EDIA Empresa de Desenvolvimento e Infra-estruturas do Alqueva, S.A.

NEW PATHS FOR WATER

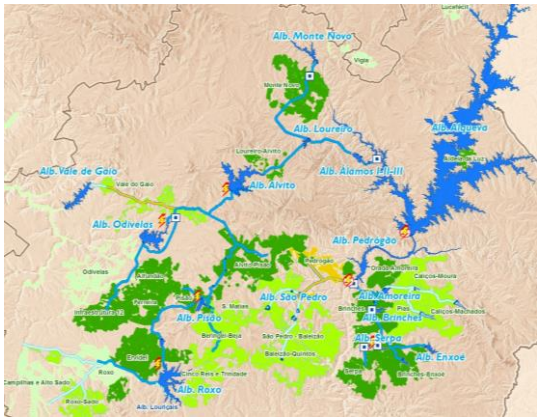
IWA the international water association

Water Challenges in Alqueva

Jorge Vazquez

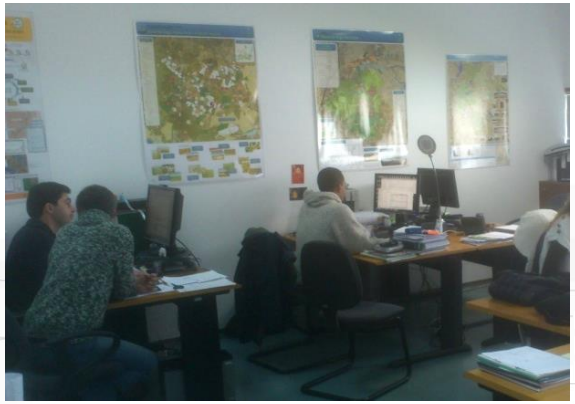
Lisboa, 2014

- EFMA



- EDIA

- FINAL NOTES



Guadiana Basin and Alqueva Project

Guadiana Basin Area 67 214Km^2

Alqueva Basin Area 55 189Km^2

Flooded Area - 250 km^2

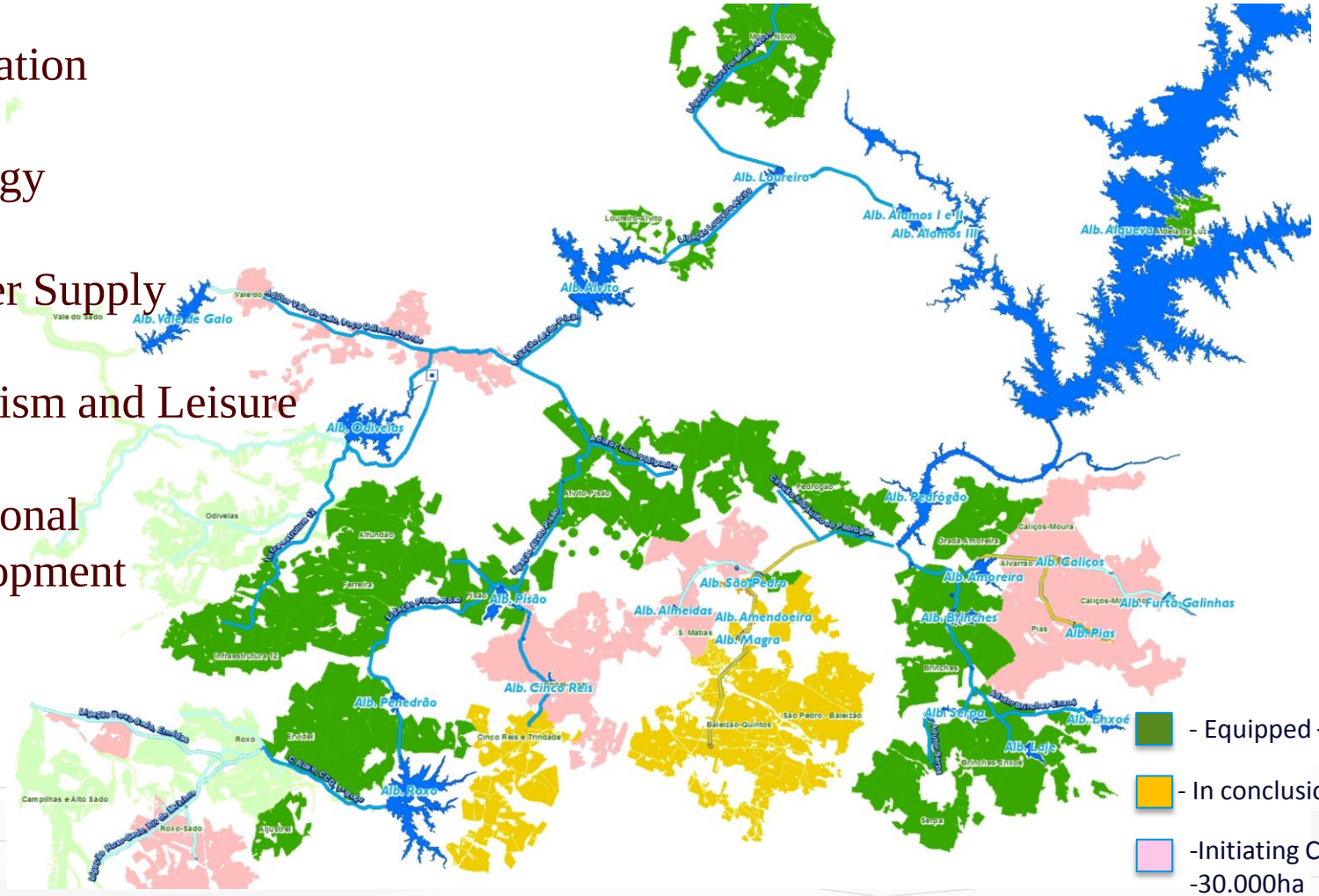
