



# Introduction into the Drâa Basin (Morocco)

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B. Reichert, A. H. Fink, M. Christoph, O. Schulz, and H. Kirscht



Universität zu Köln



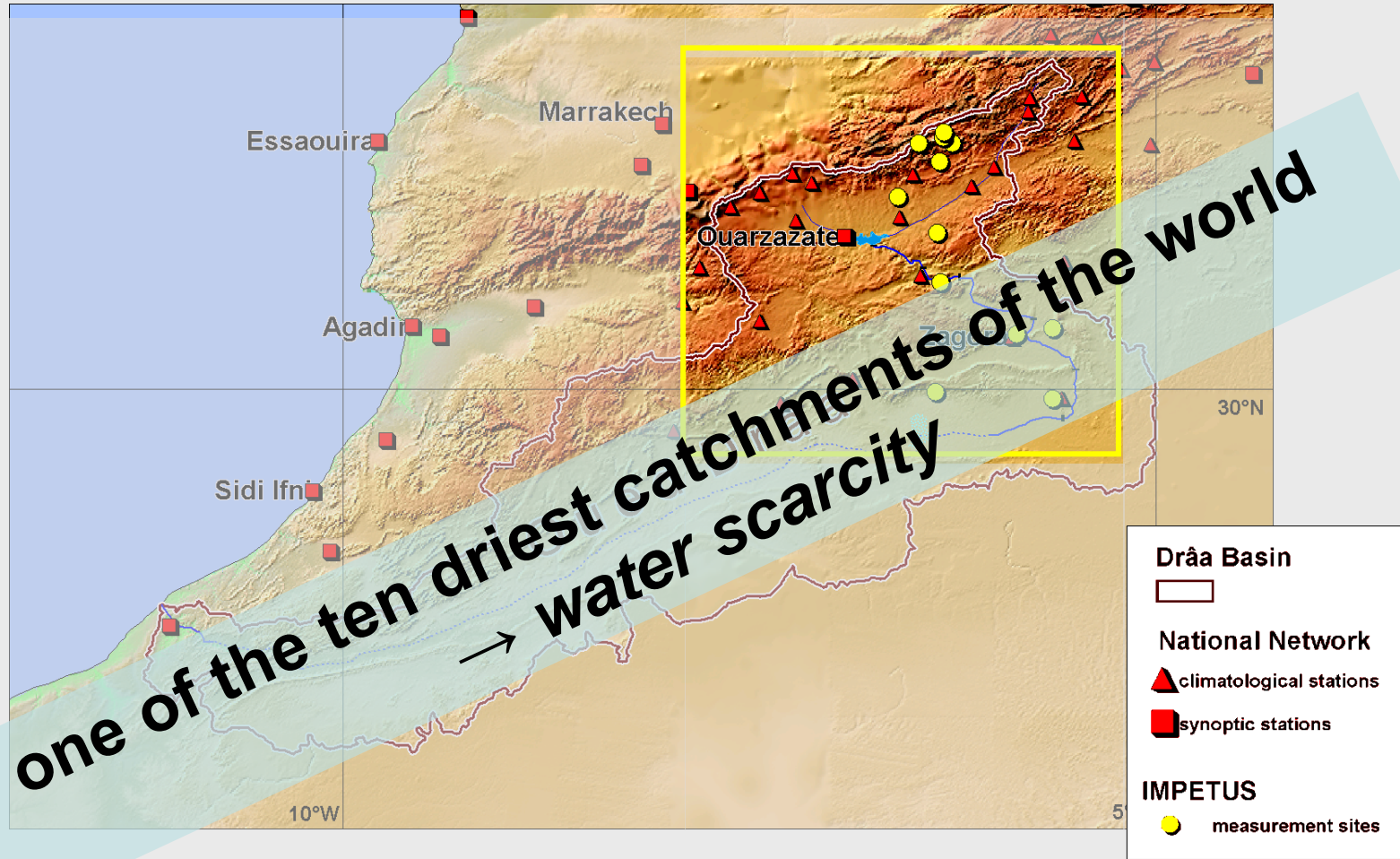
Ministry of Innovation, Science, Research  
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# Case study: Wadi Drâa

