



**LANDCARE RESEARCH**  
**MANAAKI WHENUA**



**CONABIO**  
COMISION NACIONAL PARA EL  
CONOCIMIENTO Y USO DE LA BIODIVERSIDAD



*Al servicio  
de las personas  
y las naciones*

# **Capacity Building and Training on Economic Analysis for Mexican Invasive Alien Species Professionals**

## *Workshop Proceedings*

**Pike Brown**

Senior Economist & Capability Leader

**Adam Daigneault**

Senior Economist & Research Area Priority Leader

**Florian Eppink**

Economist

*Landcare Research, Gerald Street, PO Box 69040, Lincoln 7640, New Zealand,  
Ph +64 3 321 9999, Fax +64 3 321 9998, [www.landcareresearch.co.nz](http://www.landcareresearch.co.nz)*



## Purpose

In November 2015, the United Nations Development Programme (UNDP) commissioned Landcare Research to lead a workshop on economic analysis for managing invasive alien species (IAS) for Mexican professionals and practitioners through Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO). 21 applicants sought to participate in the workshop, 14 of whom were ultimately selected to participate by CONABIO staff. These participants represented universities, government agencies, and non-governmental organisations and had backgrounds ranging from marine ecology to economics (Appendix 1). Five CONABIO staff members also participated in the workshop.

## Summary of the Sessions

On 23 November 2015, CONABIO led a workshop entitled “Enhancing National Capacities to Manage Invasive Alien Species (IAS) by Implementing the National Strategy on IAS”. This provided superb context for participants of our workshop entitled “Capacity Building and Training on Economic Analysis for Mexican Invasive Alien Species Professionals”, which was held on 24-27 November 2015. Both workshops were held at CONABIO headquarters in Mexico City.

Our workshop consisted of 12 learning sessions, three detailed exercises, and one fieldtrip. It was book-ended by two highly detailed examples of using cost-benefit analysis (CBA) for managing IAS. Finally, participants gave presentations regarding case studies that they are undertaking between the first workshop (November 2015) and the second workshop (November 2016).



## Workshop Day 1

The purposes of the first day of the workshop were to provide additional context for economic analysis of IAS; to provide a complete case study of CBA; and to provide a detailed, step-by-step guide to conducting CBA for IAS management.

“Overview of IAS in New Zealand” provided a working definition of IAS; described their impacts on biodiversity, economic systems, and health; and provided concrete examples of the impacts of IAS on New Zealand with reference to each of these three areas. For example, IAS is estimated to cost New Zealand the equivalent of 2.3% of gross domestic product on an annual basis. We then reviewed three approaches that may be adopted with regard to managing IAS, namely, prevention, eradication, and control describing the New Zealand experience and the roles of CBA in determining the preferred approach.



“Introduction to Economic Analysis of Invasive Alien Species” reviewed the roles of economics in managing IAS, including setting priorities for management, ruling out projects when the costs exceed the benefits, and avoiding ad-hoc solutions. It then presented two different approaches to economic analysis, namely CBA and cost-effectiveness analysis (CEA). Next, the presentation listed typical costs and benefits that are included in CBA and CEA and engaged participants by asking

them to qualitatively list benefits and costs associated with managing armoured catfish (an IAS of particular concern and the subject of one participant’s case study) in Mexico. Finally, we reviewed the differences between economic and financial analyses.

In “Economic Analysis of IAS: Small Indian Mongoose”, we presented a complete example of a case study that was undertaken using the tools that are presented throughout the workshop. While participants had not yet been exposed to many of the methodologies covered in the presentation, it served the purposes of both establishing an example of the tools that participants would learn during the workshop and measuring understanding: At the end of this session, participants were asked to indicate their understanding of CBA and CEA by forming a “human histogram”; the median participant reported understanding approximately 45% of the material, and none reported full understanding.

“Steps in Conducting a CBA” presented the seven procedures generally included in conducting CBA using a folklorical example of invasive jumbies. This approach was taken to abstract away from ecological debates over real IAS to better emphasize the approach. Through this example, participants determined the objectives of CBA; to identified costs and benefits; valued costs and benefits; aggregated costs and benefits; and prepared recommendations. Two additional steps – performing sensitivity analysis and considering distributional impacts – were the subjects of later refinements.



“Population Growth” added depth and utility to the jumbie example by introducing biological factors such as current population, intrinsic growth rate, and carrying capacity. Workshop participants saw that rigorously accounting for population growth may ultimately change recommendations for specific IAS management options.



Both “Steps in Conducting a CBA” and “Population Growth” incorporated working with an Excel-based toolkit developed by Landcare Research for the purpose of conducting CBA and CEA to set priorities for IAS management.

## Workshop Day 2

The second day of the workshop focused on incorporating the remaining two steps of conducting a CBA while building practical skills in using the Excel-based toolkit for both CBA and CEA. It also included a team-building field trip.

In “Refining CBA – Discounting”, we introduced the fundamental concepts of present value and net present value (NPV). Workshop participants then saw used the Excel-based tool to learn that discounting future costs and benefits may change preferences over management IAS using the jumbee example.

