WATER RESOURCES AND SUSTAINABILITY CHALLENGES IN THE GLOBALIZED OASES OF MENDOZA (ARGENTINA)

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Over the last decade of the 20th century, the agriculture-based economic development model of Mendoza sustained a great impact. The province has the largest irrigated area in the country with a pre-colonial tradition of irrigation, mostly surface, of its arid soils –200 mm of rainfall per year– under a Mediterranean crop system: grapes, olives and stone fruits. The phenomenon of economic globalization reached our country together with the Southeast Asian and Mercosur crises, at a time when Argentina had an open economy with a 1:1 exchange rate to the U.S. dollar, which was attractive to foreign investors. In the oasis of the Province of Mendoza (central-western Andean region, between 32º and 38º south latitude, and between 66º 30' and 70º 30' west longitude) there are two different situations (figure 1):

THE OASES

The **Central Oasis** (54,000 hectares irrigated)

- the upper subbasin –*Valle de Uco*– of the Tunuyán River (30.6 $m^3 s^{-1}$).
- 17 % of the flow of the river and of a significant system of brooks is used here;
- The old horticultural model is being replaced with one of quality vineyards using groundwater and drip irrigation (fig. 2)
- export trend from 1999 to 2009 has increased by 400 %.

Figure 2: Drip irrigation in new vineyards

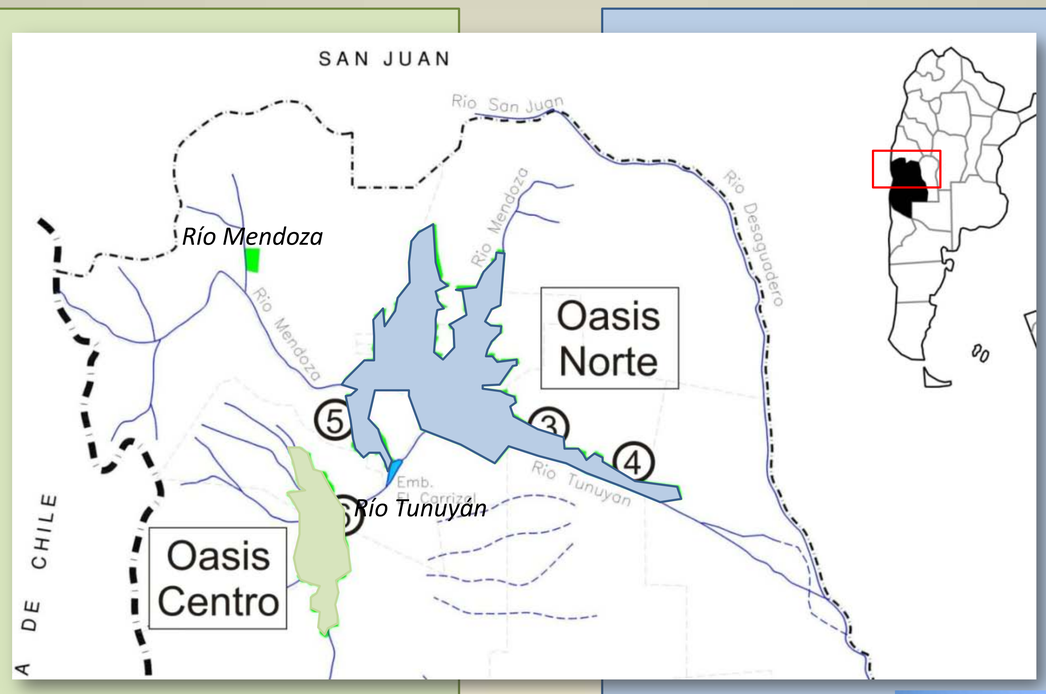

Figure 1: Oases of the Province of Mendoza - Argentina

The **Northern Oasis** (80,000 hectares irrigated)

- irrigated with waters from the Mendoza (50 $m^3 s^{-1}$) and Lower Tunuyán rivers.
- it was the first area settled in what is now Greater Mendoza (1 million inhabitants),
- with a strong agriculture-based industry (wineries, food canning plants, olive oil plants, etc.).
- The Mendoza River feeds an underground aquifer, the natural water reservoir of the oasis shows signs of depletion and contamination attributable to overexploitation and obsolescence or to poor maintenance of the oldest wells.

Figure 3: Urban waste in irrigation canals: reduced distribution and application efficiency

(1) PROBLEMS

Crisis of the 2000': new investments from Northern countries

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Significant increase in the area under cultivation of fine wine grapes

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Increasing groundwater exploitation (especially upstream)

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Rising salinity level in Tunuyán river

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For example, the production of canning peach varieties has moved to the *Valle de Uco* over the last ten years. Peach is a salt-sensitive crop and the declining water quality brought about decreasing yields which, in some cases, led to the abandonment of the fruit orchards.

