

# CAPACITY BUILDING MOROCCO

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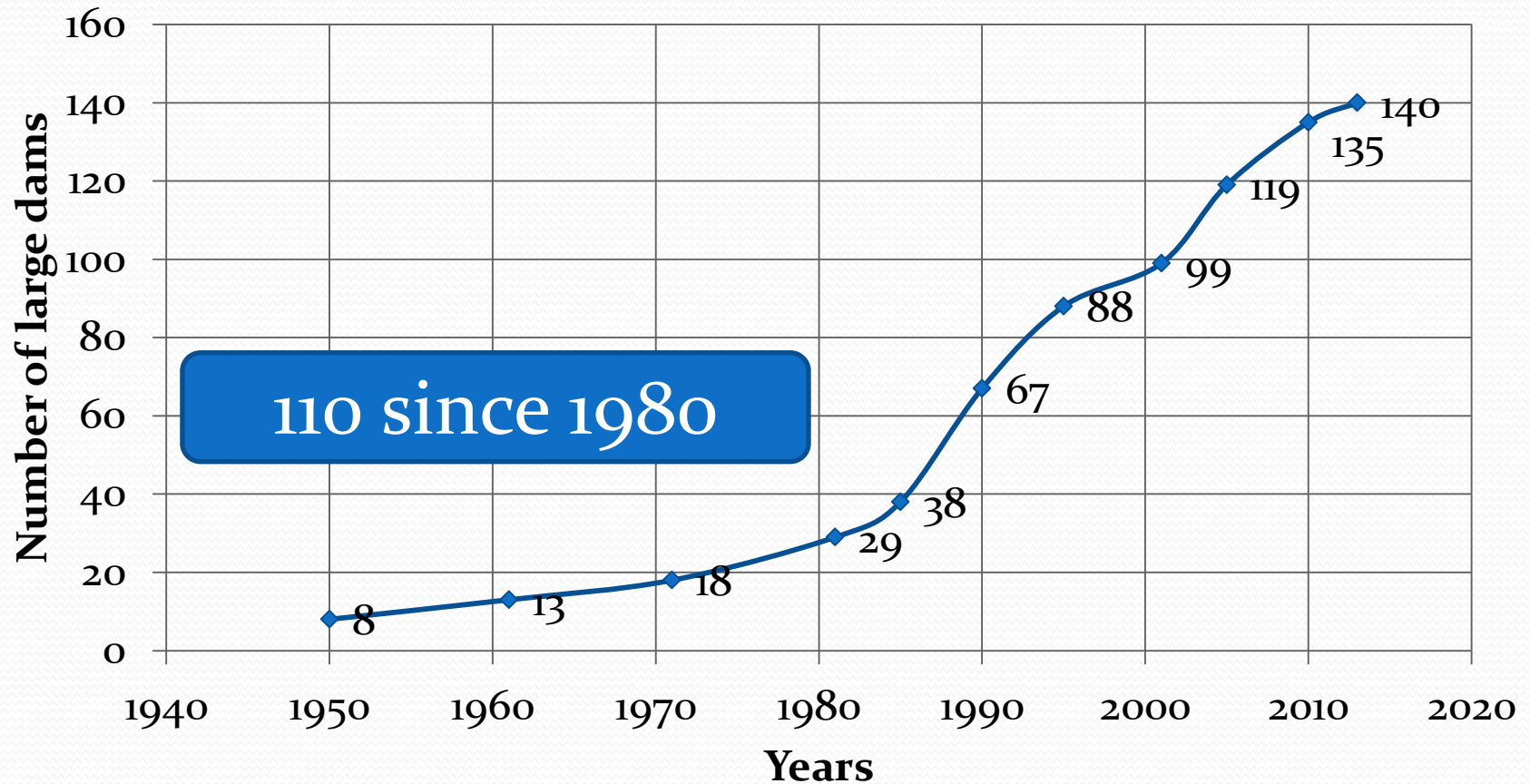
April 2014

# Large dams in Morocco (2013)

Large dams	total	Operating	under construction	under design
H $\geq$ 15m	176	140	21	15
H $\geq$ 30m	93	68	14	11
H $\geq$ 50m	54	38	11	5

with 30 RCC dams (7 under construction)  
Morocco is ranking 5<sup>th</sup> in the world and 1<sup>st</sup> in Africa

# Large Dams construction



# Political decisions

- In the eighties :
  - Massive investment in water mobilization for irrigation and drinking water
  - Acquiring within 15 years dams technology

# Adopted strategy

- Strengthening human resources within the government agency in charge of dams
- Partnership relation with few highly experienced European consulting engineers
- Contracting the design on a mutual agreement basis
- Long term collaboration with local consulting
- Increase of the local part with time
- Attribution of small dams design to locals with external expertise

# Other

- Development of RCC technology and intensive use of manpower (masonry)
- Many international jobsites visits (USA, France, Japan, China, Brazil, Argentina, Russia ...etc.)
- Strong participation in ICOLD congresses
- Invitation of high level experts
- Continuing the experience only with two local companies (the most promising)
- Local financing, no conditioned financing



