Project Appraisal and Selection

Dr. DNS Dhakal
Duke University

Leadership for Results
Program for Mid-Level Officers in the Nepalese Civil Service
Kathmandu, Nepal
21 September — 2 October 2015

Project Appraisal Objectives

• To direct resources to the best possible uses
• To justify decisions in a transparent manner
• To think about alternatives that might be more efficient
• Serves as a management tool for decision making and monitoring
• Allows the government to forecast better multiyear budgets

Objectives (cont.)

• To formulate projects for Central and Subnational levels, Donors and Bank funding
• To develop models for negotiation with contractors, service providers, different agencies in government
• For assessing cost recovery, subsidy level and for regulation in some cases

Objectives (Contd.)

• To examine projects/programs from the point of view of various stakeholders (owner, sponsoring department, banks and other funding agencies, affected parties, and the entire economy)
• To assess the likely sources and magnitude of risks and redesign the project/program to reduce risks and satisfy the requirements of various stakeholders
Projects and Programs

- **Project** – Related set of investments plus their operation to produce specific set of services or products
  - Factory to produce textiles
  - Airport plus feeder transport for air transportation services
  - Dam plus irrigation canals plus hydro plant

- **Program** – Related set of activities requiring series or set of projects
  - Education program – schools, teacher training facilities
  - Rural development – rural roads, small irrigation, village industries, rural electrification

- Programs contain projects which contain capital and current expenditures (operations and maintenance)

Scope of Project/Program Appraisal

In a nutshell, project appraisal and program evaluation is **not only about accepting or rejecting a project/program; it is more of a management tool for decision making in a transparent manner, monitoring and successful implementation of projects and programs thereby to maximize the benefits of public sector investments**

**KEY ISSUE:**
How can Nepal ensure that government revenues will generate the maximum social and economic benefits to the Nepali people.

Integrated Appraisal/Evaluation

The three main components are:
- Financial Analysis
- Economic Analysis
- Distributive (Stakeholder) With Risk Analysis

Financial Analysis

- Financial analysis to see if a particular project or program is financially viable and, if not, what is the burden on the budget - both initial and recurrent
- Examine alternative sources and costs of financing
- Assess the value of a project (firm) that could serve as the base value for privatization of a public sector company
Economic Analysis

- Economic analysis to answer the question: does the proposal make sense from the point of view the economy (society)? For public sector projects/programs this could be the basis for “yes-no” decision
- Assess the costs and benefits of externalities (pollution, deforestation, health etc.)
- Economic prices indicate the right level of user fees

Stakeholder and Risk Analysis

- Stakeholder or distributive analysis asks the question “who gains and who loses” and is relevant for the politics or the sustainability
- Special attention may be paid to projects/programs if they meet some basic needs
- Risk analysis allows assessment of risk and its management through redesigning, changing ownership or participation and contracting

3 Stage Approach for Analysis

1. Financial Appraisal
   Core building block for financing project Usually focus is on suppliers of equity capital (owners) and debt capital (bankers, etc), but includes government tax or budget financing for pure public project

2. Economic Appraisal
   Ultimate basis for public decision making – aggregate benefits to economy

3. Risk and Distributive Appraisal
   Critical to project design:
   - Identify winners and losers
   - Incentives of participants to undertake and sustain project distribution of benefits and risks
Objectives of Project Appraisal (1)

- Choose projects that increase national wealth: NPV > 0. Investment needs to generate a surplus to support growth
- Stop bad project and programs ("white elephants") with NPV < 0
  - Costs of stopping/correcting are high
  - Overpriced incomplete, not operational (corruption? Incompetence?)
  - Non-self-financing public projects (budget financed projects) do not have a direct test of actual financial success. Costs covered by taxes, not sales revenues. Failure often non-transparent.