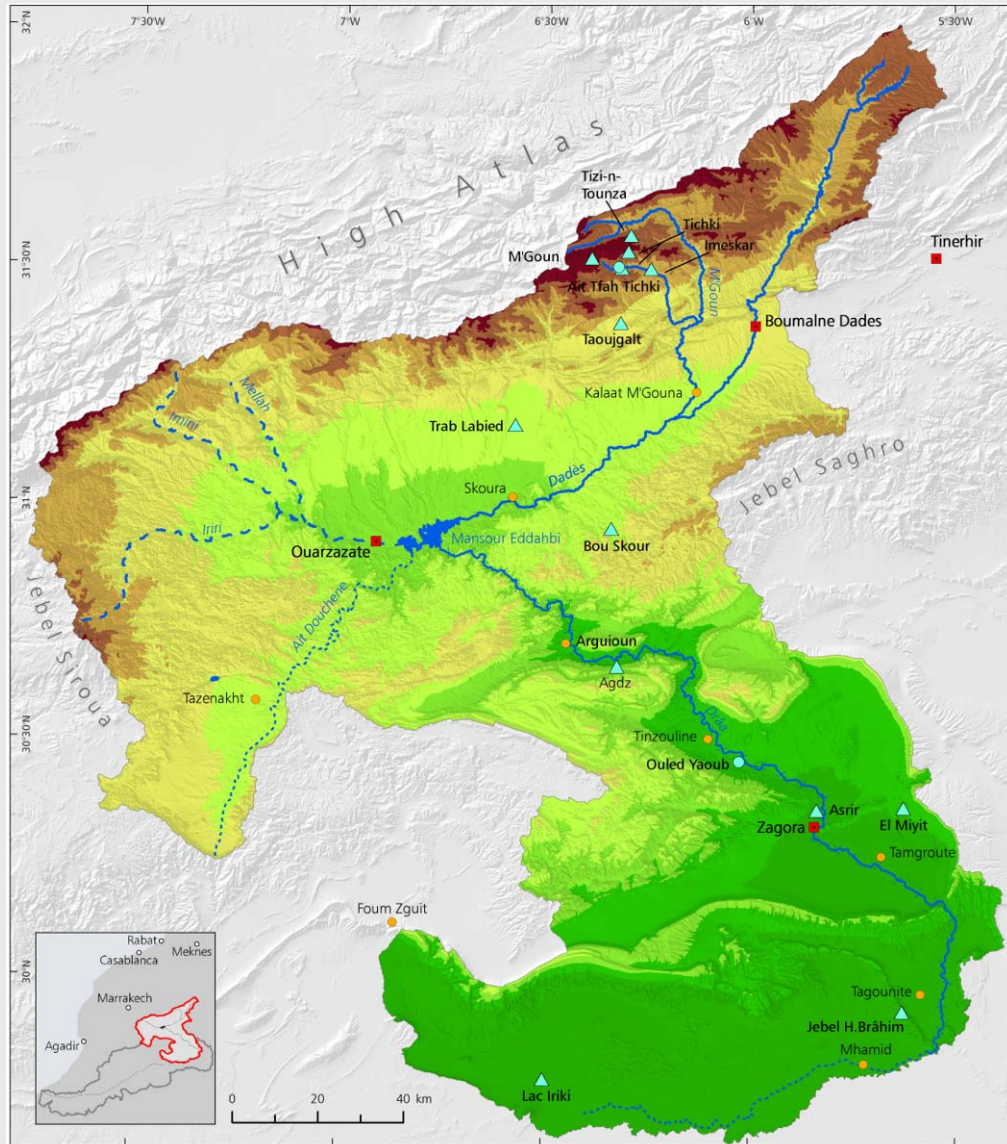


Catchment size:

Drâa: 115,000 km<sup>2</sup>; Upper and Middle Drâa: 29,500 km<sup>2</sup>

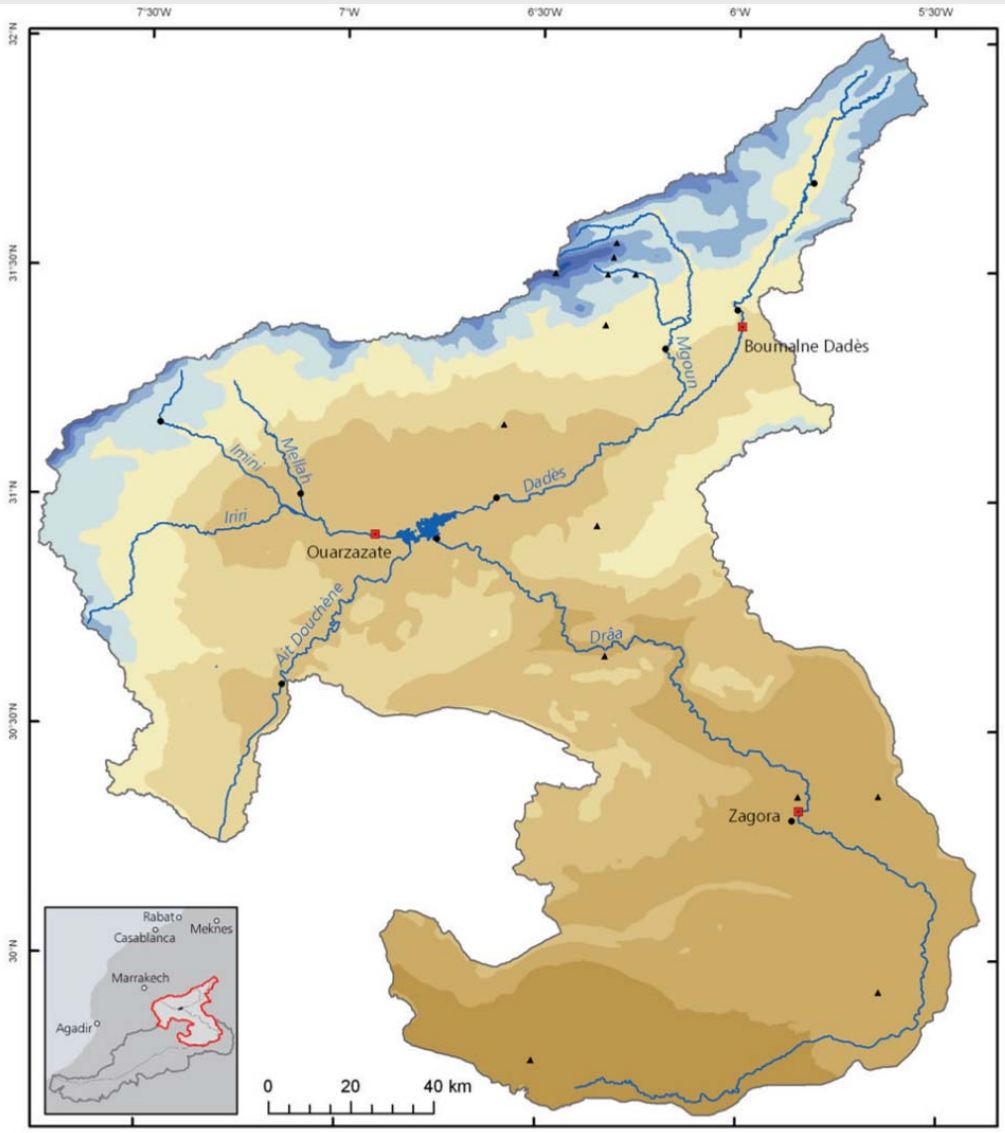


# The Drâa River Catchment



- ✓ 13 automatic weather stations
- ✓ 10 Impetus test sites:
  - geology,
  - hydrology,
  - plant ecology, e.g. vegetation plots under enclosure conditions,
  - agro-economy,
  - agriculture,
  - anthropology
- ✓ 2 villages  
*"pilote communes"*

# Climate

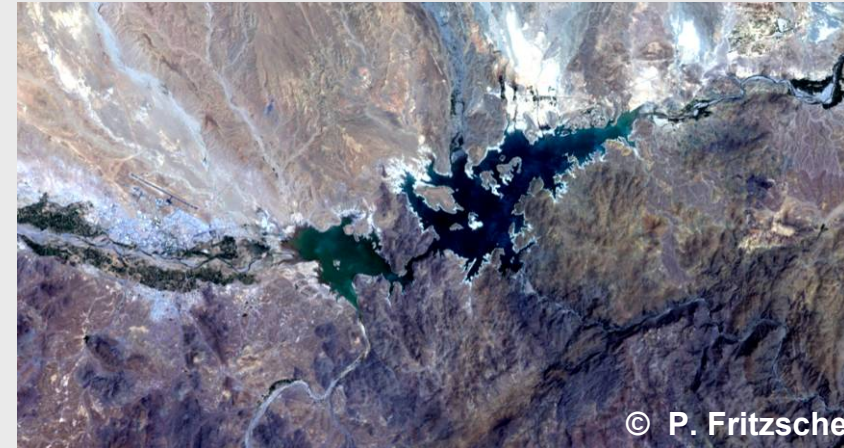
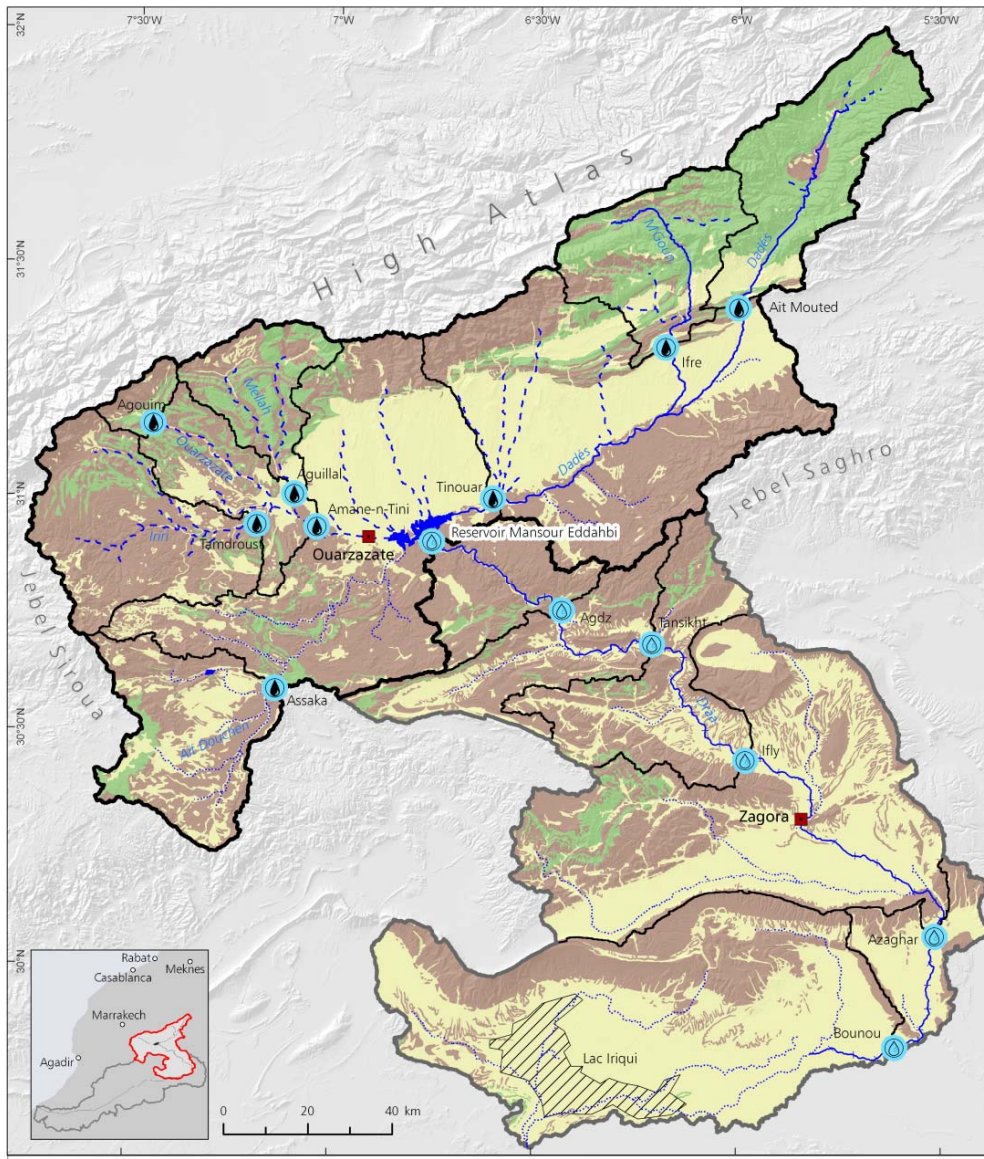