“Refining CBA: Sensitivity Analysis and Distributional Impacts” introduced the final elements of CBA. Specifically, participants learned to evaluate the robustness of recommendations by analysing sensitivity to differing assumptions regarding costs and benefits, to differing time horizons, and to differing discount rates. This session also introduced the political economy of policy recommendations by considering distributional impacts. Again, participants worked with the jumbee example in the Excel-based toolkit to understand the robustness of results that they had previously obtained.



Workshop participants then completed an exercise of evaluating options for managing IAS: leaving the hypothetical case of jumbees behind, this real-life example concerned an incursion of rats on an off-shore island. Workshop participants worked in small groups in order to facilitate knowledge transfer via new research communities

In “Cost-Effectiveness Analysis”, we introduced workshop participants to CEA, a common alternative to CBA. CEA identifies the lowest cost for achieving a stated objective and is the preferred method of prioritising management interventions when the benefits are difficult to measure and/or to quantify.

After working through an example pertaining to forest conservation, participants identified the pros and cons of CEA vis-à-vis CBA.



A second exercise based on a real IAS was then undertaken in small groups. Specifically, workshop participants were asked to assess management options of the Merremia (a flowering plant in the morning glory family) in the Pacific using both CBA and CEA.

In the late afternoon, all workshop participants (including the CONABIO staff and the instructors) visited Xochimilco, a borough of the Mexican Federal District that is well known for its canals and chinampas (artificial islands). This ecosystem is a vestige of the Federal District's pre-Hispanic past and is an important area for agricultural production, fresh water, and biodiversity. This area has seen considerable environmental degradation in recent years, including the invasion of numerous exotic species. Workshop participants discussed the identification and management of IAS with local people while touring the canals.



### Workshop Day 3

On the third day, the focus of the workshop shifted from using the toolkit to conduct CBA and CEA when data are fully available to considering where and how data may be obtained. Specifically, the sessions on day 3 emphasized experimental design, secondary data sources and value transfer, primary data collection, and non-market valuation of costs and benefits. A third group exercise was also held.

In “Experimental Design”, workshop participants were reminded of the importance of causation relative to correlation and then introduced to the history of Dr. John Snow, the father of modern epidemiology and the person to whom the concept of a quasi-natural experiment is attributed. Quasi-natural experiments for IAS (e.g., natural barriers) were then discussed in order to conceptualise ideal conditions for measuring the costs and benefits of management.



“Secondary Data Sources” then introduced potential data sources for the common case in which quasi-natural experiments are not available. It focused on value transfer and highlighted three key sources of error stemming from the use of secondary data, namely measurement error, bias, and transfer error. This session then reviewed key sources of secondary data, after which workshop participants identified other useful sources.

In “Primary Data from Surveys”, we discussed best practice in conducting socioeconomic surveys on the positive and negative impacts of IAS. The session then presented an overview of questionnaire construction for surveys targeted toward communities and for those targeted toward individuals. We then reviewed pre-survey preparation such as sampling and non-response bias and post-survey processing such as consistency checks. Finally, resources for survey design were shared with workshop participants.

In “Non-Market Valuation”, workshop participants learned common approaches to valuing benefits that are not commonly monetised, i.e., reported in dollars, pesos, or any other currency. Specifically, this session reviewed cost-based approaches, production-function approaches, market and surrogate-market approaches, contingent valuation, and choice experiments. It also reviewed the specificity and relative cost of each approach.



Day 3 concluded with a further group exercise that used the Excel-based toolkit to prioritise options for IAS management. This case study focused on velvet tree, a plant that originated in Mexico and

Central America and that is considered to be the worst invasive plant in Hawaii (where it is commonly referred to as the “purple plague”). Again, workshop participants worked in small groups to complete this exercise.



## Workshop Day 4

The sessions on the final day included a primer on ecosystem services and a comprehensive case study. Thereafter, workshop participants presented their own case studies.

In “Introduction to Ecosystem Services”, workshop participants learned about the four pillars of ecosystem services, namely provisioning services, regulating services, cultural services, and supporting services. It then reviewed the six steps involved in assessing ecosystem services established by The Economics of Ecosystems and Biodiversity research group (TEEB) and provided three concrete examples of how accounting for ecosystem services have impacted CBAs of natural resource management undertaken in Chile, Indonesia, and Thailand.

In “Economic Analysis of IAS: African Tulip Tree”, we presented a second example of managing IAS that was undertaken using the tools that are presented throughout the workshop. This session served to reinforce all of the workshop material by drawing it together into a single case study. Once again, participants were asked to indicate their understanding of CBA and CEA by forming a “human histogram”; this time, the median participant reported understanding 90% of the material and reported a high degree of confidence in the ability to conduct CBA and CEA for managing IAS.



Finally, workshop participants presented preliminary materials for undertaking CBAs of their own. Specifically, each participant presented his or her case study and then received comments and suggestions from other participants, CONABIO staff, and the workshop leaders. Thereafter, workshop participants who committed to undertaking full case studies before November 2016 were provided with a detailed work plan (see Appendix 3).

## Evaluation

On the final day of the workshop, each participant completed an evaluation form. The average evaluation was high, indicating a very high level of satisfaction in the workshop. The completed evaluations are included in Appendix 2.

## Future Directions

The second workshop has been scheduled for 3-4 November 2016. Up to seven full projects will be delivered by workshop participants during this workshop, and feedback on strengthening the CBA/CEAs for both policy and academic audiences will be provided.

