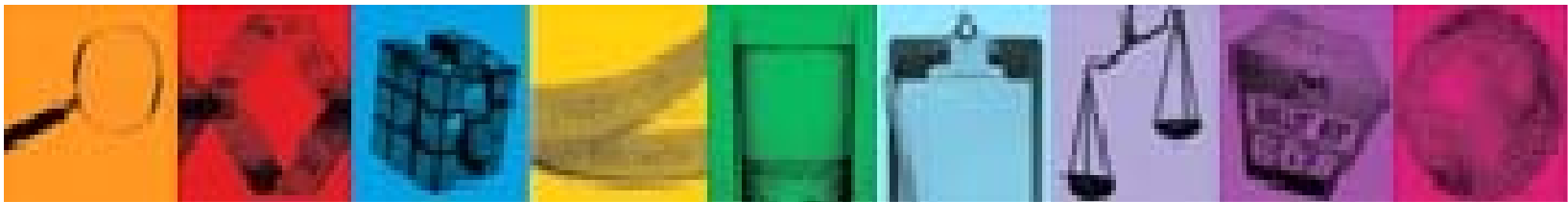


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# Business Practice of Economic Analysis in EDCF Project Operation

*– focusing Cost-Benefit Analysis –*

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# I. Overview



## ***Purpose of Economic Analysis***

- ✓ To identify critical areas for public sector involvement  
*(policy reform, institutional change, or investment)*
- ✓ To inform the choice among alternative solutions and the selection among technically feasible designs
- ✓ To assess project's impacts  
*(efficiency, equity, and sustainability)*
- ✓ To identify and assess project risks



## **Economic Analysis and EDCF Project Cycle**

- ✓ **Pre-Investment Phase**
  - *CPS/ Sector Studies* ⇒ *Identification*
  - ***PPTA Design/Implementation*** ⇒ ***Development*** (\*ensuring E/V)
  - *Loan FF/Appraisal* ⇒ *Further Due Diligence*
- ✓ **Investment Phase**
  - *Implementation and Completion* ⇒ *Monitoring and Feedback*
- ✓ **Post Investment Phase**
  - *Post-evaluation*
  - *Learn to be wiser next time*



## **Main Information Sources on Economic Analysis in EDCF**

- ✓ **Main Source Document**
  - *Guidelines for Economic Analysis of EDCF Projects (2007)*
- ✓ **Supplementary Material**
  - *Main Feasibility Study of EDCF Projects (2010)*
  - *Common General Guidelines for Project Preparation (2011)*
  - *Sectoral Guidelines for Project Preparation (2011)*  
( 5 Sectors: Health, Transport, Urban Sewerage, Education)

## II. Concepts / Principles



### ***What Economic Analysis of Project Really is:***

- ✓ **More than rate of return calculations**
  - *Beyond NPV, EIRR, Cost-Benefit analysis*
- ✓ **Framework/tool to select and design good projects**
  - *Relevant in the Context of Macroeconomic*
  - *Feasible at a level of Program and Project*
  - *Contribute to welfare of country and its people*



## **Differences between Economic & Financial Analyses :**

	<b><i>Financial</i></b>	<b><i>Economic</i></b>
<b><i>Perspective</i></b>	Project entity or participants	Economy-wide, all members of society
<b><i>Benefits and Costs</i></b>	Financial flows	Non-market values, Opportunity costs



## **Selected Steps in Project Economic Analysis :**

1. Macro Context
  2. Sector Analysis
  3. Demand Analysis
  4. Project Rationale
  5. Alternative Analysis
  6. Valuation of Benefits & Costs
  7. Financial & Institutional Sustainability
  8. Distribution Analysis
  9. Sensitivity Analysis
  10. Monitoring & Evaluation
- Relevance: Problem Diagnosis & Project Rationale
- Project Design & Decision Criterion
- Feasibility & Sustainability



## **Macroeconomic Context**

A project cannot be designed in isolation from the rest of the economy.

- ✓ project must be relevant vis-à-vis country and EDCF objectives
  - *link to country broader development objectives*
  - *link to CSP*
- ✓ country's resource position must be carefully assessed
- ✓ macroeconomic factors may affect project performance
  - *identify factors most likely to influence target sector*
  - *economic outlook*



## ***Demand Analysis***

How much of the output is wanted? How much are users willing to pay for it?

- ✓ Project design should be demand-driven
- ✓ Assess demand for product or service
- ✓ Identify demand shifting factors
- ✓ Project growth rate of demand, influence of demand shifters (size of project)

**➔ *Basis for identification of project size, timing and overall benefits***



## ***Project Rationale***

Why should there be public sector intervention?

- ✓ Market or institutional failures
- ✓ Public good
- ✓ Equity issue
- ✓ What is counterfactual if government is not involved?



## ***Alternative Analysis***

Why should What is the most efficient way of addressing the problem at hand

- ✓ Evaluate alternative project design in terms of lending modalities, financial arrangements, scale and timing, location, etc
- ✓ Explain why proposed alternative chosen (*least cost alternative*)



## ***Valuation of Benefits & Costs***

- ✓ Assess what will happen w/o project (counterfactual)
- ✓ Identify project benefits & costs
- ✓ Value project benefits & costs
- ✓ Economic viability: Benefits > Costs
- ✓ Cost effectiveness analysis if benefits cannot be valued



## ***Financial and Institutional Sustainability***

Are there enough resources to ensure flow of benefits?

- ✓ Assess financial performance of project entity for revenue generating projects
- ✓ Assess self-financing capacity of project entity
- ✓ Fiscal impact (implicit or explicit subsidy)
- ✓ Sources of funds to meet net financial requirements
- ✓ Institutional capacity assessment



## ***Distribution Analysis***

Who benefits and by how much?

- ✓ Identify groups that gain or lose
- ✓ Assess size of gains and losses
- ✓ Target groups (poor, women, etc.)

 ***Shed light on likely impact of project, sustainability***



## ***Sensitivity and Risk Analysis***

What are the chances that benefits & costs will be realized as anticipated ?

- ✓ Identify variables to which project is sensitive
- ✓ Assess change in parameters required to change project decision
- ✓ Assess likelihood of these changes occurring
- ✓ Consider mitigating actions against main sources of uncertainty



## ***Monitoring & Evaluation***

Do initial assumptions maintain validity throughout project life?

