The environmental future of a province: Mendoza in the year 2030

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"The future is a process of collective building, and strategic foresight provides a methodology to think and debate the future within the framework of formulation processes and public policies management."

Where do we start?

Human beings have always wanted to know their future. The future refers to something which does not exist. This brings us to unknown territory and it is precisely this lack of knowledge that we define as uncertainty.

Public policies which should be oriented to what we wish for are framed within this context. The strategic foresight approach can provide the conceptual and methodological framework to visualize such a future. The challenge is to move from the future as a theoretical disquisition to action that enables us to achieve what we want: from the exploration work for possible futures, the task of social construction, the formulation of strategies and action lines, and the mobilization of stakeholders around a shared future. Thus, the need arises to incorporate the strategic foresight approach – as an anticipatory tool – to formulation and decision-making processes.

How did we do it?

Here follows a summary of the environmental prospective experience for the Mendoza Province in Argentina. As a whole, the irrigation oasis represent 3 percent of the province's total surface. The principal productive activity, as well as the most valuable agricultural land, is concentrated in this area. The contribution of the oases to the gross provincial product is higher than 80 percent, taking into account that the only other economic activity besides the oases is the extraction of natural resources (oil, gas, mines and quarries), which exceeds 15 percent of the gross geographic product. Three relevant oases are located in: the northern river basin (Mendoza River and lower Tunuyán River); the central river basin (upper Tunuyán River); and the southern river basin (Diamante River, Atuel River and Malargüe River). In these oases, life depends on water and on the quality of the soil (Figure 1).

In view of the environmental vulnerability and fragility of the area, the Universidad Nacional de Cuyo, together with the Instituto Nacional de Tecnología Agropecuaria carried out an exercise over the environmental future of Mendoza for the years 2015 and 2030.

The process started with an awareness phase, the definition of the conceptual framework and the methodological design, and by forming three fields for thinking and debating possible future scenarios:

a. The technical team, formed by six social and natural sciences professionals, was responsible for working on baseline information, facilitating an analysis process, implementing motivation and evaluation workshops and writing the final document.

b. The specialist forum, formed by ten researchers (natural sciences), was created with the objective of investigating and identifying critical factors and to give support to the technical group through periodic progress meetings.

c. The prospective forum was formed by 37 specialists or researchers from the science and technology organizations of the Mendoza Province. Their role was to critically analyse diagnostic information and scenario building. Owing to the diversity of specializations of the participating experts, the challenge posed was to achieve a common language and shared understanding by all.

A system of indicators was developed that summarizes both the current status and the trajectory, in order to understand the complexity of the physical-environmental dimension of sustainable development. The system measured the variable determinants of the environment (economic-productive, socio-cultural and political-institutional) and the three subsystems, namely: the environments of the urban oasis, the irrigated oasis and low-density population oases. The main natural resources (water, soil and air) were measured in each of the subsystems at different levels of analysis (the Mendoza province, Gran Mendoza and in other urban centres, river basins, among others), according to the information available. This information made it possible to explore and identify the main environmental trends that will continue to affect the province.

What did we achieve?

The result of the process was the exploration and construction of two scenarios (one trend-setting scenario and one desired scenario) with two time horizons (2015 and 2030). These scenarios were developed in workshops using a participatory methodology and were led by specialists or researchers who were members of the strategic foresight forum. Thanks to different group dynamics, a convergence of opinions was achieved among the experts. The scenarios discourse contains quantitative data from mathematical projections carried out (when possible) and qualitative data gathered from the open interaction and dialogue among the participants.

The system of environmental indicators served as basis for the province’s Environmental Observatory, which monitors the main critical factors in the scenarios.
Below are some details of these scenarios:

- The trendsetting scenario entails the continuity of the stakeholders or social groups (public, private and civil society) and the trends, which in some critical areas will generate deterioration, especially regarding the quality and availability of water resources and the use of land.

