet (170 m^3/s) works and outlet (2-field, height of about 11m).

Rehabilitation works at existing dikes, on Rhine River

EDF and VNF

Construction design, works supervision, expertise

- Gerstheim dikes, Rhine River: impervious curtain
- Marckolsheim dikes, Rhine River: impervious curtain
- Rhinau dikes, Rhine River: impervious curtain
- Marckolsheim dikes, Rhine River: monitoring system
- Fessenheim dikes: rehabilitation works
- Aire and Nerfossé canals: dikes rehabilitation works (26 km)

Regulatory follow-up

Risk analysis, technical expertise (hydraulic, geological and geotechnical, structural etc.), periodical missions and regulatory dossier accordingly.

Several kilometers of dikes, often with a heterogeneous material.

- Jura dikes (Jura Departement)
- Haut-Rhone dikes (Union of Haut-Rhône)
- Pertuis dikes (Pertuis municipality)
- La Sanne dikes (International union Aménagement Hydraulique du bassin de la Sanne)
- Garde dikes (Municipalities of the Saint-Tropez gulf)

Thames Barrier, United Kingdom

Environmental Agency

1960 – ongoing

The Thames Barrier is one of the largest and most prestigious mobile flood defense structures in the world. The Ingerop Group (through the Rendel subsidiary in the United Kingdom) designed and supervised the construction of this major projetc.

Rendel has been involved since its inception and has been involved in the following aspects:

- Extensive hydrological and tidal investigations, hydraulic and model studies
- Engineering design (including design of gates and operating machinery)
- Extension of the lifespan of the barrier (originally 50 years but in 2009 increased to 120 years) combatting the dangers of climate change, the potential rise in sea level and the higher probability of sea-level surges on London

The structure covers the entire width of the River Thames at Woolwich with four main openings of 61m to permit navigation and six subsidiary gated openings (19m high sector gates). All gates are designed to withstand a differential head of 9.9m on the downstream side and 6.1m on the upstream side and are capable of resisting ship collision.

Don lock, France

Voies Navigables de France

2016 - 2018

Construction design, works supervision, expertise

The works concerned the existing lock (upstream and downstream ends), with the installation of new operating systems (new gates, hydromechanical and electrical equipement) and all related civil works modifications.

DAMS

Cahora Bassa dam, Mozambique

170 m high arch dam, underground plant, total power 2075 MW
Ingerop group had been involved in this challenging project since its construction.
An outstanding project that helped to develop our knowledge and expertise.