- ✓ Identify key variables necessary to measure project outcome/impact
- ✓ Establish system to collect data on all key variables

## III. Cost Estimation



### *Designing Project in Details*

- ✓ Identify project
- ✓ Identify and classify individual project components
- ✓ Schedule construction or operation and maintenance of individual components within the project design
- ✓ Engage project cost estimator to begin estimating costs in financial terms
- ✓ Engage financial analyst and economist to provide cost estimator with the level of detail required for financial and economic analysis



## **Classifying Project Cost**

- ✓ Choice of Currency
  - Domestic currency vs. Foreign currency (e.g., US\$)
- ✓ Categories of Costs
  - Domestic currency costs (e.g., unskilled labor)
  - Foreign currency costs (e.g., imported equipment)
  - Tradables vs. Nontradables
- ✓ Types of Costs
  - Investment Costs (Civil works, Engineering, Equipment, Labor, Tax & duties,.....)
  - Recurrent Costs (O&M Costs, Salaries, .....
- ✓ Salvage Values, Financial Charges(IDC)



## **Base Cost**

Base Costs - best estimates of project costs at a specified date, assuming:

- ✓ Quantities of works, goods and services and relevant prices are accurately known
- ✓ Quantities and prices will not change during implementation
- ✓ The project will be implemented exactly as planned



## Contingency Allowances

- ✓ Allowance for adverse conditions which will be in addition to the base cost estimate
- ✓ **Physical contingencies:** to cover physical uncertainties beyond the base case to complete the project. Often calculated and expressed as percentages of base costs
- ✓ **Price contingencies:** to cover inflation and price uncertainties
- ✓ Some typical levels of Physical Contingencies:
  - 5% - standard equipment designs/definable civil works(ex: road surfacing, canal lining)
  - 10% - general civil works with routine and predictable uncertainties(ex: roads, buildings, pipelines, transmission lines)
  - 15% - plant and civil works in difficult terrain.



## Cost Scheduling (1)

- ✓ Various methodologies
- ✓ Project engineers/designers advise cost estimator on the distribution of costs over the project life
- ✓ For example, major civil works on a hydroelectric project costing \$200 million may be disbursed over a 4-5 year period, as follows:

<u>Year</u>	<u>%</u>	<u>U\$ million</u>
1	15	30
2	25	50
3	40	80
4	20	40
<b>Total</b>		<b>200</b>



## Cost Scheduling (2)

- ✓ Annual build-up for each project component in the base cost completed
- ✓ Identify foreign and local currency costs separately
- ✓ Physical & Price contingencies allotted
- ✓ Taxes, duties, and other transfer payments quantified
- ✓ Interest during construction calculated
- ✓ Project cost estimate aggregated to derive total cost estimate (ex: base costs + taxes/duties + contingencies)
- ✓ Consolidated annual cost estimate prepared (ex: capital and O&M costs).



\* III. Cost Estimation (continued)

## Case: Project Cost Estimates (U\$ million)

	Base Cost <sup>a</sup>			Physical Contingency <sup>b</sup>			Price Contingency <sup>c</sup>			Total		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
A. Preliminary Works	0	4.7	4.7	0	0.2	0.2	0	0.1	0.1	0	5.0	5.0
B. Civil Works												
Lot C1 (Dam and Desanders)	75.7	12.6	88.3	7.6	1.3	8.8	5.7	1.0	6.7	89.0	14.9	103.8
Lot C2 (Tunnel)	54.6	6.4	61.0	5.5	0.6	6.1	2.8	1.9	4.7	62.9	8.9	71.8
Lot C3 (Powerhouse)	36.2	11.6	47.8	6.5	2.1	8.6	2.9	0.9	3.8	45.6	14.6	60.2
C. Electromechanical												
Lot 4 (Hydraulic Steel Work)	21.6	0.9	22.5	1.2	0.1	1.3	1.4	0.4	1.8	24.2	1.4	25.6
Lot 5 (Electrical Equipment)	31.1	1.0	32.1	1.7	0.1	1.8	2.2	0.5	2.7	35.0	1.6	36.6
Lot 6 (Mechanical Equipment)	19.5	0.8	20.3	1.1	0	1.1	1.1	0.3	1.4	21.7	1.1	22.8
Lot 7 (Transmission System)	10.5	2.9	13.4	0.6	0.2	0.8	0.7	1.3	2.0	11.8	4.4	16.2
D. Other Project Costs												
Construction Engineering	13.0	2.1	15.1	0.7	0.1	0.8	0.9	0.1	1.0	14.6	2.3	16.9
Project Management	2.1	6.1	8.2	0.1	0.3	0.5	0.2	0.4	0.6	2.4	6.8	9.3
Environmental Mitigation	2.3	3.0	5.3	0.1	0.2	0.3	0.2	0.2	0.4	2.6	3.4	6.0
Loss Reduction Component	2.3	0.9	3.2	0.1	0.1	0.2	0.2	0.1	0.3	2.6	1.1	3.7
<b>Total (A+B+C+D)</b>	<b>268.9</b>	<b>53.0</b>	<b>321.9</b>	<b>25.3</b>	<b>5.2</b>	<b>30.5</b>	<b>18.3</b>	<b>7.2</b>	<b>25.5</b>	<b>312.5</b>	<b>65.4</b>	<b>377.9</b>
E. Taxes and Duties												
Contract Tax										0	16.8	16.8
Customs Duties										0	1.5	1.5
F. Interest during Construction										7.9	1.6	9.5
<b>Total</b>										<b>320.4</b>	<b>85.3</b>	<b>405.7</b>

<sup>a</sup> Base cost is based on January 2009 prices.

<sup>b</sup> Physical contingency: Lot C1 – 10%; Lot C2 – 10%; Lot C3 – 18%; Preliminary works – 4%; other items – 5.6%.

<sup>c</sup> Price contingency: 2.7% for foreign exchange costs (FC) and 6% for local currency costs (LC).



\* III. Cost Estimation (continued)

**Case: Annual Cost Estimates (U\$ million)**

Fiscal Year	Capital Costs	Operation & Maintenance Costs	Salvage Value	Total Costs
2012				
2013	64.91			64.91
2014	93.38			93.38
2015	165.39			165.39
2016	57.83			57.83
2017	22.74	3.46		26.2
↓		↓		↓
2025		3.46		3.46
2026		15.0		15.0
2027		3.46		3.46
↓		↓		↓
2035		3.46		3.46
2036		3.46	-81.14	-77.68
<b>Total</b>	<b>405.70</b>	<b>80.74</b>	<b>-81.14</b>	<b>405.30</b>

Construction Period: 5 years (overlap in years 1 and 6)

Project Operating Life: 20 years

Salvage Value: 20% of Investment Cost



## ***Economic Cost Estimates (1)***

- ✓ Economist advises cost estimator on the breakdown of costs required for the economic analysis
- ✓ Level of detail contingent upon availability of conversion factors and choice of numeraire
- ✓ Include base cost and physical contingencies
- ✓ Exclude price contingencies, relevant taxes, duties, subsidies, and other transfer payments
- ✓ Classify project components as tradable or non-tradable.