Hassan 1st (1986, H=145m)  
Plus grand remblai d'Afrique

40%

الله  
الملك  
الوطن



# Required specialities

1. Dam design
2. Geology / hydrogeology
3. Geotechnical
4. Structure
5. Hydrology
6. Hydraulic
7. Draughtsman
8. Hydromechanical - electromechanical
9. Scientific calculations



# Team mini

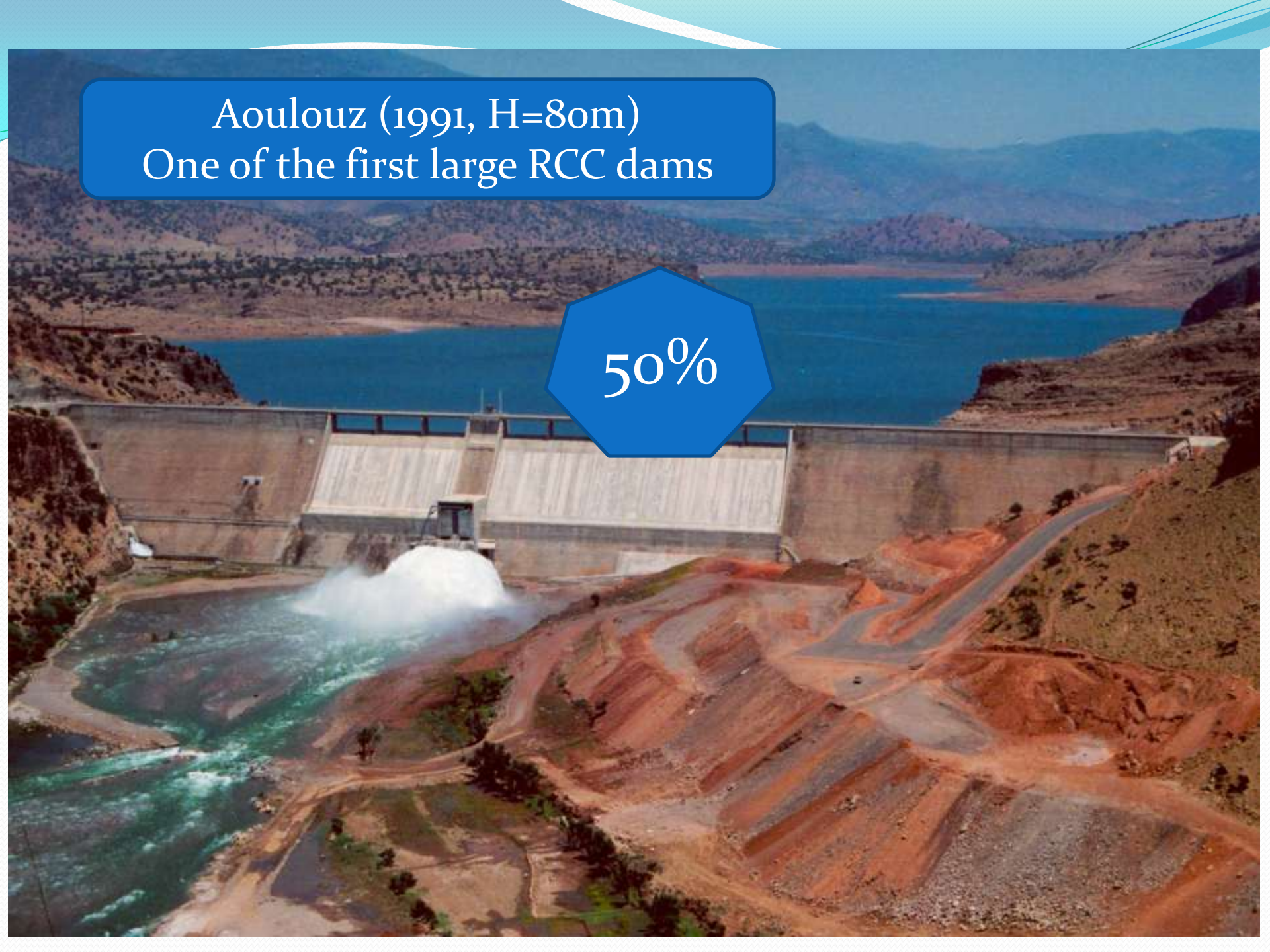
- 9 main specialties
- Require a team of 30 persons *full time*
- Work on numerous projects
- Involvement in design construction supervision and monitoring

Sustainability =

- TO of 2 à 4 M\$/Year
- Number = Budget / TO
- For a period of 15 years

Aoulouz (1991, H=80m)  
One of the first large RCC dams

50%



# Construction stage

- Supervision by the government agency
- Presence of expatriate technical staff (decreasing with time)
- Encouraging local contractors (no specific experience required, but presence of expatriate specialists)
- Involvement of the consultant
  - Assistance to the supervision (RE)
  - Preparation of construction drawings



Al Wahda (1996,  $V=27 \text{ Mm}^3$ ,  $Q=20 \text{ 000m}^3/\text{s}$ )  
Second largest embkment in Africa