Objectives of Project Appraisal (2)

- Develop potentially good projects and programs precisely and concisely (feasibility study). Capital budgeting is more than yes/no?
  - Design alternatives, including build/lease/buy, scale, timing, technology, financing mechanisms, risk sharing contracts, etc
- Prevent good projects from being rejected or destroyed either initially or during implementation
- Examine projects from various Stakeholders point of view (owner, sponsoring department, banks and other funding agencies, affected parties, the entire economy)

Objectives of Project Appraisal (3)

- Identify winners and losers; supporters and opposition (eg, pro-poor programs and policies; multiple funders (banks, CG/LG, donors)
- Assess likely sources and magnitude of risks and redesign to reduce risks and satisfy requirements of various stakeholders
- Develop models for negotiation with contractors, private partners, service providers, government agencies in a transparent and accountable way
**Objectives of Project Appraisal (4)**

- Assess cost recovery, subsidy level and for regulating prices
- Enable better forecasting of multiyear budgets by identifying operating and maintenance (O&M) requirements and help avoid taking up projects without adequate provision for O&M; hence essential for effective MTEF

---

**Simple vs. Complex Projects**

Investment projects can be simple or complex

- **Simple Investment**: single capital purchase; single benefit stream – similar to simple financial asset such as a term deposit
  - Purchase farmland to rent to tenant farmers
  - Purchase motor vehicle to operate as a taxi

- **Complex Investment**: Complex investment and operating phases over many years with multiple revenue and expenditure items; requires detailed investment & operating plan
  - Agricultural processing plant, mine, manufacturing facility, public utility, waste disposal facility
  - Public sector projects and programs (health, education) generally complex

---

**Simple investment in farmland**

\[ B_t - C_t \]

<table>
<thead>
<tr>
<th>Years</th>
<th>( B_t - C_t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount rate or opportunity cost of funds = 10%</td>
<td></td>
</tr>
<tr>
<td>Annual rental receipts from land = 100</td>
<td></td>
</tr>
<tr>
<td>Present value (PV) of expected gross benefits = 100/10% = 1,000</td>
<td></td>
</tr>
<tr>
<td>Cost of land = 850</td>
<td></td>
</tr>
<tr>
<td>Net present value (NPV) or PV of expected net benefits = 150</td>
<td></td>
</tr>
</tbody>
</table>

---

**Complex Investment**

<table>
<thead>
<tr>
<th>Year of Project Life</th>
<th>Benefits Less Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Initial Investment Period</td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td></td>
</tr>
<tr>
<td>Stage</td>
<td></td>
</tr>
</tbody>
</table>

---
Components of Project Cash Flows

A. Investment Plan
Reconciles technical construction plans with the financing plan and manpower availability

B. Operating Plan
Reconciles demand (market) module with costs for operation of project

C. Treatment of prices levels over project time horizon
– Cash flows capture complex pattern of all revenues and costs over life of project; discounting future flows allows consolidation into a point of time for decision making
– Changes in real prices, inflation and exchange rate are relevant

D. Cash flow vs. profit and loss account

Key Variable in Cash Flow Statement

Opportunity Cost
– All resources used in a project should be charged as the project cost since public or private investor is forgoing value that could be earned in alternative uses (concept of “opportunity cost”)
– Not all “cash flows” are actual flows of cash through an account. If existing resources are used, opportunity cost (forgone “cash flows”) should be charged to the investment for using these resources
  • Existing land, building and machinery
  • Time of owner-manager of business

Generic Cash Flow Model

• Receipt:
  – Sales
  – Change in Account Receivable
  – Subsidy
  – Liquidation Value

• Expenditures:
  – Capital
  – Recurrent
  – Change in Account Payable
  – Change in Cash Balance
  – Corporate Taxes