## **Economic Cost Estimates (2)**

### **Tradable inputs and outputs**

- ✓ Goods and services of which production or consumption affects a country's level of imports or exports

### **Non-tradable inputs and outputs**

- ✓ Goods and services that are not imported or exported by the country in which the project is located
- ✓ Because by their nature, they must be produced or sold within the domestic economy(ex: products with no international market due to their quality and/or cost)



## Case(1): Economic Cost Estimates on Shadow Pricing

- ✓ For example, \$200 million civil works on a hydroelectric project including physical contingencies (10%) using world price numeraire; **Standard Conversion Factor** of 0.90 and no other conversion factors
  - In the below example, non-traded goods and services were adjusted by the standard conversion factor
  - Step repeated for each project component and then presented in the economic resource statement

Year	Total Civil Works	Traded (35%)	Nontraded			Total Economic Cost
			65%	SCF	Economic Cost	
1	33	11.6	21.4	0.9	19.3	30.9
2	55	19.2	35.8	0.9	32.2	51.4
3	88	30.8	57.2	0.9	51.5	82.3
4	44	15.4	28.6	0.9	25.7	41.1
<b>Total</b>	<b>220</b>	<b>77.0</b>	<b>143.0</b>		<b>128.7</b>	<b>205.7</b>



## Case(2): Economic Cost Estimates on Shadow Pricing

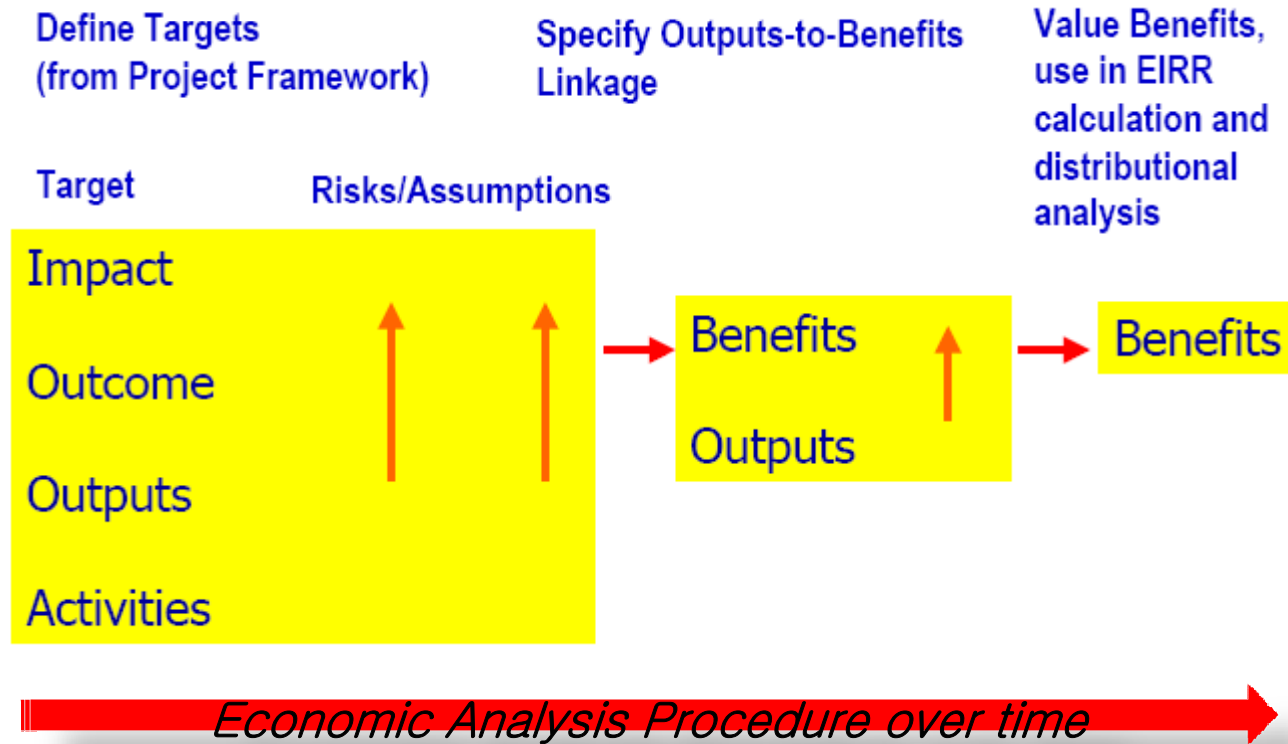
- ✓ If domestic price numeraire used for project, result is as follows; **Shadow Exchange Rate Factor** of 1.11 (i.e.  $1/SCF = 1/0.9$ )
  - Economic costs are different with different numeraire, so it is important to ensure numeraire is defined clearly and used consistently.
  - However, if numeraire is used consistently for costs and benefits, eventual decision on project, will not be affected by choice of numeraire

	Total	Traded		Nontraded	Total Economic	
Year	Civil Works	(35%)	SERF	Economic Cost	65%	Cost
1	33	11.6	1.11	12.9	21.4	34.3
2	55	19.2	1.11	21.3	35.8	57.1
3	88	30.8	1.11	34.2	57.2	91.4
4	44	15.4	1.11	17.1	28.6	45.7
<b>Total</b>	<b>220</b>	<b>77.0</b>		<b>85.5</b>	<b>143.0</b>	<b>228.5</b>

# IV. Benefit Estimation



## *Benefit Identification: Project Framework and Economic Analysis*



\* IV. Benefit Estimation (continued)