Perimeter Length - 1 160 km

Annual Mean Flow - 2 850 hm^3

Annual Mean Evaporation -240 hm^3

EFMA

- ✓Irrigation
- ✓Energy
- ✓Water Supply
- ✓Tourism and Leisure
- ✓Regional Development



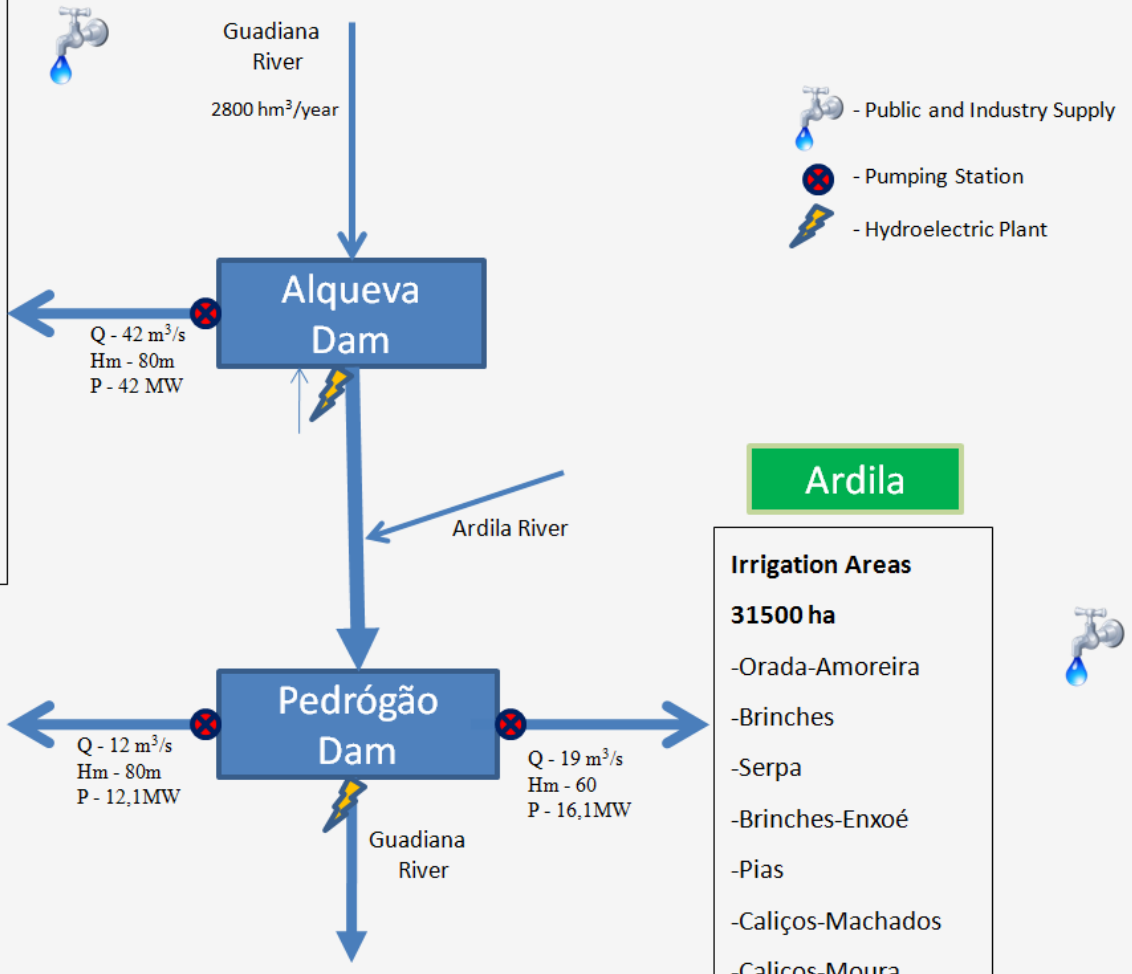
EFMA

Alqueva

Irrigation Areas

64.000 ha

-Monte Novo
-Loureiro-Alvito
- Vale de Gaio
-Alvito-Pisão
-Pisão
-Alfundão
-Ferreira e Figueirinha
-Ervidel
-Beringel-Beja
-Cinco Reis-Trindade
-Roxo-Sado