Strong demographic growth and migration of rural communities

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Loss of suitable production areas to urbanization

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The irrigation system, which crisscrosses the main metropolitan area of Mendoza, has turned into a huge urban waste container that collapses during heavy rains and affects distribution (principle of equity) and irrigation application efficiency (Fig. 3)

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Physical, chemical and microbiological contamination of the water supplies completes the picture of the oasis (Fig. 4)

(2) SOLUTIONS

Government officials have focused on education and raising awareness of the problem of urban wastes, on modernization of the irrigation network (canal lining), and on a land use planning law.

But construction of new domestic wastewater treatment plants, regular water quality monitoring and the use of performance indicators, which will help visualize the evolution of water quality in time and space, will contribute to water conservation and sustainability in both oases, as we already proposed (fig. 5).

The integrated management of the upper and lower subbasins of the Central Oasis is yet to be implemented. Attention should be paid to the basin's water balance so as to set a limit, on the basis of sound criteria, to the expansion of land under irrigation, especially when groundwater is involved. With regard to the Upper Tunuyán River, though so far the physical, chemical, and microbiological quality of water in its command area has not been affected by human activity, it will be necessary to monitor the flows entering the upper subbasin and its discharges into the lower subbasin.

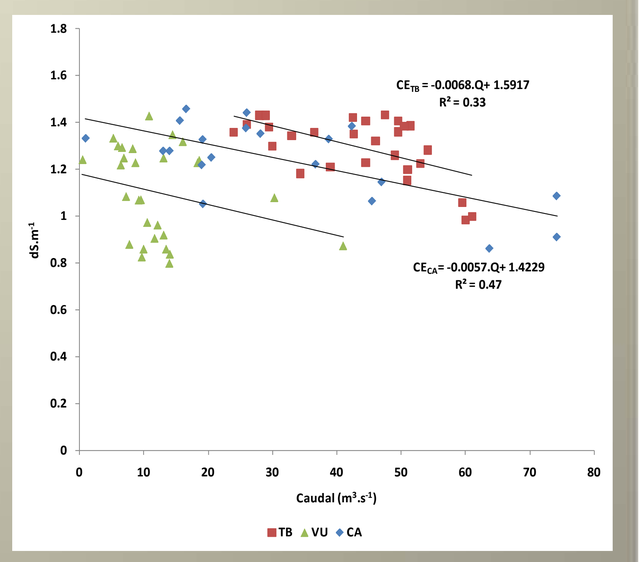

Figure 4: Increasing water salinity in the Lower Tunuyán River. Values in *Valle de Uco* (upper subbasin) vs. *Costa Anzorena* and the *Tiburcio Benegas* dam (lower subbasin)

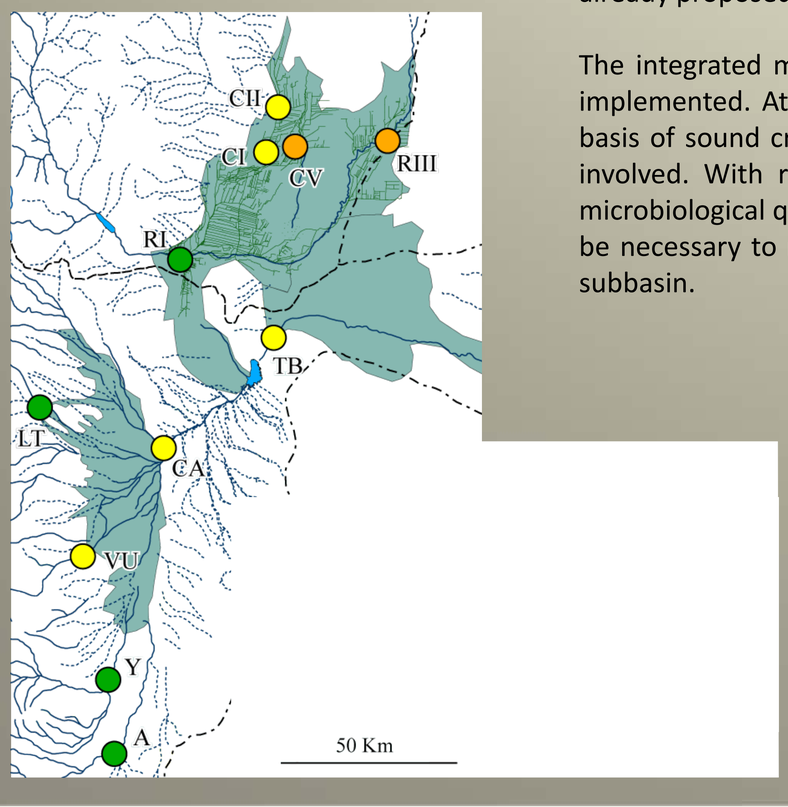

Figure 5: Irrigation water quality using the Integrated Water Quality Index (WQI) (Lavie *et al.*, 2013)

Bibliographie:

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