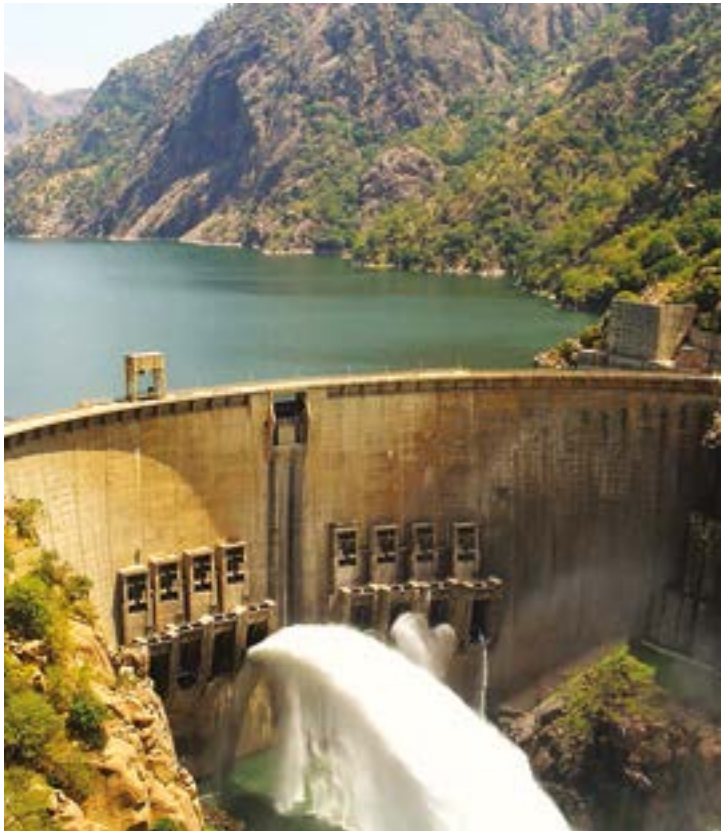
Hidroeléctrica de Cahora Bassa

2009 - 2016

Central spillway rehabilitation (8 gates, 2200 m^3/s each)

- Revision of tender documents
- Assistance to the client during the tender evaluation process (technical evaluation of the proposals, negotiation of the contract and recommendations)
- Supervision of on-site investigations
- Design review by taking into account the results of the site investigations
- Evaluation, comments and approval of all documents, procedures, methods, schedules, drawings and calculations submitted by the contractor
- Works supervision, certification of completed work
- Approval and consolidation of the operation and maintenance manuals
- Quality control management

Geotechnical expertise, studies for soil and rock characterization for the plant on the Northern Bank.



Halzelmere dam, South Africa

Department of Water and Sanitation

2011 – ongoing

Dam heightening and stabilization works, new Piano-Key Weir spillway

- Dam and appurtenant structure inspection
- Dam stability analysis before and after dam heightening
- Conception and detailed design of the dam heightening and the new spillway
- Conception and detailed design of the anchors for improving dam stability
- Construction design
- Tender documents and assistance to the client during the tender phase
- Works supervision
- Works contracts management

Kibling dam, Germany

Deutsche Bahn Energy (DB Energy)

2012 – 2020

- Structural and dam expertise
- Hydraulic studies
- Preliminary and detailed design, works supervision
- Regulatory dossier

The dam was built between 1910 and 1913. The water is used for the production of hydroelectricity. The project consisted in the dam's reconstruction and the installation of new gates (rolling gate 10 x 5.9 m), an inflatable water gate on the crest of the spillway (H = 2.5 m; L = 30 m) and a pressure segment (width 13.6 m, height 8.8 m) with a top flap 3.9 m high.

Rappbode dam, Germany

Operator of the Lande Saxe-Anhalt dam

2012 – 2021

Preliminary, detailed and construction design, works supervision.

Bottom outlet rehabilitation and new water intakes and turbines to this major structure.

Dams on Aisne and Meuse rivers, France

Voies Navigables de France

2016 – ongoing

Assistance in the design and construction phases.

Reconstruction of 29 existing needle dams replaced with concrete dams equipped with automated water inflatable gates (height from 1.5 to 2.7 m).
New fish passes (different configurations: ramps, pool-type, slot-type).
4 new micro-hydroelectric power stations Very Low Head type.

Vaux dam, France

Voies Navigables de France

2014 – 2020

- Preliminary, detailed and construction design, works supervision
- Regulatory dossier

Replacement of an existing needle dam by a concrete dam equipped with automated water inflatable gates.
New fish ladder.

Mussey, Chanteraine, Houdelaincourt and Saint-Joire-sur-l'Ornain dams, France

Voies Navigables de France

2014 – ongoing

Preliminary, detailed and construction design, works supervision, regulatory dossier.

Rehabilitation and updating of the dams.

Apremont dam, France

Voies Navigables de France

2008 – 2015

- Preliminary, detailed and construction design, works supervision
- Regulatory dossier
- Geotechnical investigations and subaquatic surveys

Reconstruction of the dam.