Pedrógão

Irrigation Areas

24500 ha

-Pedrogão-Selmes
-S.Pedro-Baleizão
-S.Matias
-Baleizão-Quintos

Ardila

Irrigation Areas

31500 ha

-Orada-Amoreira
-Brinches
-Serpa
-Brinches-Enxoé
-Pias
-Caliços-Machados
-Caliços-Moura

ALQUEVA DAM AND HYDRO-POWER PLANTS

Height: 96 m

Crest: 458 m

Total Capacity: 4.150 Hm^3

Usable Capacity: 3.150 Hm^3

2 Hydro-power plants

- 2+2 turbines Francis Reversible
- $200m^3/s$x4 =$800m^3/s$
- 130 x4 =520 MW

Alqueva Dam

Hydraulic Model

Applied research

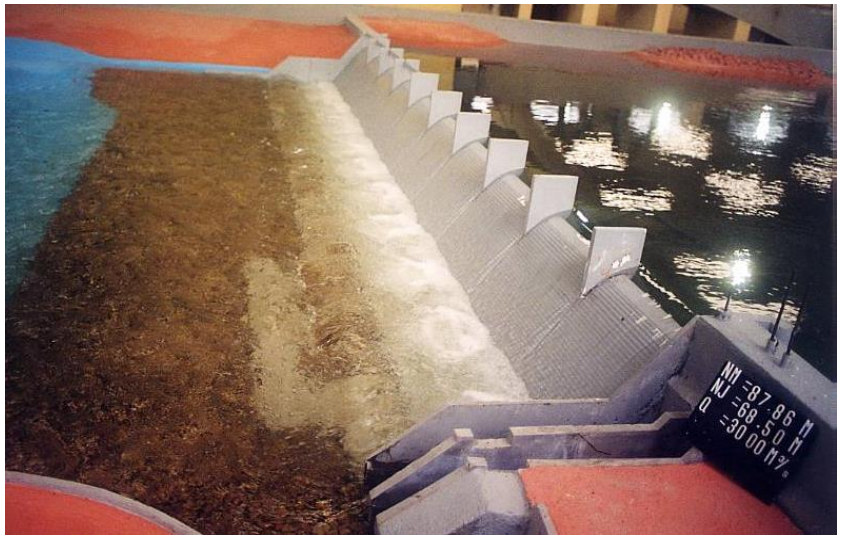
Flood (2010)

Middle Bottom Spillways

Pedrogão Dam

Hydraulic Model

Applied research



Flood (2010)

PEDROGÃO HYDRO-POWER PLANT

1 Hydro-power plant

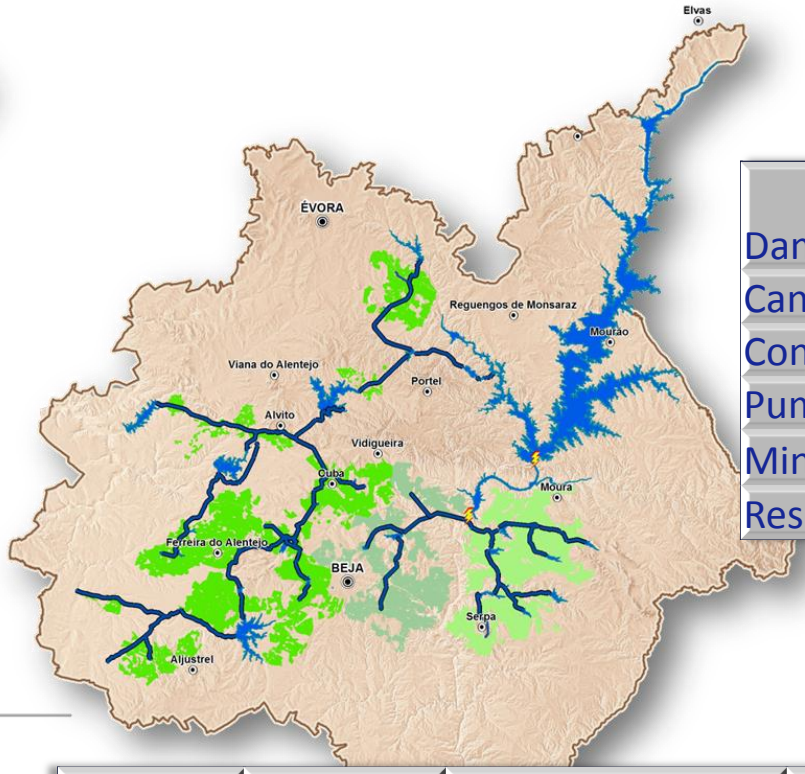
- 2 turbines Kaplan
- 25m³/s =50m³/s
- 5,2MW