## Case: Project Framework(Log Frame)

Design Summary	Performance Targets and Indicators	Data Sources and Reporting Mechanisms	Assumptions and Risks
<b>Impact</b> Road travel across and within the Central Mekong Delta, interconnecting Ho Chi Minh City and the Southern Coastal Region with the GMS Southern Coastal Corridor improved	5,500 goods vehicles and 10,000 passenger car units per day cross the bridges in 2016 and grow at 10% per annum thereafter Transport and transit costs across the Central Mekong Delta, reduced by 10% from 2015 to 2020 in real terms .....	Traffic and travel time surveys Reports from Review Missions Reports from the Supervision Consultant Project Completion Report Updated Resettlement Plans and Social Action Plan .....	<b>Assumptions</b> • Government of road investment projects are implemented as planned for Second Southern Highway, and GMS Southern Coastal Corridor • The toll system is efficiently operated <b>Risks</b> • Resettlement updating and .....
<b>Outcome</b> Road travel distances decreased and average travel speeds increased across and within the Central Mekong Delta	Travel time from Cao Lanh Ferry to Vam Cong Ferry reduced from 1-1½ hrs in 2010 to ½ hrs by 2016 Travel distance from Cao Lanh Ferry to Vam Cong Ferry reduced from 30 km in 2010 to XX km by 2016 .....	Traffic and travel time surveys Reports from the Supervision Consultant Project Completion Report Reports from Review Missions Toll revenue and operations and maintenance accounts	<b>Assumptions</b> • Project road and bridges adequately maintained • Projected traffic demand materializes • The toll system is efficiently operated ..... <b>Risks</b> • Tolls charges too low to cover operations and maintenance after traffic build-up.
<b>Outputs</b> 1. , tolls and Approach Roads built, operating and maintained 2. , tolls and Approach Roads built, operating and maintained 3. ....	Bridges and roads open to traffic by end-2016 Road safety measures operational for roads and bridges by end-2106 Financial and accounting capacity in place by end-2016 .....	Traffic and travel time surveys and socio-economic surveys Bridge toll accounting records Government monitoring data on environmental issues, and road safety .....	<b>Assumptions</b> • MOT has the capacity and counterpart funds available on time • Financial and institutional capacity of PMU-MT is sufficient to manage and operate the infrastructure safely and efficiently • The toll system is efficiently operated .....
<b>Activities with Milestones</b> 1. Consultants . Detailed design consultants recruited by June 2011 . Detailed designs completed by February 2012 2. Resettlement and Social Action Plans . Resettlement & social action plans updated by March 2012 . Resettlement & social action plans implemented by June 2014 3. Civil works . Civil works contracts commenced by mid-2012 . Civil works contracts completed by end-2015 .....			<b>Inputs</b>  KEXM: \$200 million Government: \$201 million ADB/AusAid: \$220 million



## ***Specifying the Output-to-Benefit Linkage***

<b>Output-to-Benefit Characteristic</b>	<b>Characteristic</b>	<b>Alternate characteristic</b>
Type of output-to-benefit linkage mechanism	Direct (e.g., the project produces intermediate or final goods for participants)	Indirect (e.g., the project strengthens institutions or services to participants)
Basis of output valuation	Project output is sold in domestic and/or international markets	Project output is not sold in markets (domestic or international)
Types of beneficiaries	Existing participants (e.g., farmers, smallholders)	New, or new and existing participants



## ***Benefit Identification: Incremental and Non-incremental***

Economic valuation of project outputs depends upon whether they are incremental or not to existing national output or usage:

	<b>Project Output</b>
<b>Incremental</b>	<b>the project output is additional to the case without the project</b>
<b>Nonincremental</b>	<b>the output of the project substitutes for alternative sources of supply in the economy (or imports)</b>



## Case(1): Urban Infrastructure Projects

Type of Project	Potential Nonincremental Benefits	Potential Incremental Benefits
a) Piped Water Supply	<ul style="list-style-type: none"> <li>i) Alternative sources of supply displaced</li> <li>ii) Improved quality displacing adverse health impacts</li> <li>iii) Improved quality resulting in efficiency gains</li> </ul>	<ul style="list-style-type: none"> <li>Improved quality</li> <li>Induced demand</li> </ul>
b) Wastewater Treatment	<ul style="list-style-type: none"> <li>i) Alternative sources of wastewater treatment displaced</li> <li>ii) Improved health through cost of illness displacement</li> </ul>	<ul style="list-style-type: none"> <li>Induced demand</li> </ul>



\* IV. *Benefit Estimation (continued)*

**Case(2): Energy Projects**

Type of Project	Potential Non - incremental Benefits	Potential Incremental Benefits
a) Power Generation	Displaced alternative forms of electricity/ energy generation in various sectors – all size generators	Additional or induced energy consumption valued at willingness-to-pay
b) Electricity Transmission i) Augmentation	i) Transmission loss reduction i) Reliability Improvement ii) Alternative supply displacement	Induced demand
ii) Interconnection	Alternative sources of fuel displaced	Induced demand



## Case(3): Energy Projects

Type of Project	Potential Non-incremental Benefits	Potential Incremental Benefits
c) Rural Electrification	Alternative supply displaced	Induced demand
d) Gas Reserves Development (Field Development, Transmission, Distribution)	Fuel Substitution: Power – Coal Fertilizer – Fuel Oil Industrial – Fuel Oil/ Coal/ Fuelwood Commercial – Kerosene/LPG Residential – Kerosene/ Fuelwood	Exports



\* IV. *Benefit Estimation (continued)*

**Case(4): Transport Projects**

<b>Type of Project</b>	<b>Potential Non-incremental Benefits</b>	<b>Potential Incremental Benefits</b>
a) Road Improvement/ Rehabilitation	i) Reduced operating costs for existing traffic ii) Reduced operating costs for traffic diverting from alternative route iii) Travel time savings iv) Reduced road maintenance expenditures	Willingness-to-pay of new traffic generated by improved conditions of road.
b) Expressway Construction	i) Resource cost savings for traffic diverting from existing roads/railways ii) Resource cost savings for traffic remaining on existing roads (reduced congestion)	Willingness-to-pay of new traffic generated by new road.



\* IV. *Benefit Estimation (continued)*

**Case(5): Transport Projects**

Type of Project	Potential Nonincremental Benefits	Potential Incremental Benefits
c) Railway Improvement/ Rehabilitation	i) Resource cost savings to existing traffic ii) Travel time savings for existing traffic iii) Resource cost/travel time savings for traffic diverting from road/other railways	Willingness-to-pay of new traffic generated
d) Ports	i) Resource cost savings for existing users (queuing time, berth time) ii) Resource cost savings for users diverting from other ports	Willingness-to-pay for new users of port (induced demand)



\* IV. *Benefit Estimation (continued)*

**Case(5): Transport Projects**

Type of Project	Potential Nonincremental Benefits	Potential Incremental Benefits
c) Railway Improvement/ Rehabilitation	i) Resource cost savings to existing traffic ii) Travel time savings for existing traffic iii) Resource cost/travel time savings for traffic diverting from road/other railways	Willingness-to-pay of new traffic generated
d) Ports	i) Resource cost savings for existing users (queuing time, berth time) ii) Resource cost savings for users diverting from other ports	Willingness-to-pay for new users of port (induced demand)



## **Valuing Incremental and Non-incremental Output**

- ✓ Incremental outputs valued at demand price (i.e., what consumers are willing to pay for them)
- ✓ Non-incremental outputs valued at supply price (i.e., what it costs to produce them through the alternative means which have now been replaced/displaced)