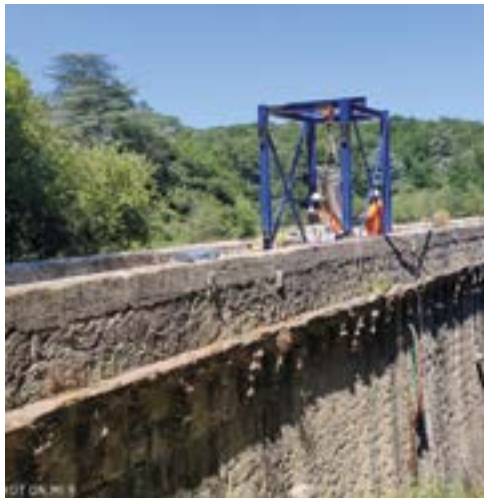
La Rouvière dam, France

Gard Departement

2013

Large arch-gravity dams built in 1969.

Stability analysis, bi-dimensional and tri-dimensional structural analysis, including seismic simulations, risk analysis, dam-break analysis.



Cenne-Monestiés dam, France

Cenne-Monestiés municipality

2018 – 2019

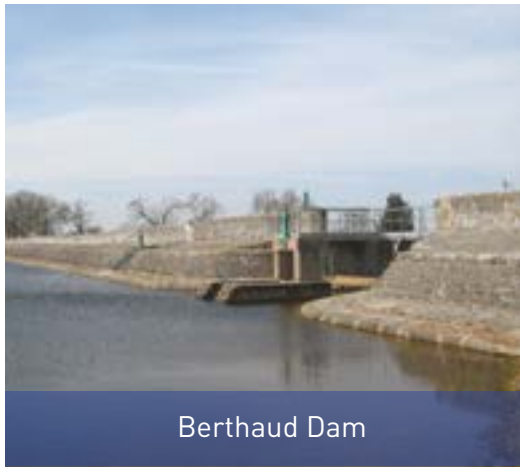
Preliminary, detailed and construction design. Regulatory dossier for the rehabilitation and reservoir emptying works.

Cenne-Monestiés is a masonry dam built in 1883, with a plane curved structure. The crest length is 95 m and the dam is 24 m high.

Ingerop group designed the rehabilitation works, including anchors, spillway modifications and masonry joints completion.