O. Schulz, IMPETUS Atlas, 2008.  
Data source: Service Eau, IMPETUS



- Steep precipitation gradient with elevation:
  - > 700 mm (partly as snow) in the semi-arid High Atlas mountains
  - < 100 mm in the low mountain ranges and the pre-Saharan foreland
- In the same direction aridity increases

# Hydrology



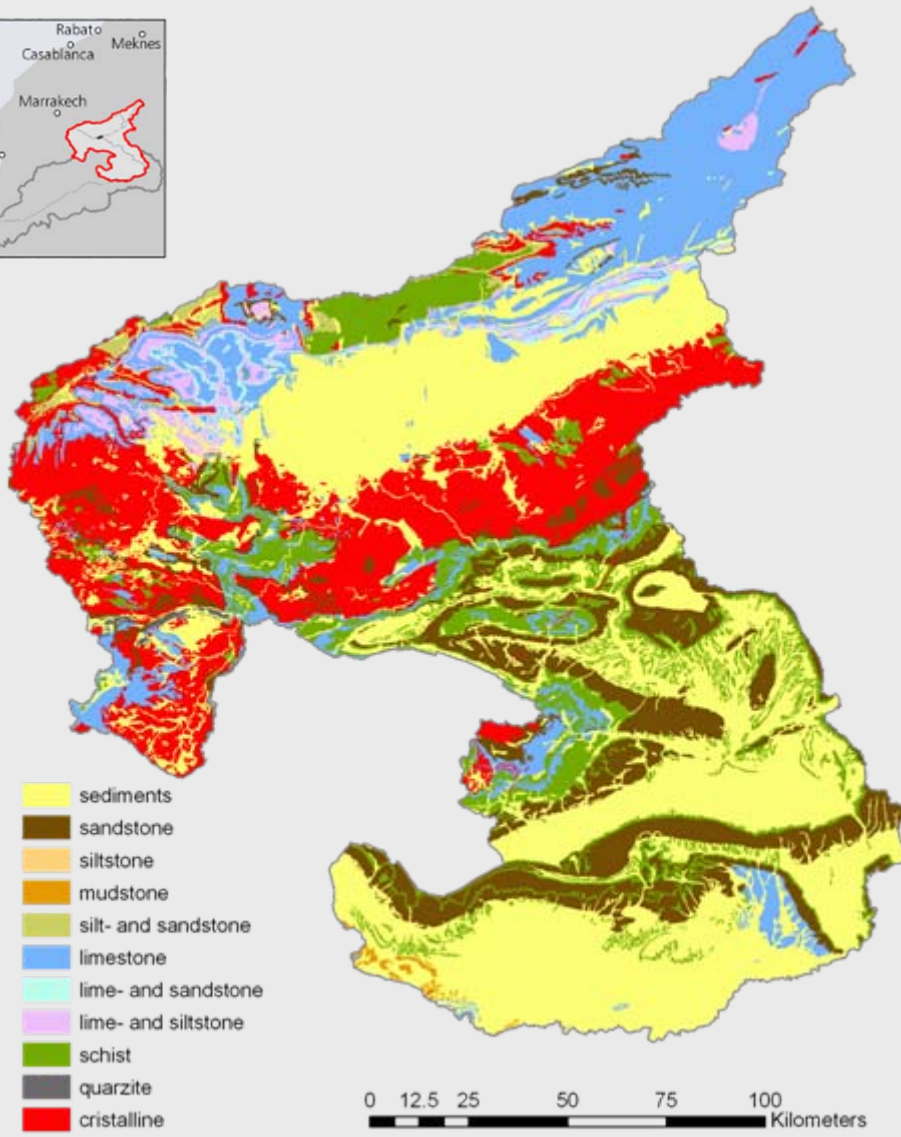
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Different hydrological systems:

- Upper Drâa: flood-driven natural system with the only perennial rivers of the whole catchment
- Middle Drâa: human controlled runoff from the Reservoir Mansour Eddahbi (since 1972)

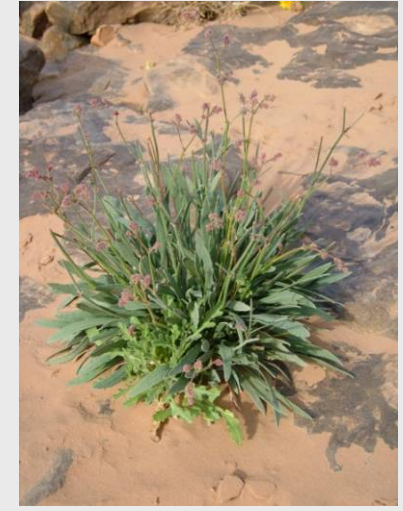
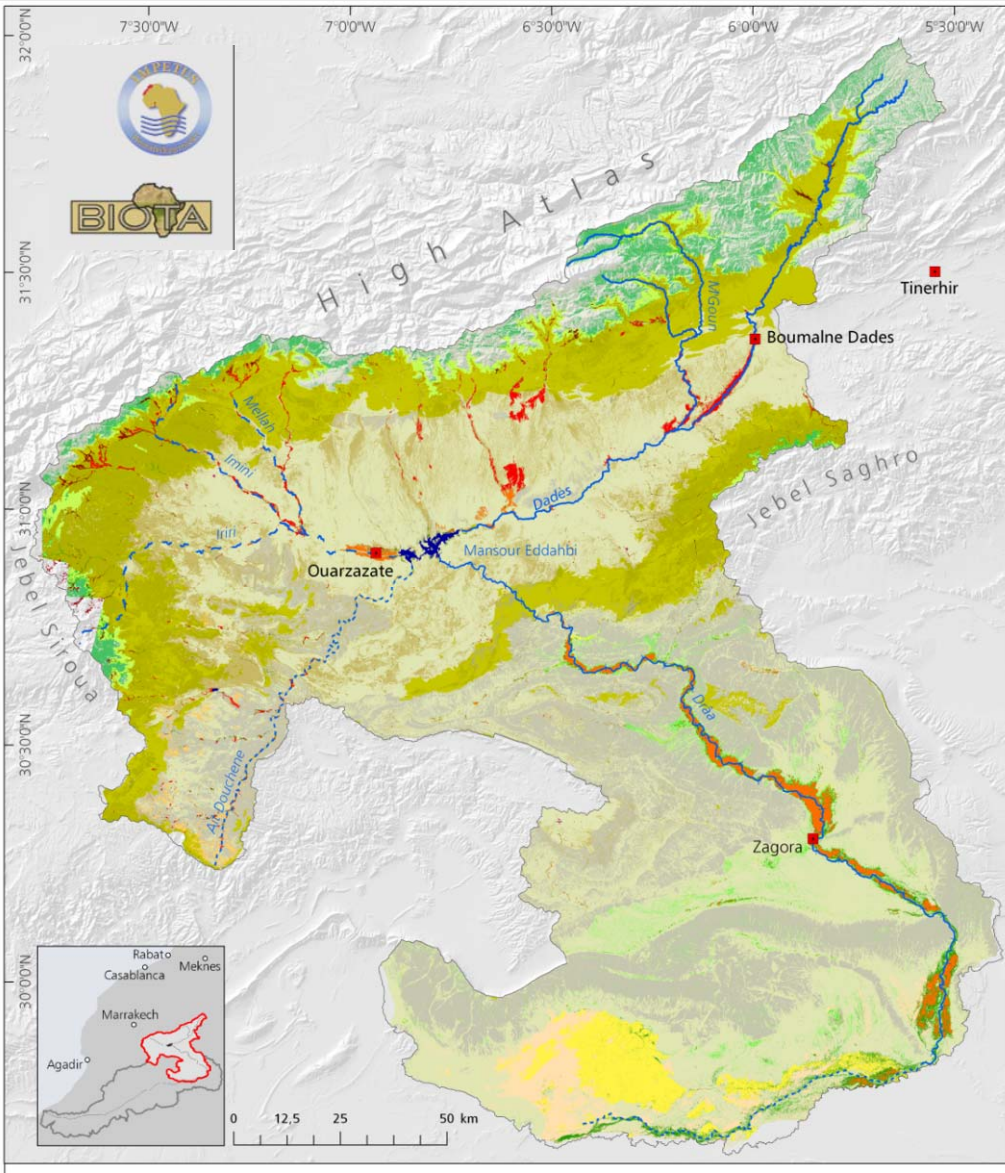