Incremental Benefits



Willingness-to-Pay



Demand Price

Non-incremental Benefits



Resource Cost Savings

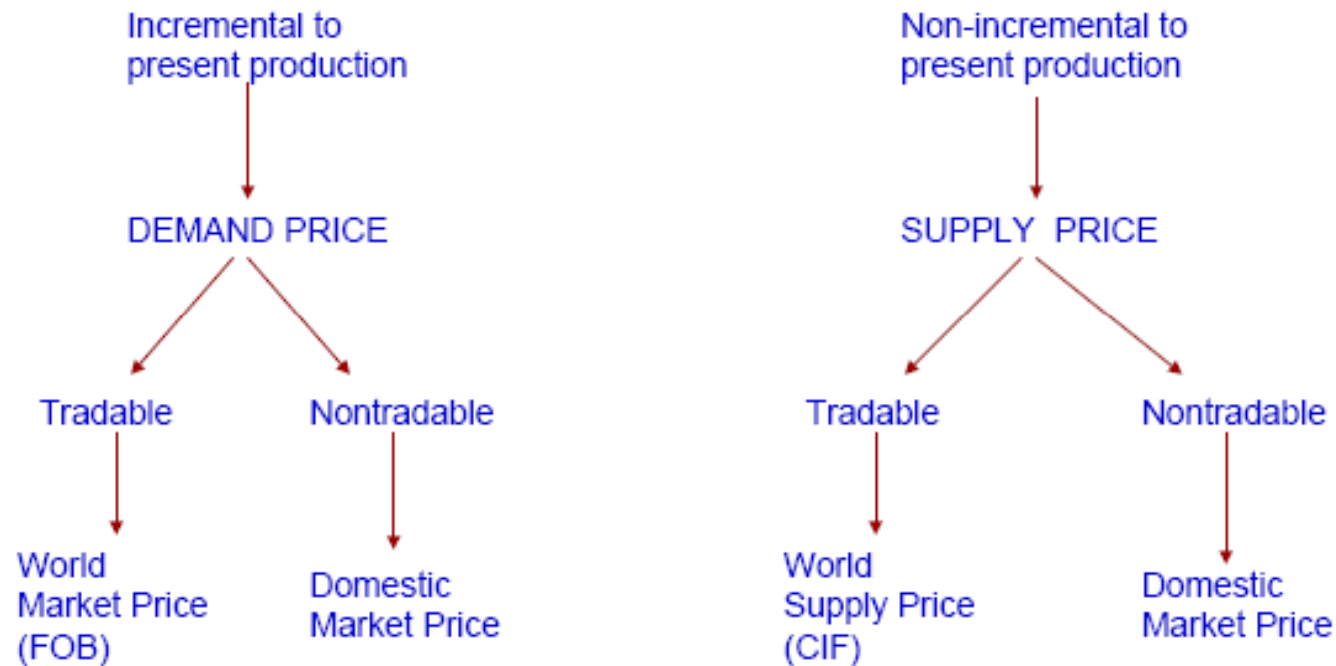


Supply Price



\* IV. *Benefit Estimation (continued)*

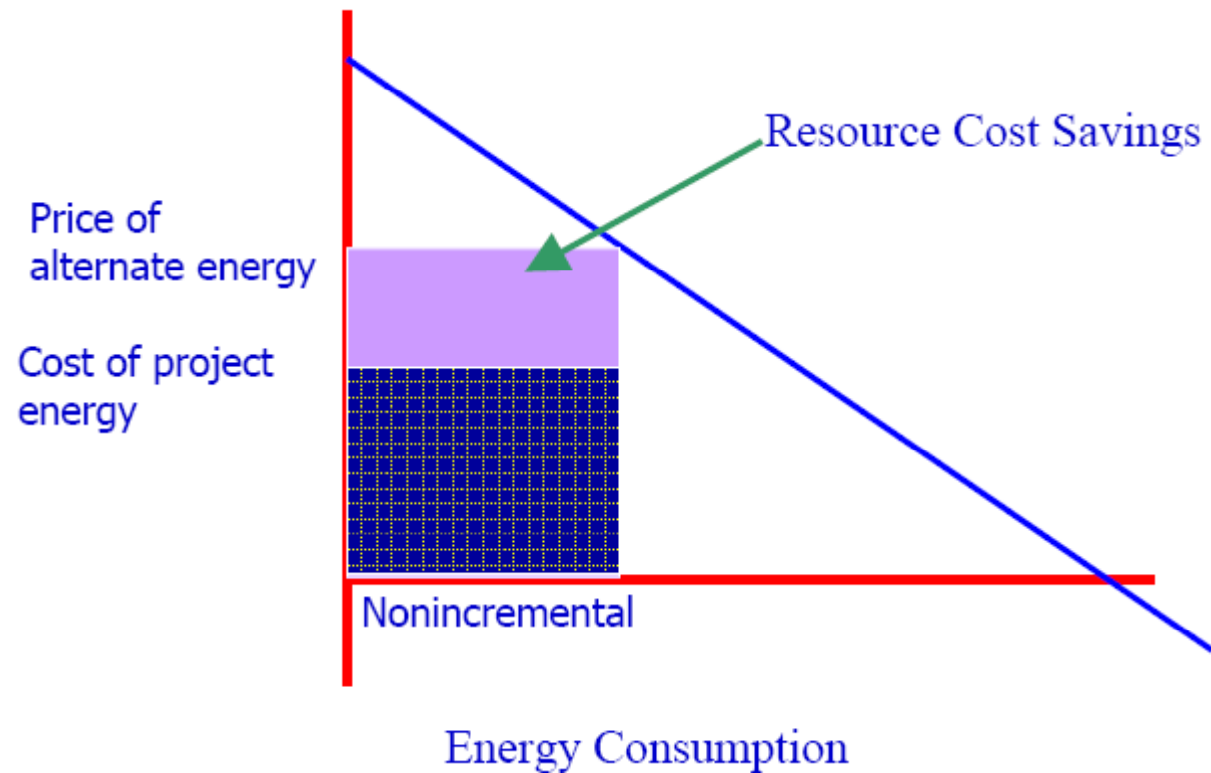
## **Valuing Project Output**



NB> Note that the domestic market demand price includes net taxes (i.e., it is a measure of what consumers are willing to pay for it), but that the domestic market supply prices is only the cost of production (i.e., it should exclude any production taxes or surplus profits).