Mouche-Haute-Marne Dam


Cenne Monestiés Dam


Berthaud Dam

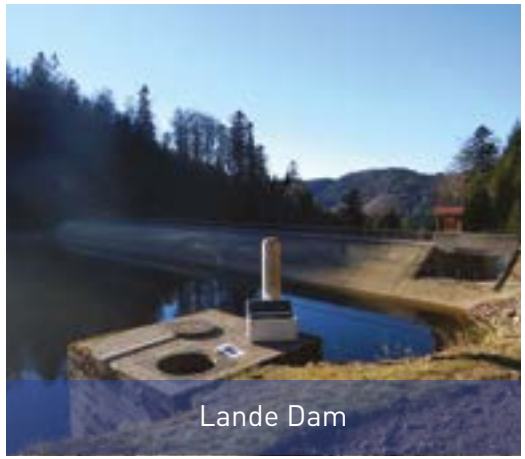

Bourdon Dam


Carces dam


Goule Dam


Grosbois Dam


Cheze Dam


Lande Dam


Liez Dam


Saint Pardoux Dam


Sidiailles Dam

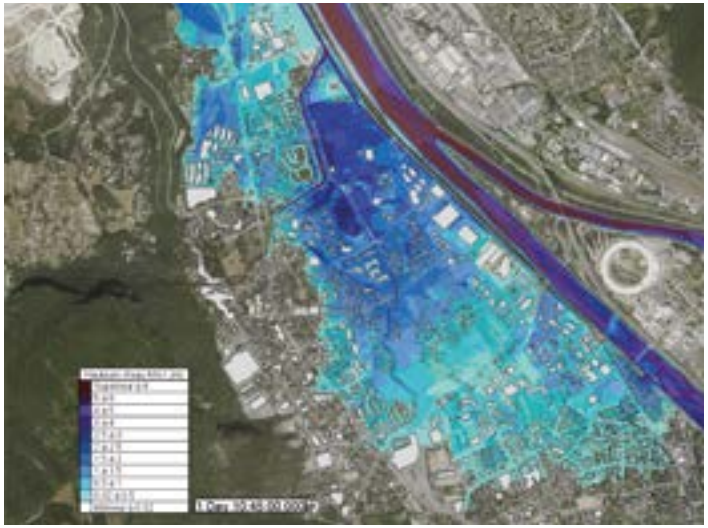
Rophémel Dam

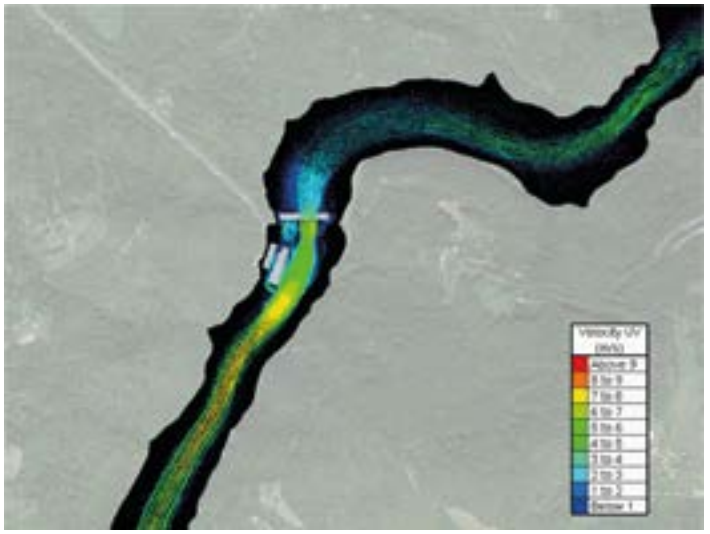
Cenne Monestiés, Maginot, Queuille, Carces, Grosbois, Sidiailles, Goule, Saint Pardoux, La Cheze, Rophemel, Canut, Bellevaux, La Mouche, Crescent, Berthaud dams etc.

Tory Dam

Risk analysis, technical expertise (hydraulic, geological and geotechnical, structural, etc.), periodical missions and regulatory dossier according to the French law on dams.

Several large dams, different types (concrete gravity and arch dams, rockfill, earthfill and masonry dams).

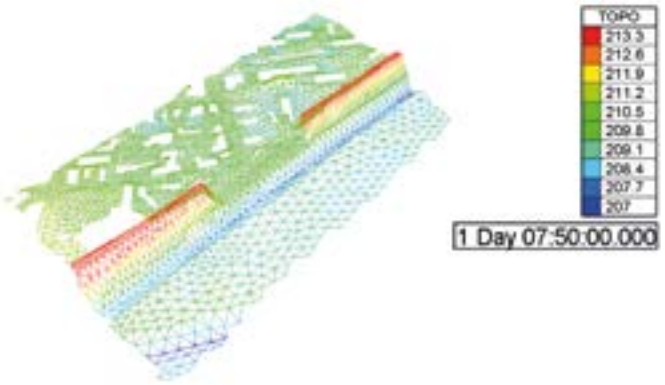




Pont Rolland, Pont de Bauges, Gannes, La Lande, Bondilly, La Plessis, Long Pendu, Montaubry, Torcy – Neuf, Torcy – Vieux, Berthaud, La Liez, Charmes, Vingeanne, Bourdon, dams etc.

Dam-break analysis, monodimensional, bidimensional and three-dimensional hydraulic modelling, breach modelling, flood propagation modelling, integration of complex topography and morphology features (obstacles and river structures, dikes, urban elements, etc.).

Several large dams, different types (concrete gravity and arch dams, rockfill, earthfill and masonry dams) with integration of different types of dam failure.



Fish lift and Moulinets hydropower plant, Switzerland

VOEnergies Production SA

2008 - 2013

Preliminary, detailed and construction design, works supervision of the whole plant.

New hydropower plant, including small dam equipped with clapet gates and fish lift.

Fish pass at Gerstheim dam, France

Demathieu Bard (end client EDF)

2016 - 2018

Contruction design.