# Geological setting



Courtesy of S. Klose and S. Cappy

# Vegetation

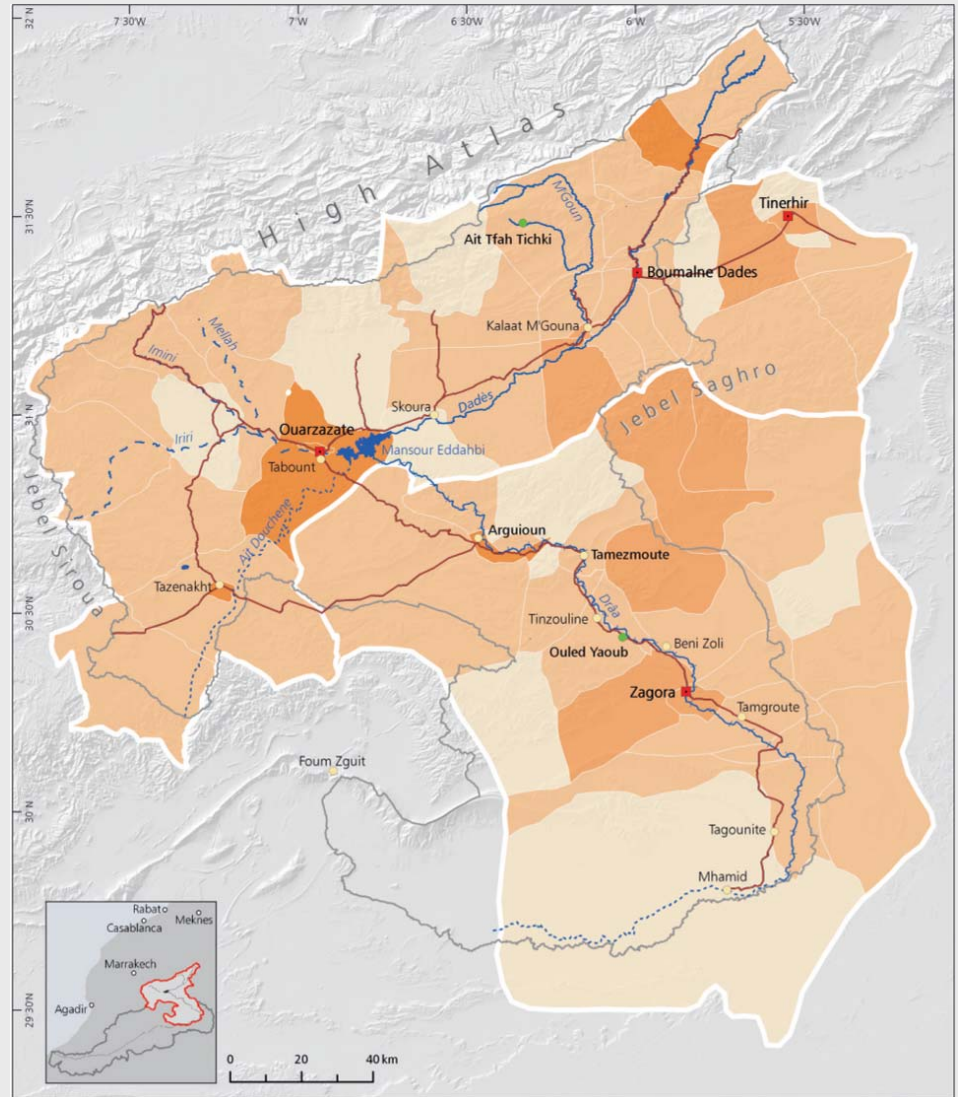


© A. Linstädter

# Population and Society



- total population: ~ 780,000 (2004)
- average population density: 29 people/km<sup>2</sup>
- increasing urbanisation expressed in the average annual growth rates:  
0.8 % rural areas  
3.1 % urban centre
- pulling factors for this intra-regional migration are:
  - diversified economic possibilities
  - better education and supply infrastructures



S. Platt, IMPETUS Atlas, 2008.

Source: Recensement Général de la Population et de l'Habitat 1994, 2004.





# Population and Society

## Income sources:

- ✓ irrigation agriculture (but arable land is restricted to only 2 % of the whole Drâa catchment)
- ✓ extensive rangeland animal production
- ✓ small commerce

## Income sources:

- ✓ tourism (growing but highly vulnerable)
- ✓ labour migration (intra-regional as well as national and international)



© A. Klose  
C. Rademacher, IMF ETOS Atlas, 2006. Source:  
Survey in the *pilote commune* Ouled Yaoub.



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C. Rademacher, IMF ETOS Atlas, 2006. Source:  
Survey in the *pilote commune* Ouled Yaoub.