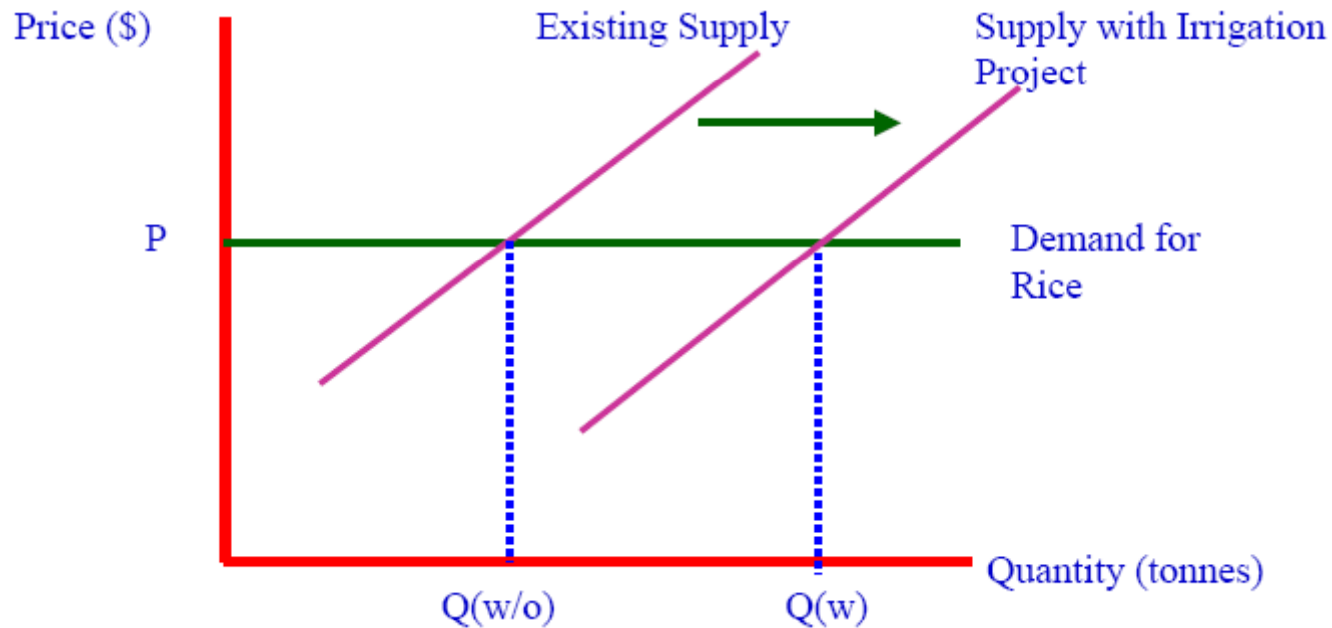


## Non-incremental Benefits





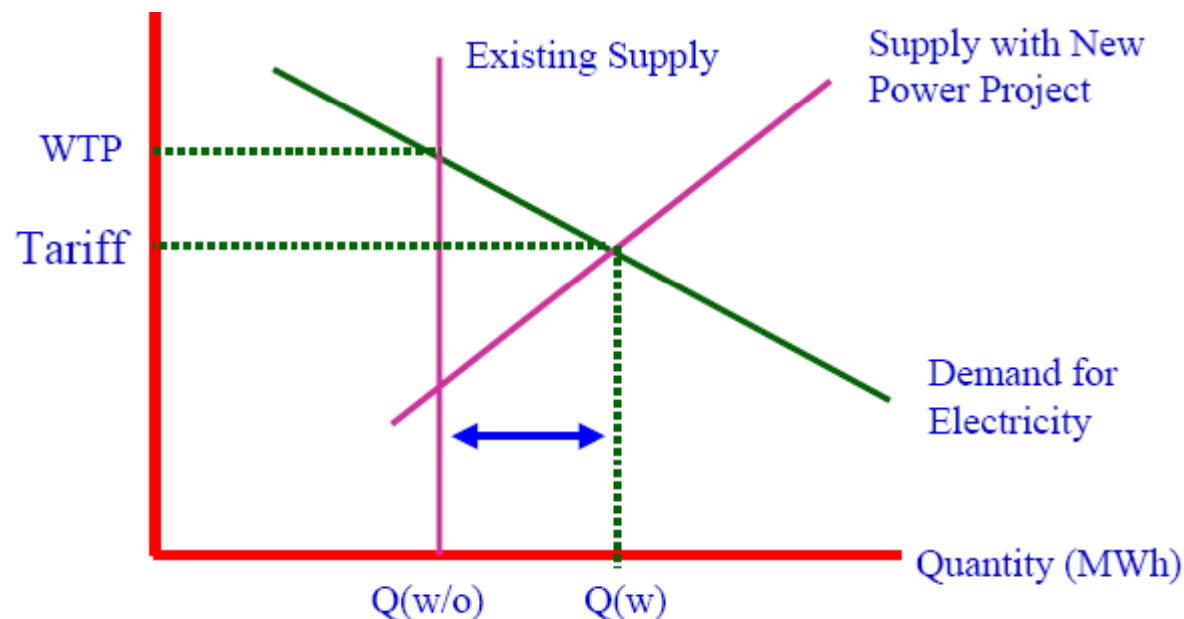
## **Incremental Benefits of a Tradable Output (Rice Production)**



- The project is a new irrigation scheme, increasing rice production
- Without the project, production is  $Q(w/o)$ ; price is  $P$
- With the project, production rises to  $Q(w)$ ; price remains constant at  $P$



## **Incremental Benefits of a Non-tradable Output (Producing Electricity for Domestic Consumption)**



- The project is new power generation, increasing power supply
- Without the project, production is  $Q(w/o)$ ; price is the tariff; consumers are willing to pay WTP
- With the project, production rises to  $Q(w)$ ; price is still the tariff.



## ***Non-Quantifiable Economic Benefits***

- ✓ Non-tangible (social / political, knowledge / information / business skills)
- ✓ Tangible (inputs for processing industry, new businesses)
- ✓ **Exclude from economic analysis** but describe textually (quantity and quality)



\* *IV. Benefit Estimation (continued)*

***Economic Benefit Estimates  
on Shadow Pricing***

<u>Numeraire</u>	<u>Adjustment</u>	
	<u>Nontradable</u>	<u>Tradable</u>
Domestic Price	none	SERF
Border Price	SCF	none

## V. Resource Statement



### *Project Resource Statement*

- ✓ Investment costs (land, construction, plant and equipment, vehicles, resettlement, other); periodic replacement
- ✓ Appropriate project life
- ✓ Include residual values
- ✓ Working capital (initial stocks of materials, final stocks of outputs, work in progress)
- ✓ Recurrent costs (labor, materials, utilities, overheads, environmental)
- ✓ Gross economic benefits disaggregated by incremental, non-incremental and external economies
- ✓ Net economic benefits  
= economic benefits – economic costs