Fish pass at Gerstheim dam.

HYDROPOWER

Inga I et II, Democratic Republic of Congo

1972 - INGA 1 = 351 MW (6 turbines)
1982 - INGA 2 = 1 424 MW (8 turbines)

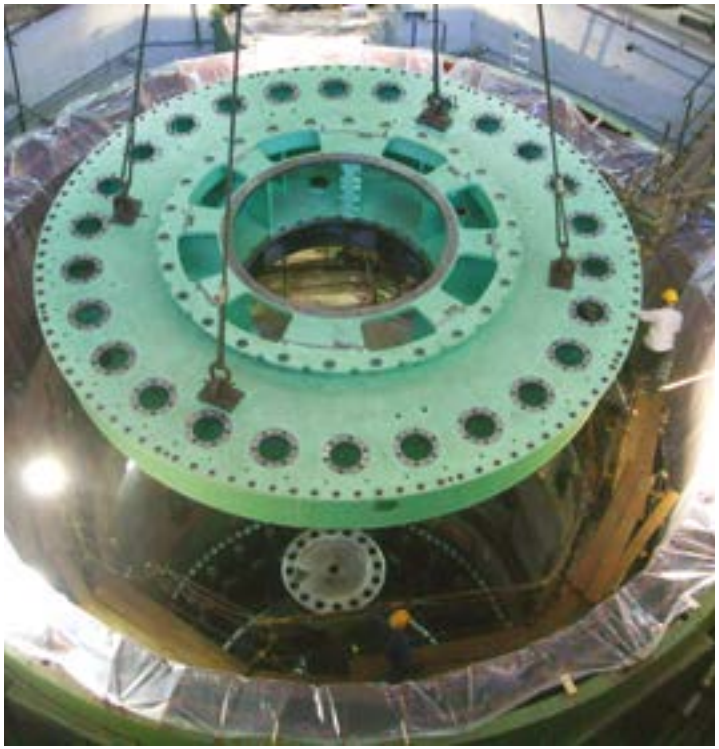
INGA hydropower scheme and Ingerop: a history of involvement.

Ingerop group - as SEEE, Design Office of Grands Travaux de Marseille, and subcontractor to EDF DAFECO -has been involved since the construction of this major project:

- Inga 1 - 1969-1972 - Detailed design of the structures excl. plant & tailrace canal
- Inga 2 - 1973-1975 - Detailed design of the intake canal & water intake

Some of our recent major achievements:

- 2005 - Hydrology and bathymetry studies at water intake level (the accumulation of sediment in the intake channel (> 30 Mm^3) led to design opening of a second channel)
- 2005 - 2006 - Geotechnical expertise on the rock foundations of the dam and the powerhouse
- 2006 - Assessment of the stability of existing Inga 2 civil structures, and study of appropriate rehabilitation solutions
- 2006 - Expertise concerning structures under risk of alkali-aggregate reactions. Study of solutions for INGA 1 (G14 and G16 - G11 and G15)
- 2007 - Due diligence on the Inga 3 hydroelectric project (4300 MW)
- 2010-2011 - Rehabilitation of units (inspections, scope of works and cost of rehabilitation assessment) G14 and G16 (2 x 58 MW)
- 2010 - Recommissioning of G23 to service (June 2010)
- 2010 - Emergency works on G24



Selingue, Mali

Energie du Mali-SA

2010 - 2019

Selingue hydropower plant and dam

- Inspection of the civil structure (3000m-long and 23m-high dam and associated concrete structures, building, dikes, monitoring instrumentation)
- Inspection and expertise of hydraulic equipment (8 No.13x5m overflow gates, 1 segment gate 14x11m, stoplogs)
- Inspection and expertise of electromechanical equipment (4 Kaplan turbines with vertical axis of 11.9 MW, 13.6 MVA umbrella type alternators, transformers, control system and protection, control gear, 1 diesel unit of 800kVA)
- Inspection and expertise of the 150kV line between Sélingué and Bamako of approximately 140km (equipment of 8.66kV, 63kV and 150kV substations, pylons, insulators, earthing system)
- Determination of the state and volume of work to be carried out to enable the operation for the next ten years
- Assessment of rehabilitation and modernisation works.
- Detailed design of the rehabilitation works
- Tender documents
- Assistance to the client during the tender process and contractor selection
- Works supervision