According to this scenario, in 2030 there will be numerous problems of salinization. For example, the salt contamination of the northern aquifer groundwater will increase in some areas, which could lead to the abandonment of irrigation areas and affect 50 percent of the cultivated land. Although more moderate, this trend also applies to the southern oasis.

The availability of irrigation water will decrease as a consequence of water polluted by liquid waste and garbage and the rising demand of domestic water.

Regarding the land use change as a consequence of urban growth, there will be a significant loss of fertile land with water rights. The agricultural border will continue expanding to areas that depend on groundwater, and aquifer over-exploitation will increase.

- The desired scenario provides a feasible description of the environmental future of the province. The feasibility consists of the capacity to modify stakeholders' behaviour and considers the existing potentialities and limitations.

By 2030 the growth rate of groundwater irrigated agricultural areas will have been controlled, and therefore there will be no more aquifer over-exploitation. The efficiency of water resources (conduction-distribution) will achieve 90 percent and efficiency application 70 percent. Presently, these values correspond to 61 percent efficiency conduction-distribution and 67 percent efficiency application.

Salt contamination of groundwater will decrease in the northern aquifer through measures that prevent over-exploitation and remove drillings in bad condition. Soil salinity at middle and high levels will remain at the present levels, especially in cultivated areas in the Mendoza River environment.

State control of liquid and solid waste in urban and peri-urban areas will increase. Hence, this pollution will not reach irrigation ditches, and the availability of irrigation water will increase.

The high impact of territorial planning will help to reduce the loss of fertile soil, with irrigation rights brought about by urban growth. The increase in agricultural areas with groundwater irrigation rights will be controlled so that there will be no over-exploitation of aquifers.

**How do we move forward?**

The action phase is in full implementation given that the study facilitated the development of the guidelines for the province's environmental policy. Consequently, the Ministry of the Environment of the Mendoza government recently incorporated the prospective focus and the scenario construction in the formulation, implementation and dissemination of results of the Plan de Gestión Ambiental 2008-2012\(^3\) (Environmental Plan 2008-2012) and in the Ley Provincial 8051\(^4\) de Ordenamiento Territorial y de Usos del Suelo (Provincial Law 8051 of land management and soil use) (approved in 2009), which clearly states the prospective character of the territorial planning process (Article 1). This is reiterated in the elaboration plan criteria. The scenario construction specifies the construction of alternative scenarios in the elaboration phase of the Plan Provincial de Ordenamiento Territorial.

The strategic foresight approach is also incorporated in the formulation, monitoring and evaluation of the environmental and territorial policies, as well as in Mendoza’s strategic development plan “Plan Estratégico de Desarrollo de Mendoza (PEDMZA 2030),” \(^5\) (Strategic Plan for Development of Mendoza) finished in 2011. This plan was construed by a broad and participatory reflection process that now requires both its implementation through government programmes and projects, as well as coordination with the territorial planning projects.

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This exercise made it possible to consolidate the process of joint learning between the Ministry of the Environment (which has information and trained professionals) and the scientific and academia sectors that have sufficient capacity to incorporate the future dimension in the province’s sustainable development.

**What did we learn?**

According to Rodríguez Cortezo, the objective of the strategic foresight approach is to visualize as closely as possible what the future may be in order to make the best decisions in the present. For the latter, he refers to the opinions expressed by the social stakeholders through systemized thought and collective reflection.

Key to the success of these processes is to guarantee the quality of reflection, which is feasible through the quality and seriousness on which the creation of prospective-strategic information and the methods used to visualize the future are based. To guarantee social ownership by the stakeholders, who are the architects of their own future, the process of collective reflection and the consensus achieved are just as important as the final product.

Project “Futuro ambiental de Mendoza” (Environmental Future of Mendoza) covers the first phases of the transforming reflection process. The anticipation process constituted a space of thought and collective learning through participation and the search for consensus between the specialists or researchers of the province's science and technology organizations.

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*Mendoza vineyard, example of the main agricultural crop in the oasis irrigation environment (INTA, 2012)*