\* V. Resource Statement (continued)



## Processing Project Resource Statement (Economic Prices)

Years			0	1	2	3	4	5	6	7	8	9	10	11	12
Capacity Utilization					50%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Item	Initial Amount	Replace-ment Period													
<b>A. Investment Schedule</b>															
Land Preparation	80	-	80												
Construction	1860	30	930	930											
Equipment	900	12		900											
Vehicles	370	5		370					370					370	
Others	60	-	30	30											
<b>I. Total</b>	<b>3270</b>		<b>1040</b>	<b>2230</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>370</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>370</b>	<b>0</b>
<b>B. Working Capital</b>															
II. Working Capital	230			115	115										
<b>C. Annual Costs</b>															
	Annual Amount														
Materials	600				300	600	600	600	600	600	600	600	600	600	600
Utilities	170				85	170	170	170	170	170	170	170	170	170	170
Labor	145				73	145	145	145	145	145	145	145	145	145	145
Overheads	90				90	90	90	90	90	90	90	90	90	90	90
Land Opportunity	35		18	35	35	35	35	35	35	35	35	35	35	35	35
<b>III. Total</b>	<b>1040</b>		<b>18</b>	<b>35</b>	<b>583</b>	<b>1040</b>	<b>1040</b>	<b>1040</b>	<b>1040</b>	<b>1040</b>	<b>1040</b>	<b>1040</b>	<b>1040</b>	<b>1040</b>	<b>1040</b>
<b>D. Benefits</b>															
	Annual Amount														
IV. Incremental Output	1695				848	1695	1695	1695	1695	1695	1695	1695	1695	1695	1695
<b>E. Net Benefits</b>															
IV-III-III			1058	2380	150	655	655	655	285	655	655	655	655	285	655
Discount rate	12.0%														
Net Present Value	329														
Internal Rate of Return	13.4%														

## VI. Distribution & Poverty Impact Analysis



### *Why Consider Distribution of Project Effect*

#### ✓ **Equity Considerations**

- Who benefits from the project by how much?
- Are distribution of effects consistent with project objectives?
- How do benefits reach target groups?

#### ✓ **Incentive Considerations**

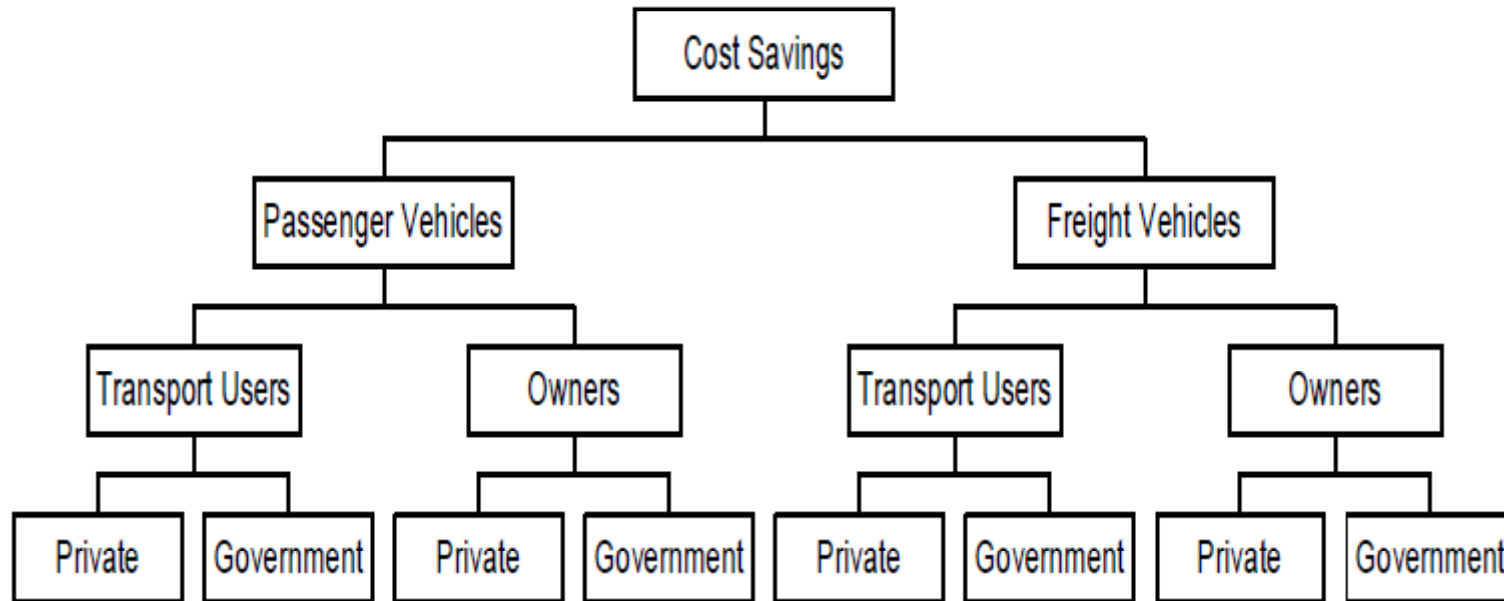
- Who receives, by how much?
- Who pays, by how much?

➔ Poverty reduction addressed where components effectively reach poor groups

\* VI. Distribution & Poverty Impact Analysis (continued)