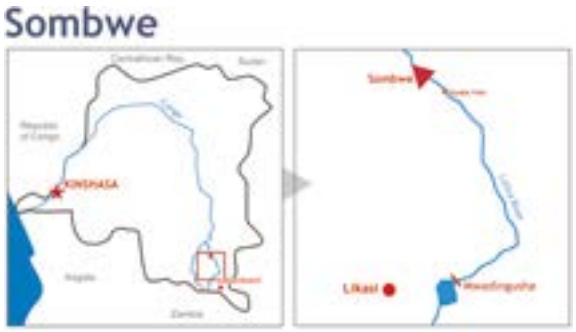
Sotuba, Mali

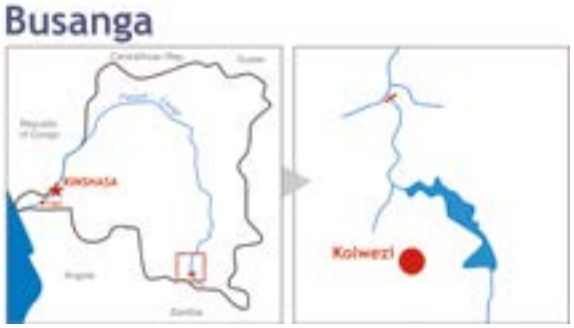
Energie du Mali-SA

2010 - 2019

Sotuba hydropower plant and dam

- Inspection of the civil structure (dam and associated concrete structures, building, dikes, monitoring instrumentation)
- Inspection and expertise of hydraulic equipment
- Inspection and expertise of electromechanical equipment (P=2 x 85 MW)
- Inspection and expertise of the 150kV line
- Determination of the state and assessment of rehabilitation and modernisation works to be carried out to enable the operation for the next ten years
- Detailed design of the rehabilitation works
- Tender documents
- Assistance to the client during the tender process and contractor selection
- Works supervision





Sombwe, Democratic Republic of the Congo

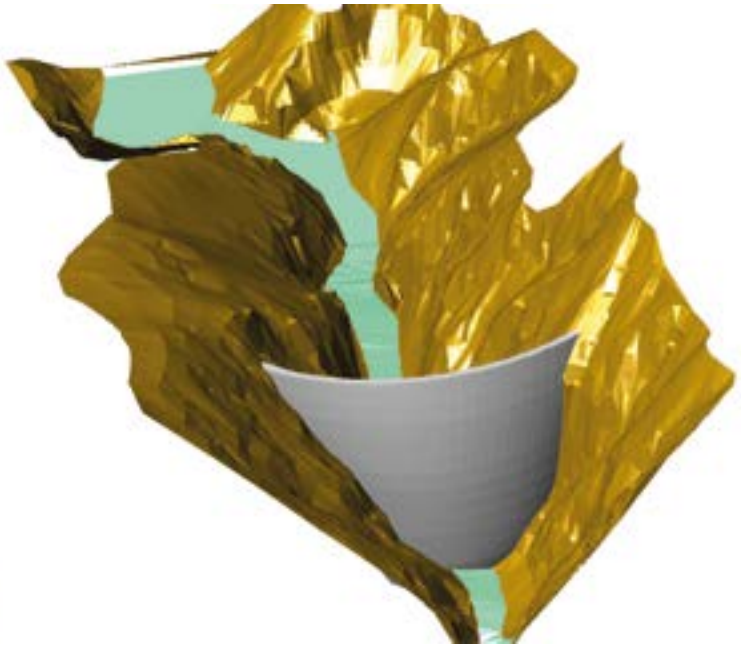
Kipay Investments

2016

Sombwe Hydropower plant and dam (P=166 MW; dam height 70-100 m)