• Net Cash Flow

Example: Cash Flow for Water Project

Water Connection Project, Financial Analysis

<table>
<thead>
<tr>
<th>Year</th>
<th>PV 10% DR</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>565.0</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Liquidation Value</td>
<td>161.0</td>
<td>0</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
</tr>
<tr>
<td>Subsidy</td>
<td>500.0</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Total Revenues</td>
<td>1,226.0</td>
<td>1,226.0</td>
<td>1,226.0</td>
<td>1,226.0</td>
<td>1,226.0</td>
<td>1,226.0</td>
<td>1,226.0</td>
</tr>
<tr>
<td>Recurrent/unit</td>
<td>0</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recurrent</td>
<td>282.5</td>
<td>0</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
</tr>
<tr>
<td>Capital</td>
<td>1,000.0</td>
<td>1,000.0</td>
<td>1,000.0</td>
<td>1,000.0</td>
<td>1,000.0</td>
<td>1,000.0</td>
<td>1,000.0</td>
</tr>
<tr>
<td>Import Tariff</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total Expenditure</td>
<td>1,282.5</td>
<td>1,282.5</td>
<td>1,282.5</td>
<td>1,282.5</td>
<td>1,282.5</td>
<td>1,282.5</td>
<td>1,282.5</td>
</tr>
<tr>
<td>Net Cash Flow</td>
<td>(56.50)</td>
<td>(56.50)</td>
<td>(56.50)</td>
<td>(56.50)</td>
<td>(56.50)</td>
<td>(56.50)</td>
<td>(56.50)</td>
</tr>
<tr>
<td>NPV @ 10%</td>
<td>50</td>
<td>Owners</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPV @ 12%</td>
<td>(50)</td>
<td>Owners</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Analyses of Investment Decisions from Different Viewpoints

Note: Exchange premium=10%; Receipts & Equipment 100% tradeable; Tradeable Operating cost =100

<table>
<thead>
<tr>
<th>Year</th>
<th>Banker’s (Total Investment) (A)</th>
<th>Owner (B)</th>
<th>Country (C)</th>
<th>Govt. Budget (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>400</td>
<td>-140</td>
<td>950</td>
<td>950</td>
</tr>
<tr>
<td>1</td>
<td>400</td>
<td>-140</td>
<td>950</td>
<td>950</td>
</tr>
<tr>
<td>2</td>
<td>440</td>
<td>-150</td>
<td>1100</td>
<td>1045</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>-50</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analyses of Investment Decisions from Different Viewpoints

Using Discount Rate and Net Present Value (NPV)

- **Discount Rate:** Recognizes time value of money
  - Funds when invested yield a return
  - Future consumption worth less than present consumption
- **Net Present Value:** Value addition over and above the Opportunity Cost
  \[ NPV = (B_0-C_0)/(1+r) + (B_1-C_1)/(1+r)^1 + \ldots + (B_n-C_n)/(1+r)^n \]

Use NPV Criteria for Project Selection
Other Criteria for Project Evaluation

1. Net Present Value (NPV)
2. Internal Rate of Return (IRR)
3. Benefit Cost Ratio (B/C Ratio)*
4. Payback Period*
5. Annual Debt Service Coverage Ratio (ADSCR)
6. Debt Service Capacity Ratio (DSCR) or Loan Life Ratio (LLR)
7. Cost Effectiveness Analysis

Project-Program Life Cycle

A. Idea and Project Definition
B. Pre-Feasibility Study
C. Feasibility Study
D. Detailed Design
E. Project Implementation
F. Project Post Evaluation, Audit, Impact Evaluation

Why should a project evaluation be done in stages?

A. Idea and Project Definition

Key questions

a. Where is the demand? What factors are typically important to justifying new investments in a sector?
b. Is this project consistent with the country’s strategy?
c. Why not involve the private sector?
d. What depth of analysis is required or justified to take an investment decision?

From Idea to Feasibility Study

1. Identify or forecast demand for project/program output
2. A pre-feasibility study uses known information to see whether it makes sense to proceed to a detailed feasibility study
3. Feasibility and final detailed “blue prints” and design contain:
   – Market or demand analysis
   – Technical or engineering analysis
   – Organization, ownership, human resources and capital financing
   – Financial analysis including all internalized risks and environmental costs
   – Economic analysis including all external benefits and costs including costs of risk and external environmental benefits or costs
4. Stakeholder analysis - who wins and who loses
From Idea to Feasibility Study (2)

Key questions:

a. Does project satisfy some existing or expected excess demand?

b. Is project financially and economically feasible?

c. Can winners compensate the losers? Is target population capturing benefits?

d. What are the sources of risk, and how to reduce risk?