# Problems covered by IMPETUS





# Major issues

- recurring periods of droughts during the last decades
  - *affects agriculturally based economy*
  - *affects amount of available fodder in the rangelands and thus increases the grazing pressure*
  - *leads to less and unreliable water supply to the oases of the Middle Drâa and thus to groundwater mining and to soil and water salinization*



© A . Klose

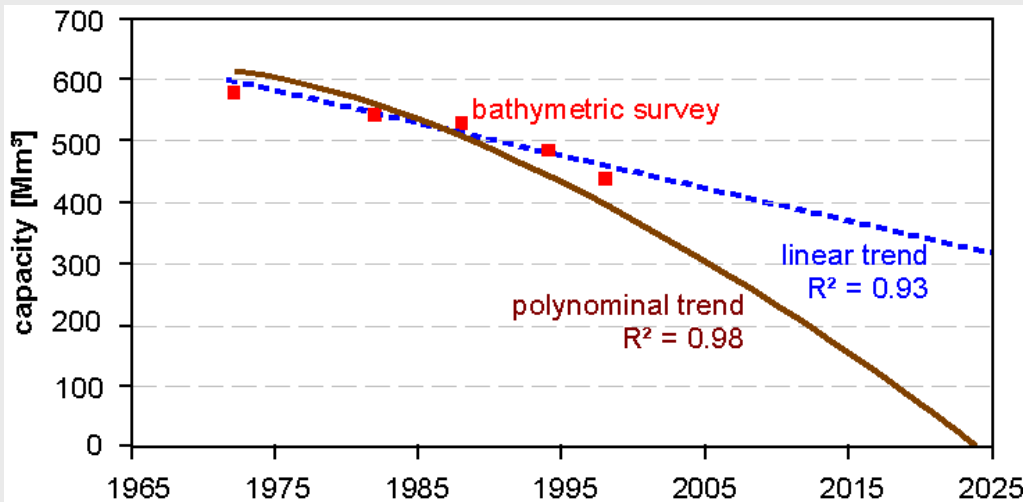


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# Major issues

- Climate models predict more heavy rainfall events → extreme erosion rates:
  - pasture degradation in the High Atlas mountains
  - silting of the reservoir Mansour Eddahbi (lost already more than 25% of its original capacity).



Courtesy of A. Klose. Data source: DRH Agadir.



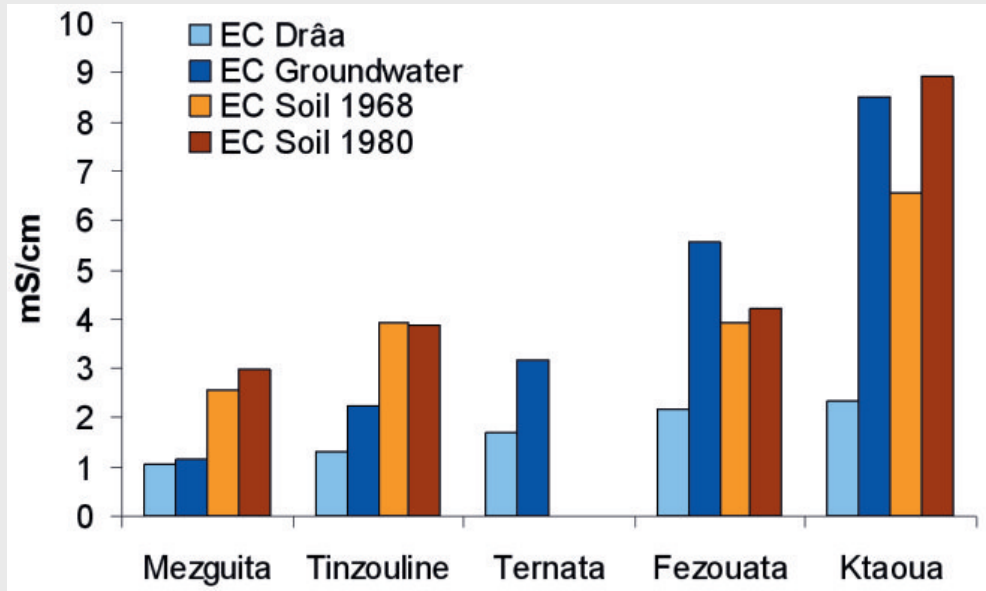
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# Irrigation-related problems

Sinking water tables and increasing salinity of soil and water in the Middle Drâa oases