TO RECOVER SOME ENERGY IN EFMA

5 Hydro-power plant

Plant	Q (m^3/s)	Hu (m)	turbines	Rated Power (MW)	Tota l of production (GWh)
Alvito	40,6	9,6	2 Kaplan	3,36	8
Odivelas	3,7	76	1 Francis	2,5	11,5
Pisão	2,85	25,5	1 Francis	0,65	2,05
Roxo	5,7	33	1 Francis	1,6	4,7
Serpa (reversíbel)	2,5	63	1 Francis	1,5	3,4

29.7 GWh/year



Primary Network

Dams	23
Canals (km)	100
Conduits (km)	103
Pumping Stations (10)	110 MW
Mini Hydro (5)	11 MW
Reservoirs	32

LEGEND

- Primary Network
- EFMA Reservoirs

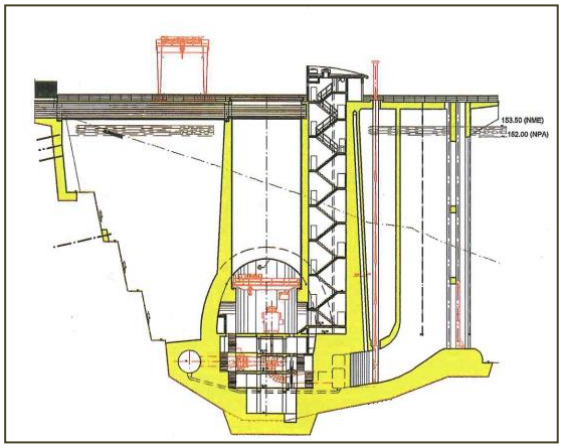
EFMA Irrigation Area

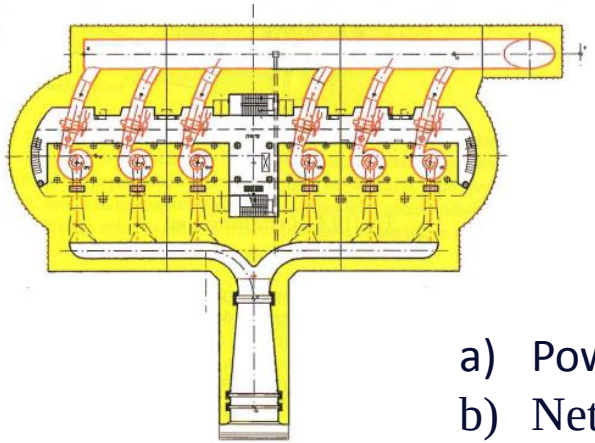
- Alqueva Subsystem
- Ardila Subsystem
- Pedrógão Subsystem

Secundary Network

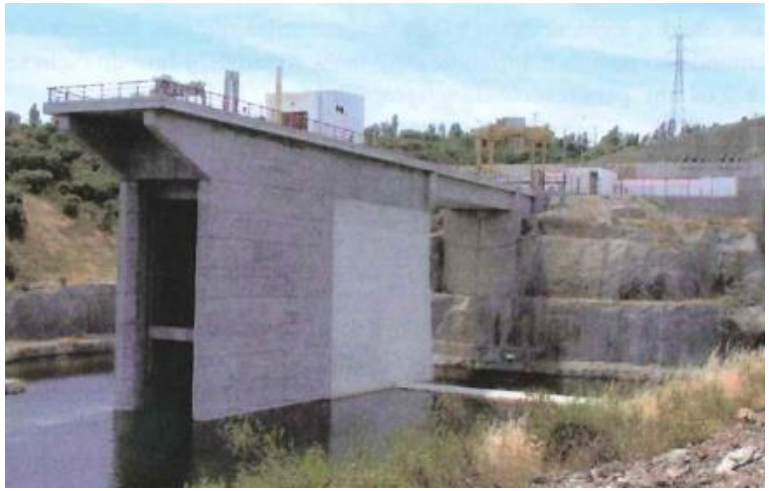
	Irrigated Area (ha)	Secondary Irrigation Network (Km)	Roads (Km)	Hydrants	Irrigation Outlet	Pumping Power (MW)
Alqueva	64.000	699	254	1.761	3.482	29
Pedrogão	24.500	268	44	433	865	13
Ardila	30.400	379	177	932	1.863	27
Total	118.900	1.346	475	3.126	6.210	69