Financial Analysis

• Construct cash flow profile of project/program using market prices: both revenue stream and expenditure stream (cost of investment and operating/maintenance costs); this yields net cash flow

• Ascertain sources and costs of financing: cost of funds serves as discount rate for making sense of the net cash flow

• Using discounting, calculate the net present value (NPV): present value of revenues minus present values of costs

• Use NPV as project selection criterion and for choosing from a menu of projects/programs

Financial Analysis (2)

• Annual net cash flow indicates burden on budget

• Financial analysis from alternative points of view: What are minimum cash flow requirements for each of stakeholders; What can be adjusted to satisfy all of them?

Self-Financing vs Non-Self-Financial Project

• Financial cash flows are starting point for capital budgeting, but are not enough.

• Focus on analyzing economic costs and benefits (cost-benefit analysis) or financial costs & revenues plus economic externalities

• Need to recognize that there are two types of projects:
  – Self-financing or commercial projects
  – Non-self-financing or budget supported project
Two Types of Projects

- **Self-financing or commercial projects**: where user charges or revenues from services covers financial costs (e.g., regulated electricity, water utility, PPP arrangement for toll road or ports).
  
  **Key issue**: financial viability of project.

- **Non-self-financing or budget supported project**: no direct financial benefits, and only benefit is social benefit e.g., health and education when government charges token or no fees; increased productivity, savings from controlling diseases (SARS, HIV-AIDs), cost savings of replacing self-supply (water, energy), time and operating cost savings from an improved road or, more generally, people’s willingness to pay for public service.
  
  **Key issue**: financial analysis to ensure costs can be absorbed by future budgets, otherwise no external benefits.

Financial vs Economic Appraisal

- Economic (shadow) prices estimated from financial prices and market distortions (taxes, subsidies, controlled prices, foreign exchange premium)

- Evaluation of externalities including environmental impacts

Economic Analyses

- Examines project using whole country as accounting entity based on new services produced and resources consumed. Transfers between persons net out.

- Evaluation of externalities (subsidies, taxes, consumer and producer surplus, environmental impacts, etc.

- What is the expected value of economic net benefits?

Stakeholder /Distributive Analysis

- Income, cost, and fiscal impacts on various stakeholders (Distributive Appraisal) -- disaggregation of overall economic costs and benefits

- Basis of political analysis and possible compensation of losers

- Basic Needs: Impact of project on achieving basic needs objectives
Risk Analysis

• Identify risk variables and monitor them throughout project’s life
• Risk variables are modeled using probability distributions rather than deterministic values
• Using Monte Carlo simulation, find probability of making losses, the range of maximum profits and losses, and the probability of ending up with negative cash flows during project’s life and the effects of risk sharing or allocation mechanisms on distribution of the value of the project.
• Re-design project to allocate or spread risks to reduce the costs of risk if necessary and decide if project should be accepted

Net Present Value (NPV):
Key Criteria for Project Selection

<table>
<thead>
<tr>
<th>Economic Perspective</th>
<th>Financial Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV(-)</td>
<td>NPV(-)</td>
</tr>
<tr>
<td>REJECT or REDESIGN</td>
<td>REJECT or REGULATE or TAX to reduce net economic cost (typically, negative pollution externality or subsided or protected private sector project)</td>
</tr>
<tr>
<td>ACCEPT a GOVERNMENT or DONOR FINANCE AVAILABLE AND BUDGETED (typical public infrastructure or social project)</td>
<td>ACCEPT as PRIVATE SECTOR or COMMERCIALIZE or PRIVATIZE or PRIVATE PARTNER (such as BOOT)</td>
</tr>
</tbody>
</table>

Revenue financed projects
Self financed projects

While NPV (net present value) from Economic Perspective gives aggregate estimate of net benefits to all stakeholders, often also key to disaggregate economic perspective from Distributive Perspective to identify major winners and losers amongst stakeholders

Summary Thoughts

• Project planning and investment appraisal are critical to STOP BAD PROJECTS QUICKLY, while ensuring good stream of projects
• All projects should be evaluated from financial, economic and distribution perspective, while accounting for risk.
• Linking projects to the capital and recurrent budgets are critical for realization of benefits.
• Focus on entire public investment management (PIM) cycle