© A. Klose



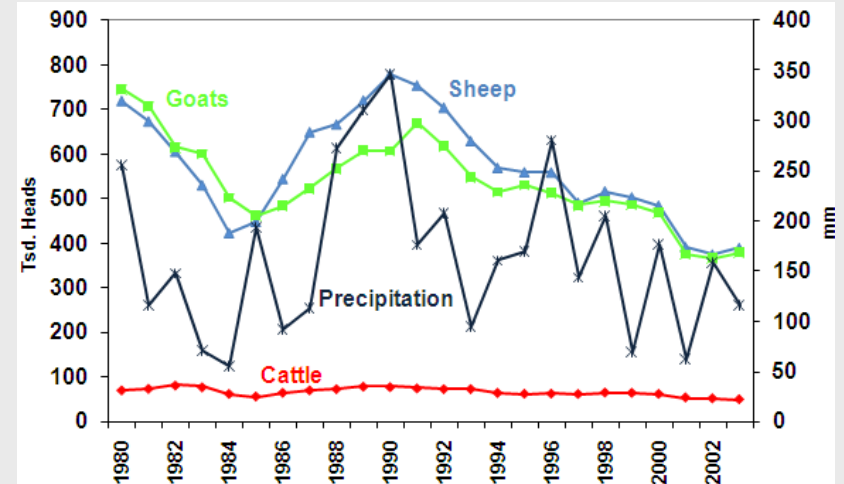
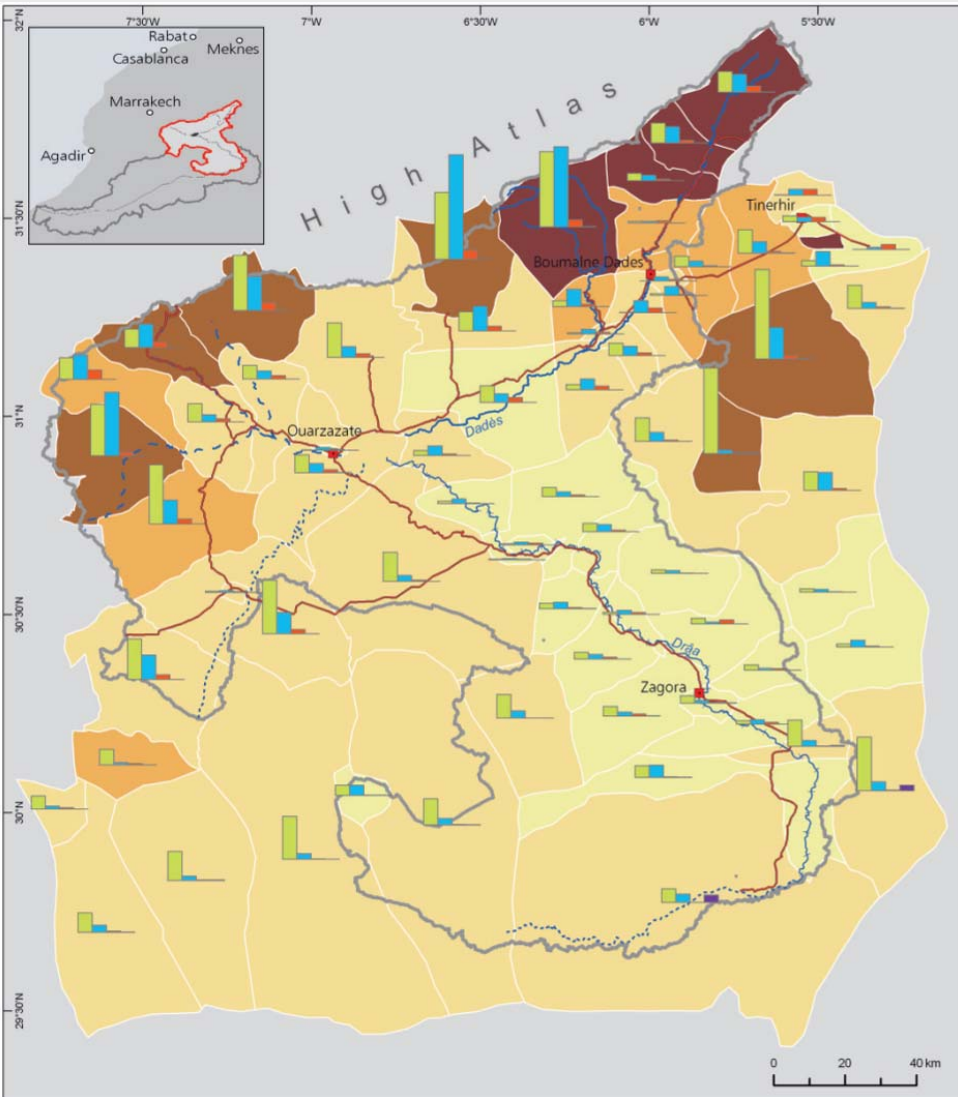
A. Klose, IMPETUS Atlas, 2008.

Source: Boudida, 1990, data from ORMVA, Ouarzazate.



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# Rangeland productivity



C. Heidecke and A. Roth, IMPETUS Atlas, 2008.



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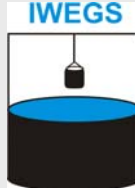
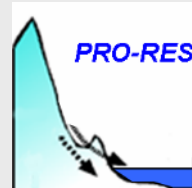
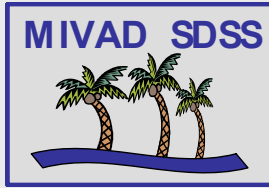
C. Heidecke and A. Roth, IMPETUS Atlas, 2008.  
Source: Agricultural Census 1996 (MADRPM 2000).



# Support for solutions

Interdisciplinary research of IMPETUS provides

- process understanding
- *following talks, posters and IMPETUS Atlas*
- management tools:
  - ✓ Spatial Decision Support Systems
  - ✓ Monitoring tools
  - ✓ Information systems



*please try them in the exhibition hall!*



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Thank you for your attention



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