Álamos Pumping Station



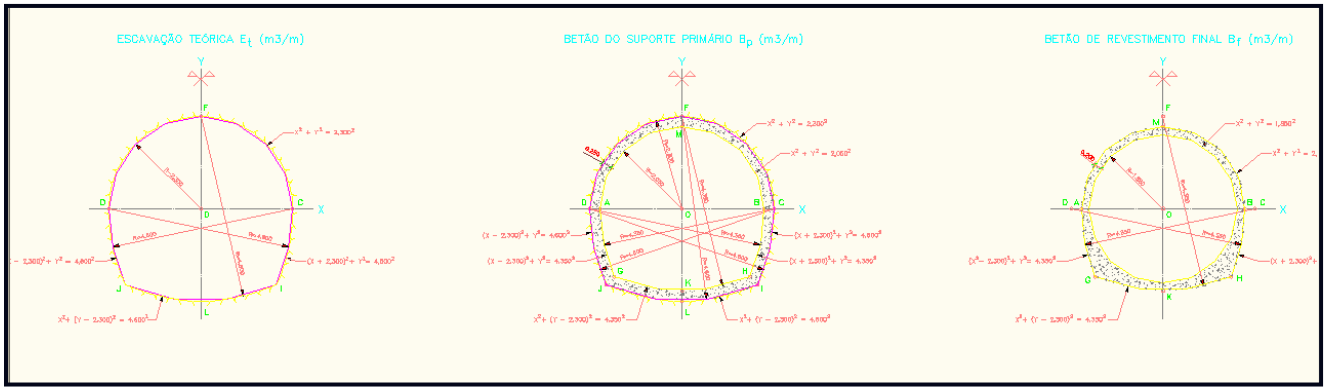


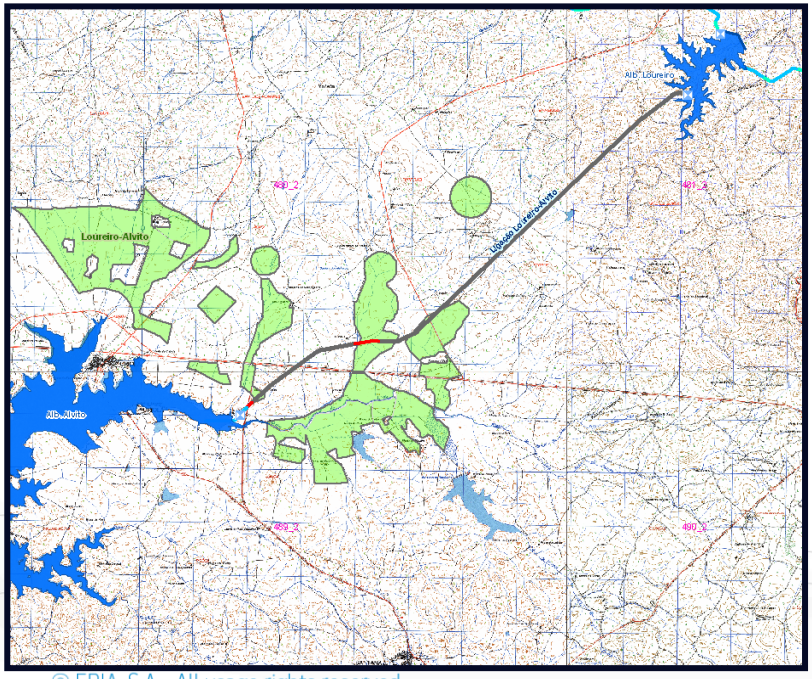
a) Power: 42 Mw
b) Net head: 80 m
c) Flow: 42 m^3/s