50%



# Benefit

- Dam design, construction and monitoring is cheaper compared to similar countries
- Development of specific technology
- Homogeneity and improvement in the design
- Availability of local expertise for any urgent action
- Moroccan designers and contractors are present internationally

Laghrass (1998, H=80m)  
Arch in karstic foundation

85%

29 Nov 2000





Asfalou (1998, H=110m)  
Thin arch in karstic foundation



95%





100%

Hassan II (2005, H=120m)  
One of the largest RCC in Africa

17 4 2006



SMBA (1974 et 2006, H=95m)

100%

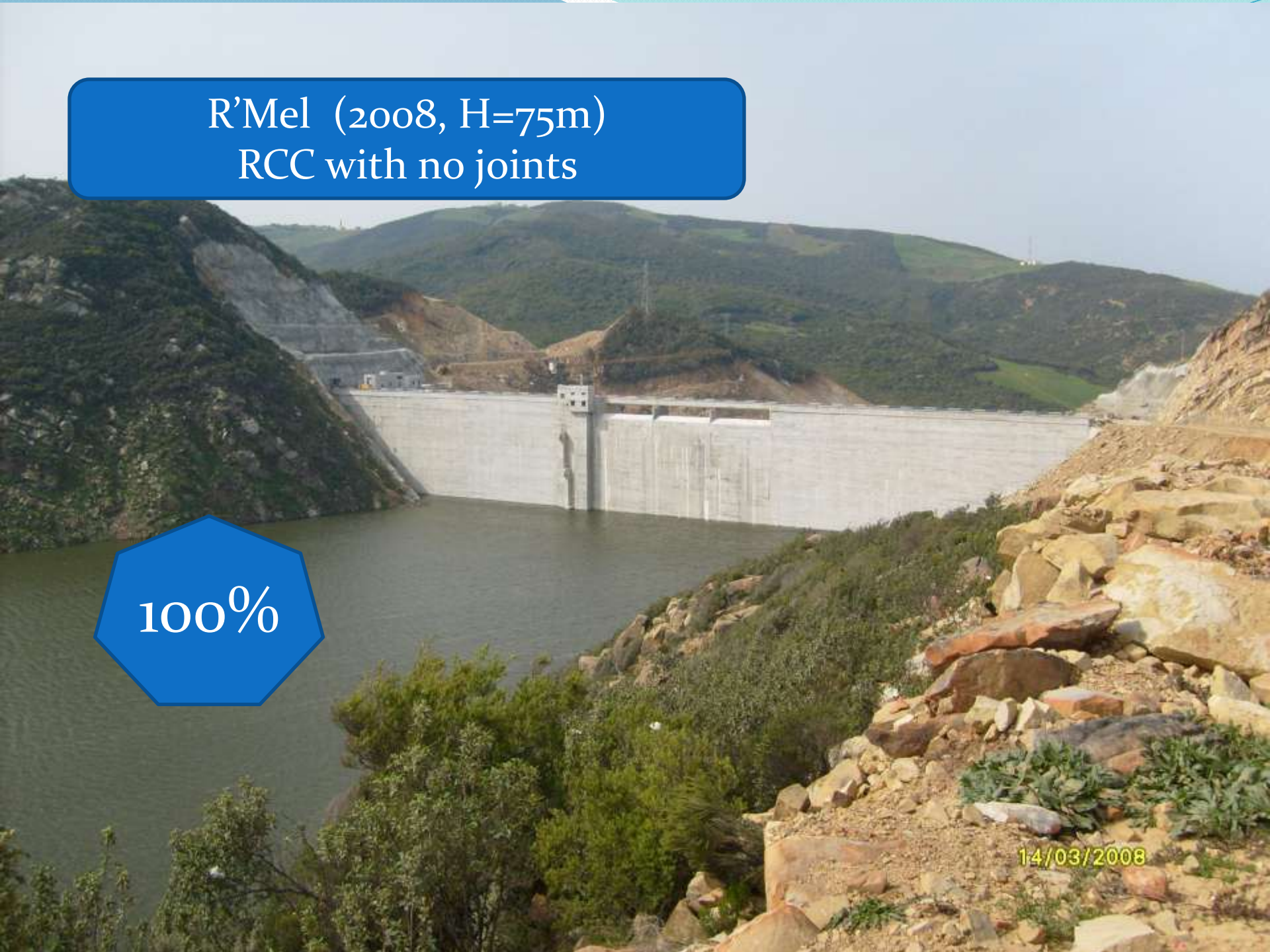




R'Mel (2008, H=75m)  
RCC with no joints

100%

14/03/2008



# Conclusion

- Very particular experience
- Its success is due to the conjunction of multiple factors:
  1. Long term voluntarist strategy
  2. Highly competent owner
  3. Numerous projects well distributed in time
  4. Flexible legislation
  5. Serious and competent partnerships
- Cost savings and expertise availability
- Design more suited to local conditions

SMIR: 1989, First large dam 100%  
moroccan

Thank you for your  
attention

