No. 70030

#### Tue, 10:40-12:10

Ishikawadai Building No.4, Room B04/05

# Project Evaluation for Sustainable Infrastructure

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# Outline

This course aims to provide the methods necessary to undertake project evaluation and cost benefit analysis for sustainable infrastructure. The methods comprise of microeconomics background, cost benefit analysis, valuing market and non-market goods, and other technical issues. Case studies of various infrastructures are also provided.

## Schedule

1. Introduction to Project Evaluation 10 April 2. Basics of Microeconomic Theory 17 April 3. Foundations of Cost Benefit Analysis 24 April 4. Valuing Benefits and Costs in Primary Markets 01 May 5. Discounting Benefit and Cost, Existence Value **08 May** 6. Midterm Examination 15 May 7. Valuing Market Goods 22 May 8. Valuing Non-Market Goods: Revealed Preference 29 May 9. No Class 5 June 10. Valuing Non-Market Goods: Stated Preference 12 June 11. Cost Effective Analysis 19 June 26 June 12. Presentation (1) 13. Presentation (2) 3 July 10 July 14. Presentation (3) 15. Presentation (4) 24 July 16. Final Examination 31 July

# Grade

Presentation	15%
<b>F</b> resentation	137

Report 15%

### Midterm Exam 35%

Final Exam35%

## **Presentation & Report**

- 1. Select one method of Valuing Market or Non-Market Goods from Chapter 9, 12, 13 and 14.
- 2. Find one paper from "international" scientific journals from any research fields to use your selected method.
- 3. Explain the paper by powerpoint.

English presentation (7 mins) and discussion (3 to 5 mins) for each.

### **Report Submission**

Deadline: Summarize 3 to 4 pages report and submit me by email as **PDF file**. (hanaoka@ide.titech.ac.jp):

### **Textbook and References**

Boardman, A. E., Greenberg, D. H., Vining, A. R. and Weimer, D. L. (2006)

<u>Cost Benefit Analysis: Concepts and Practice (3rd Edition), Prentice Hall</u> <u>College.</u>

**UNESCAP** (2007)

Sustainable Infrastructure in Asia -Overview and Proceedings-.

Victoria Transport Policy Institute:

<u>Transportation Cost and Benefit Analysis: Techniques, Estimates and</u> <u>Implications, Online TDM Encyclopedia, http://www.vtpi.org/tca/.</u>

Varian, H.R. (2003)

Intermediate Microeconomics: A Modern Approach 6<sup>th</sup> Edition, W.W.Norton & Company.

United Nations (2003)

Cost Benefit Analysis of Transport Infrastructure Projects.

## Sustainable Infrastructure

- Infrastructure's value is its services, and its ability to work with.
- Infrastructure development plays an important role in determining environmental sustainability since it locks in *consumption patterns*, e.g.,
  - Developing highways in preference to mass transit systems imply heavy future fossil fuel demand for personnel modes of transport and continued growth in greenhouse gas emissions.
- Need for greater integration of different *development* stages and to view infrastructure as a system to facilitate the delivery of services rather than an endproduct or each component or stage.

#### **Concept of Sustainable Infrastructure Development**



**Sustainable Infrastructure Development** 

consumption

Eco-efficiency is possible? *Eco*nomic Growth with *Eco*logically Efficient

### **Aims of Project Evaluation**

To evaluate the <u>feasibility</u> of infrastructure development/investment project under <u>limited budget</u>.

- to be viable or rejected
- to compare alternatives, priority
- to capture the significant impact
- to support decision-making
- to report the result in a consistent (scientific) form [Accountability for the public]

#### **Overall Scheme in Transport Infrastructure Project Evaluation**



## What is Cost Benefit Analysis?

#### **Cost Benefit Analysis**

Economic or Social Viewpoint

(Quantifying in monetary terms [Monetizing])
Benefit, Cost, Utility, Efficiency...
NSB (Net Social Benefit) = B (Social Benefit) - C (Social Cost)

After opening a new expressway/ new subway/ new airport, you can go to your destination faster. How do you feel?

### Financial (Individual) Analysis

- Private Viewpoint *Revenue & Expenditure* 

### Effect and its Indicator of Transport Projects

Effect	Indicator
User Benefit (Efficiency)	Time saving, Cost saving
Other transport system	Network, Pricing, Intermodality
Safety	Accident
Environmental impact	Local, Global
Wider economic impact	Employment, Production
Other policy impacts beyond	Relevant policies, Consistency, Conflic
the transport system	
Financial viability	Cash flow, Profit and Loss

### **Financial Analysis**

Financial analysis is required on toll road project.

CBA values on a resource cost basis

Financial values on a commercial basis at market prices

#### Financial analysis

to ensure that project are consistent with the fiscal and financial capabilities of the implementing agency.

to ensure that the financial revenues and costs for the implementing agency are based on estimates of demand and prices/ tolls in the cost benefit analysis.

### **Chapter 1 Introduction to Cost-Benefit Analysis**

### Major Steps in CBA "Highway Example"

1. Specify the set of alternative projects

Road Surface, Routing, Size (Lane), Tolls, Wild Animal Friendliness, Timing

2. Decide whose benefits and costs count

Global, National, Provincial, Local...

3. Catalogue the impacts and select measurement indicators

Time saving, Operation cost saving, Horizon Value, Safety Benefit, Toll Revenue, New Users, Alternative Road Benefits, Construction cost, Maintenance cost, etc.

4. Predicts the impacts quantitatively over the life of the projects

Number of vehicle-trips, Vehicle operation cost, number of accidents avoided, number of lives saved, etc.

#### 5. Monetize all impacts

Based on the concept of WTP

- Observed Behavior: Direct Estimation & Indirect Market Method (HPM, TCM)
- Contingent Valuation Method (Stated Preference)
- 6. Discount benefits and costs to obtain present values
- 7. Compute the net present value of each alternative Discount rate, NPV, IRR, CBR

8.Perform sensitivity analysis

9. Make a recommendation