Loureiro - Alvito Tunnel

Length – 11Km Flow – 32m^3/s Diameter – 3,7 m



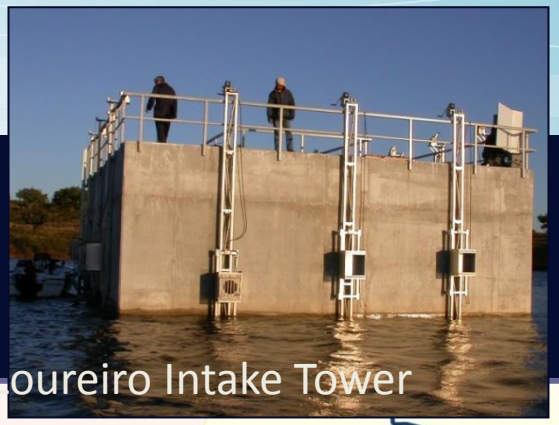


Loureiro - Alvito Tunnel

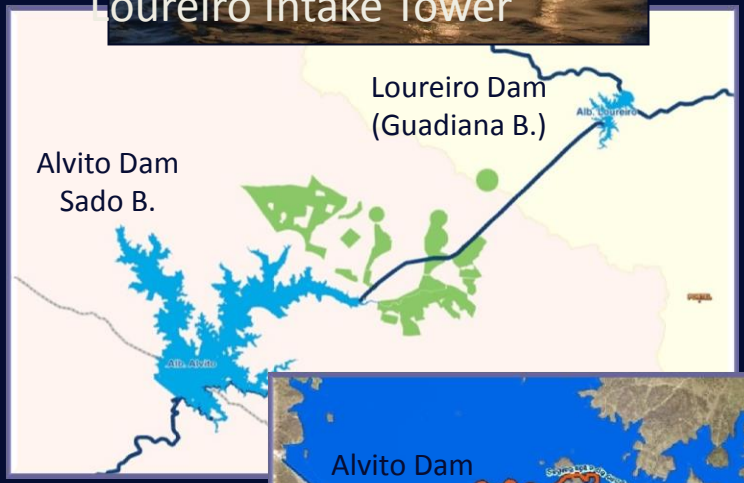
ENVIRONMENTAL IMPACT ASSESSMENT

Water transfer between the basins of Guadiana and Sado.

- Extension of water intake tunnel Loureiro-Alvito.
- Installation of an acoustic barrier to deter fish in Loureiro reservoir.
- Device segregation of water to ensure the ecological flow with water from the basin of the Sado.
- Countervailing Program for the indigenous fish fauna and continental basin of the Sado.
- Monitoring and evaluation of impacts of water transfer Guadiana-Sado: ichthyofauna and water quality.



Loureiro Intake Tower



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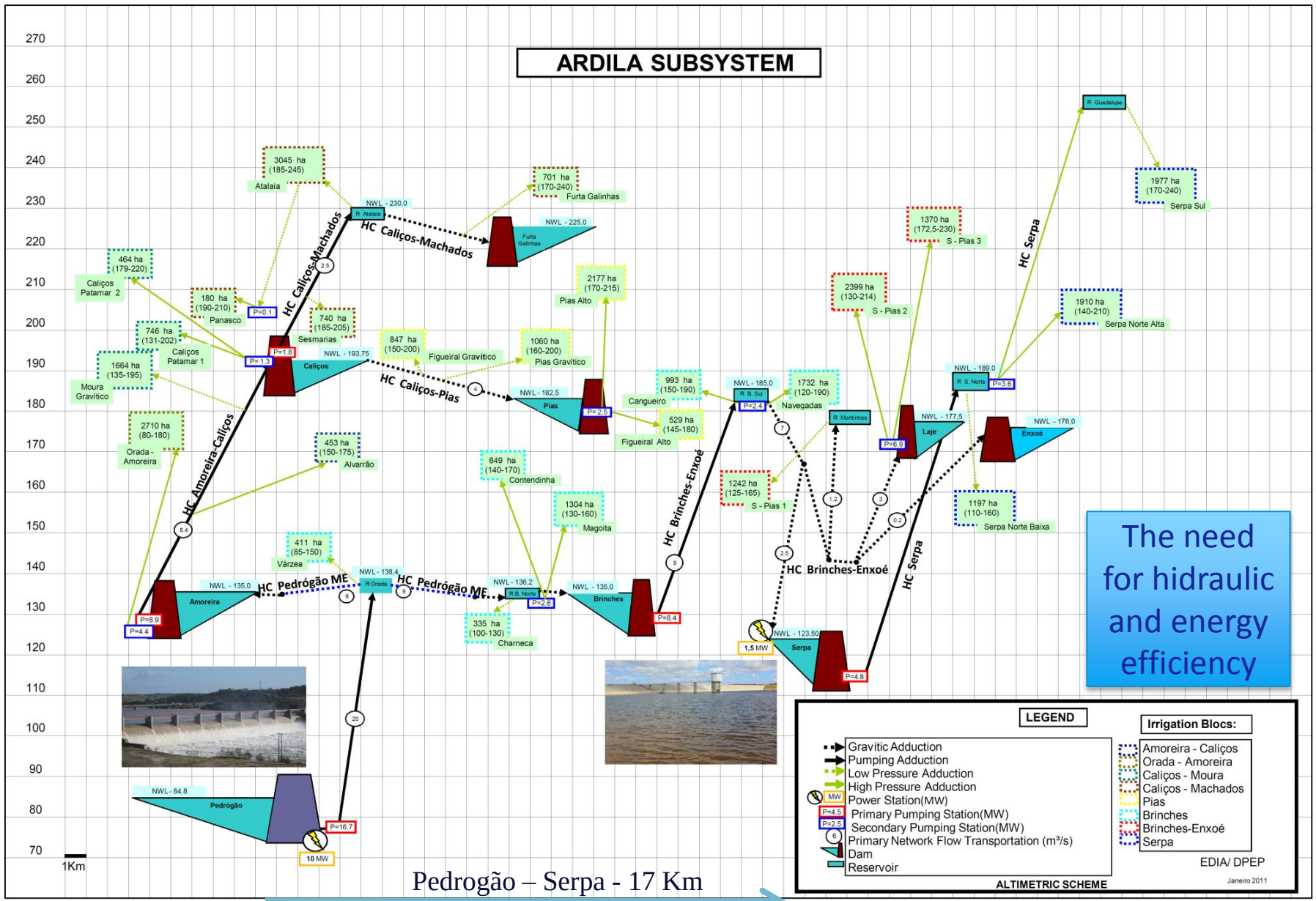
Alvito-Pisão Canal

