Introduction to economic analysis of invasive species

Economics and IAS

- Managing IAS has traditionally been seen as the responsibility of biologists
- But the problem of invasive species is fundamentally economic
  - Most invasions can be linked to the intended or unintended consequences of economic activities
  - A major reason that IAS are considered a problem by human beings is because they ultimately impact economic systems and undermine human wellbeing

Economics and IAS

- Economics deals with more than just understanding the costs of IAS
  - Analyses causes
  - Links human behaviour and natural processes
  - Helps to identify solutions

- Economics represents *an approach* to analysing invasive species management

Economics and IAS

- Despite growing recognition by the scientific community of the need for economics, the application of economic approaches and tools to invasives remains a recent innovation

- Most literature deals with the economic costs of biological invasions, with case studies carried out in North America and Europe

Economics and IAS

- It is now widely acknowledged that economic analysis and the use of economic instruments are key to dealing with the problems associated with biological invasions
- Yet, there remains little guidance as to how economic approaches and tools should be applied in practice
- This course presents some practical methods and tools for economic analysis

Roles of Economic Analysis

- To determine proper resource allocation with a constrained budget → to set priorities

- To rule out projects in which the costs exceed the benefits → to avoid intervening when it's not worth it

Roles of Economic Analysis

- To avoid investing in a solution before identifying the problem and all possible remedies → to avoid ad-hoc solutions
- To identify priorities across multiple projects → to spend stakeholder money wisely
- NOTE: Decisions are typically not made solely on the basis of economic analyses, but they can be a useful tool to aid the decision-making process

Benefits of Economic Analysis in Decision-making

- Objectivity
  - Takes a community-wide or multi-stakeholder perspective
- Inclusiveness
  - Allows the consideration of a range of policy options and stakeholders

Benefits of Economic Analysis in Decision-making

- Emphasises efficiency
  - Determines which policy maximises net benefits to the affected area/parties
- Transparency and accountability
  - Allows benefits and costs to be compared over time
  - Can account for risk and uncertainty of options and estimates

Common Approaches

- Cost-benefit analysis (CBA)
  - Shows which options should be considered
  - Determines which option maximizes
    - total benefit
    - benefit per dollar of cost
- Cost-effectiveness analysis (CEA)
  - Identifies which option yields the “cheapest” way of achieving an objective/outcome
  - Often used when data on key benefits of a project are difficult to measure

Typical benefits

- Avoided costs - the value of inputs or lost outputs which would have been incurred in the absence of an intervention
  - Avoided infrastructure damage
- Productivity savings - reductions in existing levels of input expenditure which can be shown to result from the project
  - Higher agricultural productivity

Typical benefits

- Positive health and social impacts resulting from the project
  - Increased leisure time
  - Preserved traditional ecological knowledge
- Positive environmental impacts resulting from the project
  - Natural food harvesting
  - Protected biodiversity

Typical costs

- Research, design, and development costs
- Capital expenditures
  - Machinery
  - Control agents
- Labour costs
- Operating and maintenance costs for the entire expected economic life of the project

Typical costs

- **Negative externalities**
  - health outcomes/impacts on third parties
  - environmental impacts on third parties

- Lost benefits associated with controlling/removing the IAS
  - Consumption for food
  - Building materials

Cost and Benefit Examples

- Example 1: Society must decide whether to open-up an old-growth forest for logging.
  - Benefits: Products and employment generated by logging.
  - Costs: Harvest and labour, the loss of wildlife habitat, damages to streams due to runoff, and the lost opportunity to cut the forest sometime in the future.

Cost and Benefit Examples

- Example 2: A government agency must decide whether to impose regulations to conserve a biologically important wetland.
  - Benefits: The wetland provides habitat for a variety of birds and animals. Attracts hunters and bird-watchers. Helps to maintain water quality and reduces flooding.
  - Costs: Opportunity cost of using land under alternative uses (e.g., agriculture or a commercial). Landowners direct costs to protect wetlands on their property. Public funds used to conserve area.

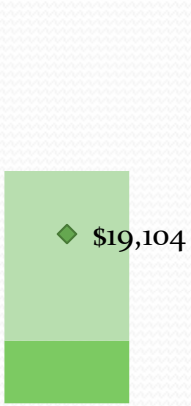
Which of these costs & benefits are easily quantifiable

- Example 1: Society must decide whether to open-up an old-growth forest for logging.
  - Benefits: Products and employment generated by logging.
  - Costs: Harvest and labour, the loss of wildlife habitat, damages to streams due to runoff, and the lost opportunity to cut the forest sometime in the future.

Which of these costs & benefits are easily quantifiable

- Example 2: A government agency must decide whether to impose regulations to conserve a biologically important wetland.
  - Benefits: The wetland provides habitat for a variety of birds and animals. Attracts hunters and bird-watchers. Helps to maintain water quality and reduces flooding.
  - Costs: Opportunity cost of using land under alternative uses (e.g., agriculture or a commercial). Landowners direct costs to protect wetlands on their property. Public funds used to conserve area.

Economic feasibility vs. Financial feasibility



Economic feasibility	**Financial feasibility**
Net values	Profits
Benefits and costs	Revenues and $ costs
Social impacts	Monetary impacts
Environmental impacts	
Distributional impacts	
… etc.	
All community groups	Groups that pay or earn money

Where to draw the line with an economic analysis…

- The **cost** of doing the analysis should be **small relative to the cost of the project itself**
- Some costs and benefits are not worth capturing because they are either **too small** (relative to cost) or **difficult to measure** even by the experts

  → Detailed epidemiological study for a project to reduce agricultural pests impacts on human health

Where to draw the line with an economic analysis…

- Some important aspects of the analysis may be **expensive to measure**, and thus one may:
  - **Combine data** collection with other initiatives

    → Scoping study on physical impacts of IAS
  - Focus on **physical units** rather than monetizing everything

    → Counting species in surrounding forest without valuing these species
  - **Borrow values** from elsewhere (cautiously)

    → Recreation study from similar watershed

Class Exercise

1. Qualitatively list the cost and benefits of attending this workshop and conducting your case study over the next several months
2. List which of these costs and benefits could be quantified
3. Where would you find these data?