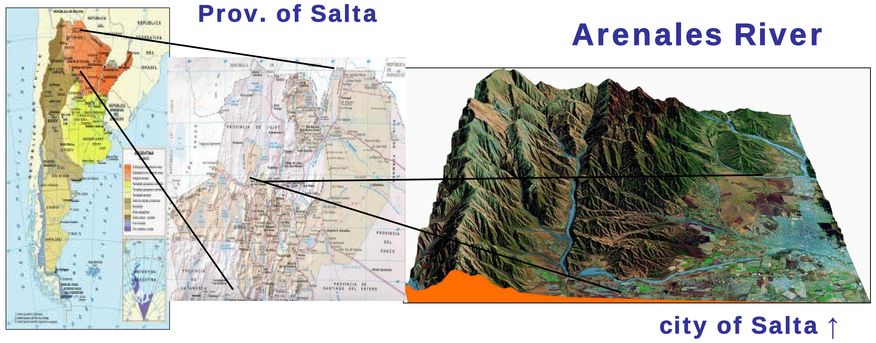
MATHEMATICAL MODELS FOR THE ARRANGEMENT AND THE CLEANING OF THE RIVER BASIN AND SURROUNDINGS OF THE ARENALES RIVER TO ITS PASSAGE BY THE CITY OF SALTA (ARGENTINA).

J. B. Grau[1], J. M. Antón[1], Federico Colombo[3], D. Andina[2], A. M. Tarquis[1]
[1,2]Universidad Politécnica de Madrid, 28040, Madrid (España),
[1]E.T.S.I..Agronomos, [2]E.T.S.I.Telecomunicación, [3]UCASAL, Salta (Argentina) .

Funding provided by Spanish Ministerio de Ciencia e Innovación (MICINN) through project no. AGL2010-21501/AGR.

AREA AND PROBLEMS

ARGENTINE



ARENALES RIVER BASIN

-INTRODUCTION.

The province of Salta is located the Northwest of Argentina in the border with Bolivia, Chile and Paraguay. Its Capital is the city of Salta , 1600 km from Buenos Aires and at 1187m altitude. It concentrates half of the inhabitants of the province and has grown to 600000 hab., from a small active Spanish town well founded in 1583. The city is crossed by the Arenales river going down from close mountains at North, source of water and end of sewers. But with actual growing, this river, instead of a core of worthy for leisure and well-being, has become a focus of infection and of remarkable unhealthiness, and of problems for the Government and society. It is necessary to undertake a plan for the recovery of the river, directed to the attainment of the well-being and to improve the life's quality of the Community. A Commission has been created belonging to its government and private entities, National and Católica Universities of Salta with the collaboration of the Technical University of Madrid.

OBJECTIVE

-The fundamental idea of the plan is to obtain an ordering of the river basin and an integral management of the channel and its surroundings, including the cleaning out. The improvement of the water's quality, the healthiness of the surroundings and the improvement of the environment, must go hand by hand with the development of sport activities, of relaxation, tourism, establishment of breeding grounds, picnic green areas, micro enterprises with clean production, and other actions that contribute to their benefit for society, being a basic factor for their care and sustainable use.

DISCRETE MULTI-CRITERIA METHODS

Initial Matrix

ALTERNATIVES	CRITERIA (ATTRIBUTES)				
	C_1	C_2	C_j	...	C_n
A_1	R_{11}	R_{12}	R_{1j}	...	R_{1n}
A_2	R_{21}	R_{22}	R_{2j}	...	R_{2n}
A_i	R_{i1}	R_{i2}	R_{ij}	...	R_{in}
...	...	...	...	...	...
A_m	R_{m1}	R_{m2}	R_{mj}	...	R_{mn}
WEIGHTS	w_1	w_2	w_j		w_n

METHODS: ELECTRE, PROMETHEE (Grau&Antón), AHP. + continuous methods
Models in steps and Grau Method with probabilities.Bayesian

Criteria may be "More is better", or "more is worse".

ALTERNATIVES

1) Hydric cleaning and prevention of floods plan
2) Installation of water's cleaner
3) Alternative 2 with infrastructure and consolidation of margin works
4) Alternative 3 with arrangement of river basin
5) Integral management of the river

CRITERIA

1) Investment
2) Maintenance cost
3) Economic income
4) Environmental quality
5) Sustainability
6) Social Income
7) Social Acceptability,
8) Legislation,
9) Implementation Time

CONCLUSIONS

- It will be necessary to consider the public intervention.
- In the model the authors have contemplated the short, average and long term actions
- With the data and weights provided by the Commission the Pareto-optimal alternative will be obtained using the Methods developed by authors