Technical and bankable feasibility study of the hydropower plant and dam:

- Geophysical and geotechnical investigations on site (drilling / coring)
- Preliminary studies (hydrology, sedimentation, seismic, geotechnical, hydraulic etc.)
- Works conception and sizing
- Final optimisation after submission of results on detailed hydrology, sedimentation, flood hydrology, and seismic and geotechnical studies
- Feasibility design, including bill of quantities and pricing of each component of the project: preliminary design of the works, variants analysis for the dam by considering thin arch dam and double-curvature arch dam and defining the final proportions of the RCC mix according to the materials available locally and sources of suitable pozzolanic materials (natural or fly ash)
- Client assistance for updating of the financial model
- Physical modelling of the spillway in its final configuration



Busanga, Democratic Republic of the Congo

MagEnergy

2006 - 2007

Busanga hydropower plant and dam

Technical and bankable feasibility study (P=180-240 MW; dam height 140 m):

- Selection of a site (topography, geology, quarry identification, definition of site access and work platforms for construction and operation)
- Preliminary studies (hydrology, sedimentation, seismic, geotechnical, hydraulic, etc.)
- Hydropower assessments (calculation of the available power, plant operation cycles, power plant options)
- Preliminary design of the arch dam, the plant, the substation and connection to the transmission line
- Quantities and pricing of the various components of the project
- Assistance to the client in preparation of the financial model
- Environmental and social impact studies.

Mpiana Mwanga, Democratic Republic of the Congo

WESD CAPITAL Ltd

2012

Mpiana Mwanga hydropower plant (12 and 17 MW)

Feasibility study of the plant reconstruction:

- Definition and preliminary design of the rehabilitation or reconstruction works
- Estimation of the quantities and preliminary pricing of the works (including the road and the HT line between Mpiana Mwanga and Manono)

Ruzizi I - Ruzizi II, Democratic Republic of Congo

E.G.L. (Énergie des pays des Grands Lacs)

2015

Ruzizi I and II hydropower plants (30 and 44 MW)

Detailed design of the rehabilition works and tender documents:

- In-depth inspections and expertise of the hydroelectric plant: hydromechanical equipment, electromechanical and civil (dams and power plant buildings) works, including auxiliaries and energy evacuation, by integrating environmental aspects
- Design, quantitative and costing assessment of works for the plants modernisation and rehabilitation, to ensure operation for next 20 years
- Risk analysis (asbestos, PCB and lead) and dangerous waste management plan
- Tender documents preparation

Aqua bella, France

SH Aquabella, AKUO ENERGY

2016 - 2019

Aqua bella hydropower plant

Update of the feasibility study, detailed design, client assistance and construction design checker, works supervision.

The project includes:
- A dam with an inflatable gate (length 33 m, height 4 m)
- A plant equipped with 4 production groups (VLH DN5000 type turbines; equipment flow rate: 80 m³/s; gross head: 4.5 m; power: 2 MW; estimated annual production: 14 GWh)
- 4 clapet gates
- 1 handling monorail

Chavort, France

SH Chavort, AKUO ENERGY

2013 - 2017

Chavort hydropower plant

Update of the feasibility study, detailed design, client assistance and construction design check, works supervision.

The project includes:
- A dam equipped with 6 clapets
- 4 production groups (VLH DN5000 type turbines; equipment flow rate: 105 m³/s; gross head: 3.1 m; power: 2 MW; estimated annual production: 10 GWh)

Contact:

Dr. Carmelo GRIMALDI
carmelo.grimaldi@ingerop.com

water@ingerop.com

Follow us on:

INGEROP
Inventing for tomorrow

18, rue des Deux Gares, CS 70081
92563 Rueil-Malmaison Cedex

Tel. : +33 1 49 04 55 61
www.ingerop.com