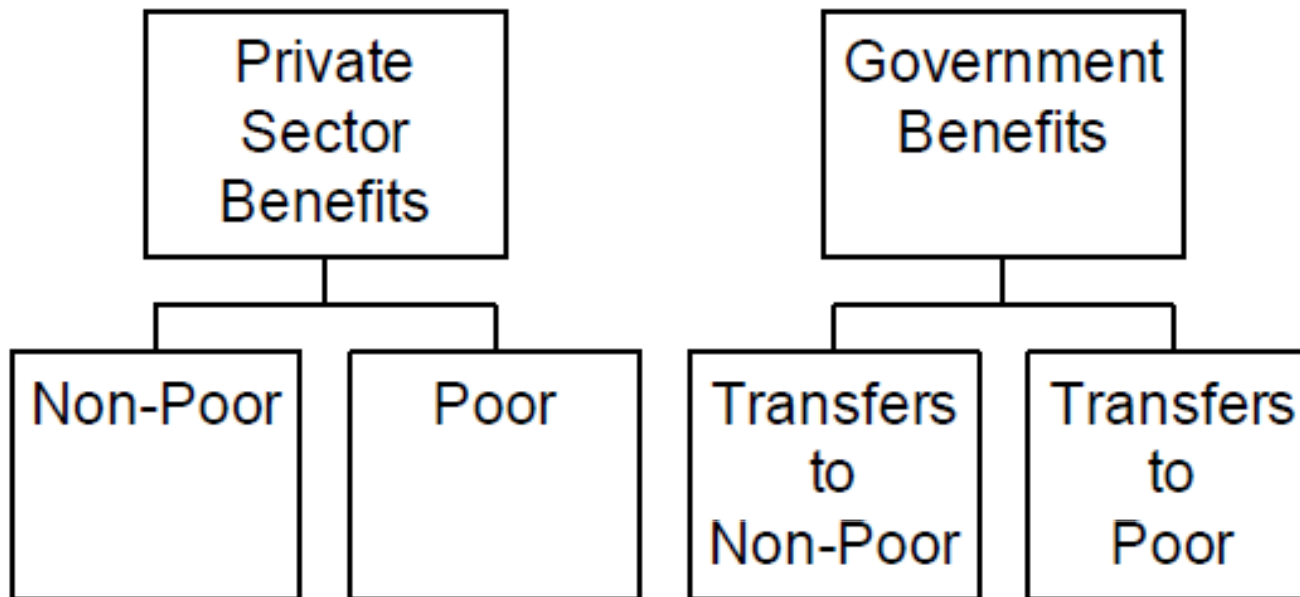
**Distribution Tree:**  
**(Example From Road Project)**



\* VI. Distribution & Poverty Impact Analysis (continued)



**Poverty Impact Tree**  
**(Example From Road Project)**





\* VI. *Distribution & Poverty Impact Analysis (continued)*

***Linking Distribution and Poverty Analysis to Cost Benefit Analysis...***

- ✓ Estimate the economic costs and benefits relative to financial costs and benefits (i.e. EPV vs. FPV)
- ✓ ***Distribution Analysis***: Distribute differences between financial and economic costs and benefits between project stakeholders
- ✓ ***Poverty Impact Ratio***: Estimate the proportion of the net economic benefits designed to go to the poor compared to total project net economic benefits



*\* VI. Distribution & Poverty Impact Analysis (continued)*

**Case Study: Water Supply Project (1)**

- ✓ Project supplies piped water in a small town
- ✓ Three main stakeholders
  - Government/economy
  - Construction labor
  - Water consumers
- ✓ Consumers pay for water supplied
- ✓ Use domestic price numeraire
- ✓ Use discount rate of 12% for FPV and EPV



*\* VI. Distribution & Poverty Impact Analysis (continued)*

## **Case Study: Water Supply Project (2)**

### **Methodology:**

1. Identify project stakeholders, for example, water consumers, labor, government, economy
2. Calculate present value of financial costs and revenues by component
3. Calculate present value of economic costs and benefits by component
  - $PV(EC) = PV \text{ financial costs } -/+ NPV \text{ transfers}$
  - $PV(EB) = PV \text{ consumer surplus } + PV \text{ financial revenues } +/- PV \text{ externalities}$



## \* VI. Distribution & Poverty Impact Analysis (continued)

### **Case Study: Water Supply Project (3)**

#### **Methodology:**

4. Calculate the difference between present values in economic and financial terms
5. Differences between EPV and FPV show project effects:  $Project\ Effect_n = EPV_n - FPV_n$
6. Distribute project effects between stakeholders using the identity
7. Identify net project effects using the identity:
8. To get distribution of Net Economic Effects(Benefits), must adjust Net Financial Effects incurred by stakeholders

\* VI. Distribution & Poverty Impact Analysis (continued)



**Case Study: Water Supply Project (4)**

Project Costs and Benefits	1. Project Financial and Economic Effects			2. Distribution of Project Effects Among Stakeholders			
	FNPV	ENPV	ENPV-FNPV	Consumers	Labor	Government/ Economy	Total
Output Benefits	1000	1800	800	800			800
Capital Costs	-650	-600	50			50	50
Power Costs	-330	-250	80			80	80
Labor Costs	-80	-56	24		24		24
<b>Project Effects</b>	<b>-60</b>	<b>894</b>	<b>954</b>	<b>800</b>	<b>24</b>	<b>130</b>	<b>954</b>
Net Financial Effects	-60					-60	-60
Net Economic Effects		894		800	24	70	894



## \* VI. Distribution & Poverty Impact Analysis (continued)

### **Poverty Impact Ratio**

- ✓ An extension of distribution analysis with stakeholders further defined by income or other poverty indicators
- ✓ Identify the proportion of poor in stakeholder groups
- ✓ Calculate the benefits to poor stakeholders
- ✓ Calculate the Poverty Impact Ratio

$$PIR = ENPV_{poor} / ENPV_{total}$$



*\* VI. Distribution & Poverty Impact Analysis (continued)*

**Case Study: Water Supply Project (5)**

	Consumers	Labor	Government/ Economy	Total
Proportion of Poor in Stakeholder Group	0.25	0.33	0.5	
Benefits to Poor Stakeholders	200	8	35	243
Poverty Impact Ratio (Benefits to Poor/Net Economic Effects)				0.27

## VII. Sensitivity and Risk Analysis



### *Steps*

1. Selecting variables to which project may be sensitive
2. Determining extent to which these may vary from base case
3. Calculating effect on EIRR and NPV
4. Interpreting results and designing mitigating actions



## \* VII. Sensitivity and Risk Analysis (continued)

### **Identifying Possible Changes**

- ✓ Changes in ratio between inputs and outputs
- ✓ Changes in prices of inputs and outputs
- ✓ Changes in timing / delivery of benefits
- ✓ Changes in utilization rates
- ✓ Changes in shadow exchange rate factor/ standard conversion factor
- ✓ Changes in management effectiveness
- ✓ Changes in policy and institutional environment



## \* VII. Sensitivity and Risk Analysis (continued)

### **Response to Sensitivity (1)**

- ✓ Where projects are sensitive, steps should be taken to reduce the uncertainty
- ✓ **At project level**
  - Long-term supply contracts
  - Training programs
  - Publicity - to increase utilization
  - Incorporation of external effects into the project design
  - Try a pilot project first



*\* VII. Sensitivity and Risk Analysis (continued)*

## ***Response to Sensitivity (2)***

✓ ***At Sector level***

- Try a pilot project first
- Tariff and price adjustments to assure adequate incentive
- Technical assistance to develop organizational skill
- Institutional reforms



*\* VII. Sensitivity and Risk Analysis (continued)*

***Response to Sensitivity (3)***

✓ ***At the National level***

- Changes in tax and credit policies
- Regulatory reform for a more certain framework
- Changes in exchange rate and fiscal management



***THANK YOU  
FOR YOUR ATTENTION!***