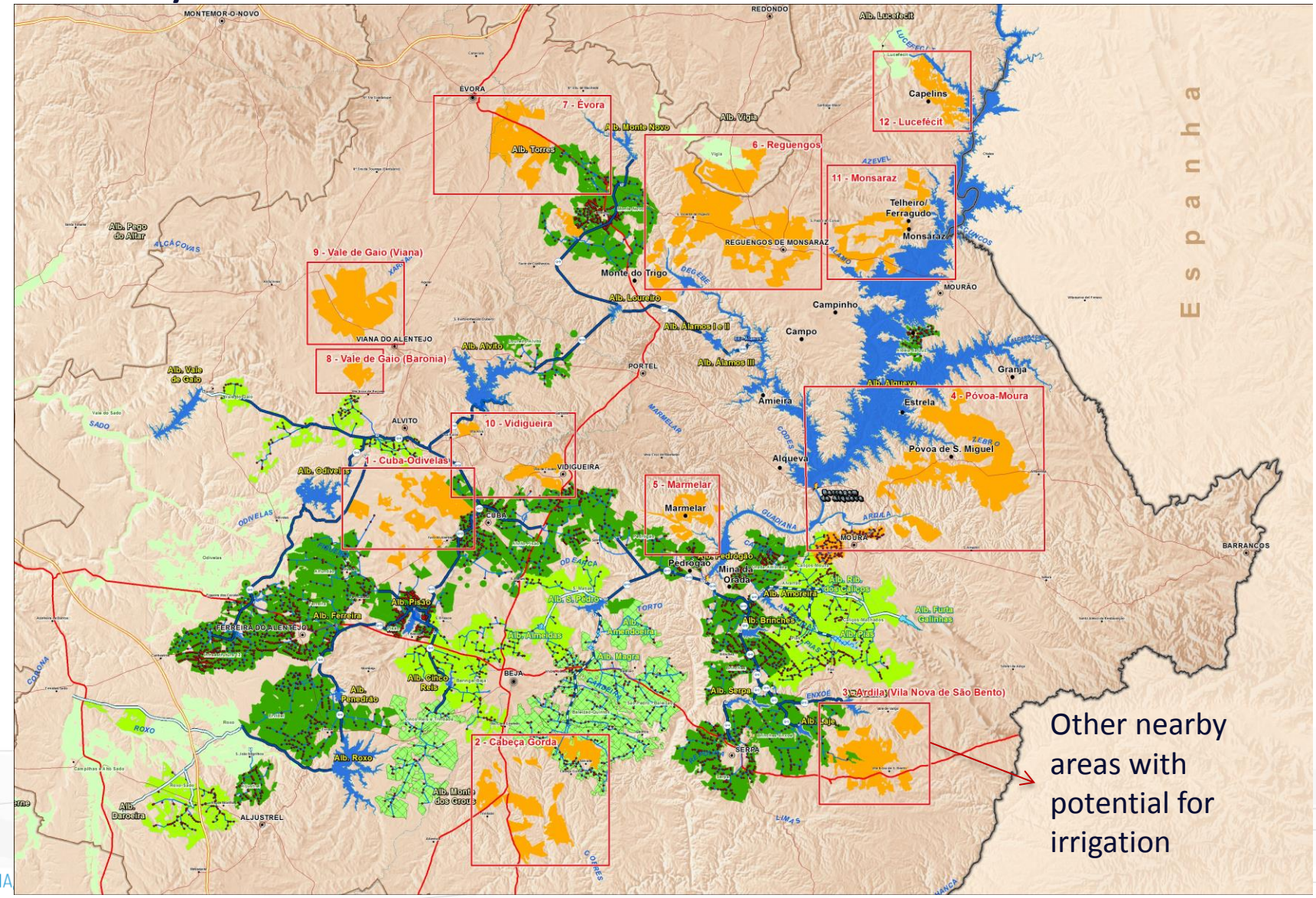
Q - 46m3/s ⇨ 20m3/s
Length – 35 Km



The need for hidraulic and energy efficiency

Pedrogão – Serpa - 17 Km

EFMA – Hydraulic Network

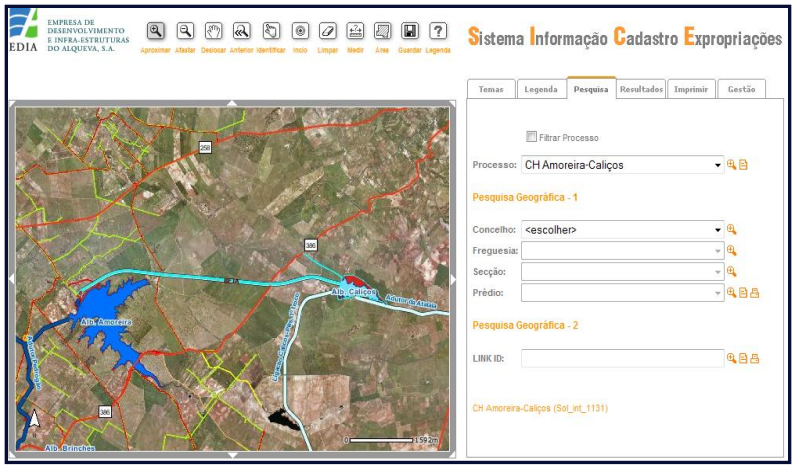


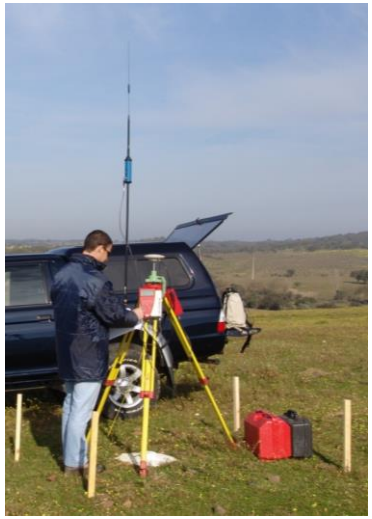
Other nearby areas with potential for irrigation

EDIA Main activities

-"Macro" planning of hydraulic systems.

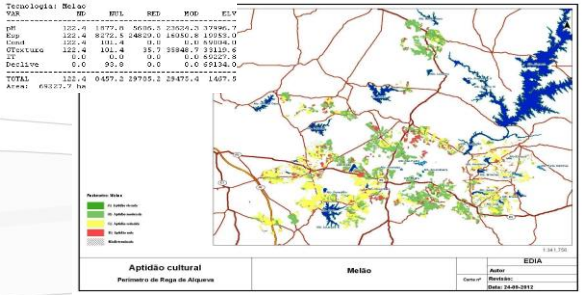
- Control and revision, including technical analysis and final approbation, of the detailed studies.





- Preparation of tender documents for procurement of studies and works.

- Studies in the field of geographic information, cartographic and topographic systems.



EDIA Main activities

-Management and supervision of works

-Water resources management.

-Supervision and monitorization of environmental impacts.

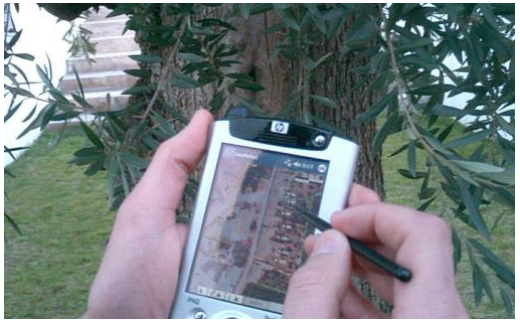
-Licensing and supervision of water abstracts.

-Water quality control.

-Hydraulic structures management.

-Management and exploration of irrigation perimeters.

-Technical support to beneficiairies, farmers and investors.



SISAP

FINAL NOTES

✓The Alqueva Project is an example of a great Multipurpose Hydraulic Development with important, complex, and sometimes unusual infra-structures, namely dams, canals, conduits, pumping and hydroelectric stations, primary and secondary hydraulic network.

✓These works had a lot of investigation studies at LNEC Portuguese National Civil Engineering Laboratory and some Portuguese Universities and a big amount of hydrological, hydraulic, geotechnical, structural, electromechanical and environmental studies were undertaken, the great majority of them by Portuguese Engineering Consultants.

✓A great part of this Project is already executed, nevertheless there are a significant number of infrastructures, being constructed, the great majority of these works were and are being executed by Portuguese Contractors.

alqueva A fresh new land

FINAL NOTES

✓Macro " planning of this important Project was developed and consolidated by EDIA and all the studies had contributions and were accompanied, revised and validated by EDIA. All the tender procedures and the surveillance of the construction works were assured also by EDIA.

✓The hydroelectric and water supply benefits are concluded.

✓60% of the irrigation network is concluded with a very good adherence in the first years.

All this giving to Alentejo a new look and allowing an upgrade of life quality, taking in due account the environmental values, in a sustainable way.

alqueva A fresh new land

✓EDIA aims to develop international cooperation taking advantage of our knowledge, experience and capacities obtained in this great and very recent hydraulic multipurpose project but also taking into account our doubts and our needs.

Thank you for your attention