

# Mainstreaming ecosystem services into decisions – a choice experiment on the future use of Parque Nacional Cumbres de Monterrey/Mexico

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## *Introduction*

The city of Monterrey is located in the north-eastern part of Mexico. Monterrey is one of Mexico's most developed cities, with the highest per capita income in the nation. It is regarded as a highly developed city and is very likely to continue growing in the future, despite its extremely mountainous surroundings. Most important and most famous is the Sierra Madre Oriental south of the city where the "Parque Nacional Cumbres de Monterrey" (National Park) is located.

Monterrey has a semi-arid climate and is one of the warmest major cities in Mexico. Water resources are therefore crucial and likely to limit the growth of the city in the future. One of the most important catchment areas for potable water is the Cumbres National Park. Many water sources of the park are already used to supply water to Monterrey. The Cumbres National Park is also the home of many endemic species and the local hot spot for outdoor recreation activities close to the intensively populated metropolitan region.

For the future development of Monterrey water supply is the crucial factor, but a more intensive extraction of the water resources in the national park might influence its biodiversity. A strict focus on water resources by city planning and regional management might also impact the recreational use in the park as well as housing development and tourism infrastructure in the park.

The supply of fresh water in Monterrey currently relies strongly on the reuse of water, which is mixed with fresh water sources. Protecting the remaining water resources in Cumbres National Park could therefore lead to two effects: increasing water bills for city residents to tap new sources far from the city, and/or increasing the reliance of treated sewage water.

The example of Cumbres National Park and the city of Monterrey represents a typical dilemma which many city planners, decision makers and regional managers face. The planning process needs to answer crucial questions such as:

- how to account for the ecosystem services accruing from the park, and
- how to integrate public values and preferences into planning and decision making processes.

In a city like Monterrey with a very versatile social structure it is also relevant to know which segment of the local residents will be affected by management actions such as an increasing water bill or restrictions for housing development in or close to the park.






## *Methodological approach*

Literature on ecosystem services shows an increasing interest in understanding how to bundle ecosystem services and how to integrate trade-offs between different services explicitly (Kareiva et al. 2011). A literature review revealed that valuation techniques are helpful tools to combine both the monetary value, e.g. the water-bill, and other social values (Daily 2011, Heal 2000, Dasgupta 2001, Birol et al. 2010).

In our case study we use a questionnaire to learn how the local population perceived the required trade-offs and to see whether different segments in the local population might be affected

differently by the various options. The survey contained a stated choice survey attributes describing possible future states in terms of biodiversity, housing development, recreational opportunities, water management options and economic parameters. Choice models assume that individuals behave in ways that maximize their utility and their relative satisfaction for a particular alternative (Louviere et al., 2000). The choice experiment provides a suitable basis to model intended behaviour, which can be combined with additional information in the form of co-variables, (i.e., expressing respondent mind-sets and characteristics) in a latent-class analysis. A decision support system (DSS) based on the choice model explains how the various attributes influence each other in decision-making. Figure 1 shows the choice experiment used in the questionnaire. The survey was conducted at many public locations in the city using several I-pads. Overall, 463 respondents from all parts of the city participated in the survey.

**Please evaluate the following possible scenarios 20 years from now, and choose the one you will prefer:**

Exercise 1 out of 3		Alternative A	Alternative B
 Probability of survival of the endangered marron-fronted parrot		20%	40%
 Recreation activities		access forbidden	free access
 New developments in the park		Houses: <b>Double</b> Cabins for tourists: <b>Double</b>	Houses: <b>Double</b> Cabins for tourists: <b>No more</b>
 Water from the Park getting to your home		<b>35%</b> 65% recycled	<b>65%</b> 35% recycled
<b>Your monthly water bill</b>			
 Extra fee for maintaining the benefits in the Park		\$ 200 <b>5% = \$ 10</b>	\$ 200 <b>15% = \$ 30</b>
<b>TOTAL OF YOUR BILL</b>		<b>\$ 210</b>	<b>\$ 230</b>

*Translation from the spanish version implemented during June and July 2013*

*Fig. 1 Example of the choice experiment (translated from Spanish)*

### **Preliminary Results**

First of all the study underlines the high relevance of the park for the citizens of Monterrey. Two aspects turned out significantly:

1. The citizens of Monterrey value the park and its biodiversity, and
2. The extraction of additional water from the park is perceived negatively.

Further segmentation shows that two socio-demographic characteristics influence the decision making process significantly: where respondents live (living conditions as well as the distance to the park), and income. Citizens living far from the park and having a lower level of income would like to see the park strictly protected (about two thirds of the respondents). This includes restrictions for further housing development, tourism cabins as well as restrictions for outdoor recreation activities. However, although this group values the park highly, this group's capability to contribute to its protection via a higher water bill is low.

Citizens living close to the park are using it much more frequently for outdoor recreation purposes. This segment is in favour of tourism and recreation development in the park, but against further housing development. It seems that their rather high willingness to pay for the water is linked to its usability for outdoor recreation and tourism.

Overall the study shows that conservation strategies are highly appreciated by all citizens and that restrictions in housing development are also well accepted. The option to increase the water bill is rather limited for the majority of respondents and seems to be associated more with the immediate use of the park.

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