



Technical Training in Project Appraisal for the Lower Mekong Basin

VALUATION OF PROJECT ECONOMIC COSTS

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Basis of Input Cost Valuation

- ◆ Project input is tradable
 - ✓ Using world prices as a basis
 - ✓ Adjust for domestic handling and transport costs

- ◆ Project input is non-tradable
 - ✓ Using domestic supply and demand, and market prices as a basis with appropriate adjustments for market distortions

- ◆ Project input is not sold in markets
 - ✓ Willingness-to-pay survey (demand price)
 - ✓ Resource cost estimation (supply price)

- *Similar to Output Benefit Valuation*

Cost Identification: Incremental vs. Nonincremental

Incremental	Project input is additional to the case without project
Nonincremental	Project input replaces other sources of demand

Example	Natural gas used by the Ca Mau Urea Plant
Incremental cost	Cost of additional gas supplied from the PM3 Gas Field (supply price)
Nonincremental cost	Cost of gas diverted from electricity production to urea production (demand price)

Important Components of Project Costs

- ◆ Cost of inputs – goods and services - and their economic prices are estimated just like output prices of goods and services
- ◆ Cost of capital
- ◆ Cost of foreign exchange
- ◆ Cost of labor
- ◆ Cost of land

- ◆ Cost of goods and services (inputs/outputs); cost of labor, and cost of land is project or region specific.
- ◆ Economic costs of capital and foreign exchange are the same for the economy and called “National Parameters”

Economic Cost of Capital (ECOC)

- ◆ In project economic analysis, ECOC is the discount rate used to calculate NPV of net economic cash flows to the project.
- ◆ In theory:
 - ✓ ECOC reflects the opportunity cost of capital from the perspective of the whole economy.
 - ✓ It is the weighted mean of the average interest rates on one hand and the average return on investment in the economy
- ◆ In real life, the EOCK in most developing countries as computed by the World Bank or ADB comes in the range:
 - ✓ Practical range: 8-12%.

So *real* ECOC may be taken as 10% as a rough and ready estimate (a rule of thumb) unless computed specifically for a country.

ECOC used in Economic Analysis (in real terms)

Project	Year	Appraisal agency	ECOC
Project of HCMC Sanitation (Nhieu Loc - Thi Nghe)	2001	WB	12%
Phu My 2.2 Power Plant	2002	WB	10%
Urban Water Supply Project	2004	WB	12%
Long Thanh - Dau Giay Expressway Project	2008	ADB	12%
Ben Luc-Long Thanh Expressway Project	2010	ADB	12%
North - South High-speed Railway Project	2010	SVN	12%
Quang Ngai High-speed Railway Project	2011	WB	11%
Project of Power Transmission Efficiency	2014	WB	10%
Project of Sustainable Agricultural Transformation	2015	WB	12%
HCMC Green Transport Development Project	2015	WB	12%
Project of Metro No. 3, Hanoi	2015	ADB	12%
MD Sustainable Likelihood Integrated Climate Strength Project	2016	WB	9%

Domestic and Foreign Currencies

- ◆ In project appraisal, cash flow items (including nontradables and tradables) can be denominated in local or foreign currency. This requires the use of exchange rate to convert the cash flows into the same currency.
- ◆ If the domestic currency is used, prices denominated in foreign currencies should multiply by the exchange rate to convert to domestic currency.
- ◆ If a foreign currency is used, prices denominated in domestic currencies should be divided by the exchange rate to convert to foreign currency.
- ◆ Normally the entire analysis – financial, economic, is done in domestic currency.

Financial Exchange Rate (FER) and Shadow or Economic Exchange Rate (SER)

- ◆ Financial exchange rates are used in financial appraisal.
 - ✓ If the project buys or sells foreign currency at the official exchange rate (OER), OER is used as FER.
 - ✓ If the project buys or sells foreign currency on the free market, the market exchange rate (MER) is used as FER.
- ◆ For economic analysis, the exchange rate used should reflect the opportunity cost of the foreign currency generated or used by the project. That is the economic exchange rate (also known as the shadow exchange rate).
- ◆ The difference between SER and FER reflects distortions in exports and imports e.g. trade taxes; quantitative restrictions.
- ◆ This is because demand and supply of foreign exchange come from imports and exports and distortions in those markets will affect SER.

Converting SER from FER

◆ In general, the ratio of Economic to financial prices is called conversion factor (CF). If one computes a list of CFs and then multiply financial prices by the CF to get economic price.

◆ Specifically for financial and economic foreign exchange:

◆ Foreign Exchange Premium (FEP)

$$\text{FEP} = \text{SER}/\text{FER} - 1$$

◆ Shadow Exchange Rate Factor (SERF)

$$\text{SERT} = \text{SER}/\text{FER}$$

◆ Standard Conversion Factor (SCF)

$$\text{SCF} = \text{FER}/\text{SER}$$

$\text{FEP} = (\text{Tariff Revenue} + \text{Export Subsidies} - \text{Export Taxes})$
divided by (value of imports + value of exports)

SEFF Used in the Appraisal of some WB- and ADB-financed Projects

Project	Year	Appraisal agency	SERF
Forestry Project	1997	ADB	1.08
Rural Infrastructure Project	1997	ADB	1.25
HCMC Environmental Improvement Project	1999	ADB	1.11
Tea and Fruit-tree Development Project	2000	ADB	1.11
2 nd Red River Basin Project	2001	ADB	1.043
3 rd Town Project of Water Supply and Sanitation	2001	ADB	1.11
Provincial Road Improvement Project	2001	ADB	1.075
Phu My 2.2 Power Project	2002	WB	1.00
HCMC Project of Water Supply and Sanitation	2004	ADB	1.11
Development Project for Rural Water	2004	WB	1.31
Long Thanh-Dau Giay Expressway Project	2008	ADB	1.04
Ben Luc-Long Thanh Expressway Project	2010	ADB	1.04
Project of Power Transmission Efficiency	2014	WB	1.00
Project of Sustainable Agricultural Transformation	2015	WB	1.11
Project of Transport Network Improvement	2015	ADB	1.02
MD Sustainable Likelihood Integrated Climate Resistance Project	2016	WB	1.11

Numeraire: Domestic market and border

- ◆ In the economic evaluation, the project cash flow items can be calculated based on domestic prices or border prices at which goods and services are exported or imported.
- ◆ If the domestic price is chosen as numeraire, tradable goods measured in terms of border prices are multiplied by the shadow exchange rate factor (SERF).
- ◆ If the border price is chosen as numeraire, non-traded goods measured in terms of domestic prices are multiplied by the standard conversion factor (SCF).

	Domestic currency	Foreign currency
Domestic price		
Border price		

Example

- ◆ Parameters:
 - ✓ OER = 19,187 (VND/USD)
 - ✓ SER = 20,698 (VND/USD)
 - ✓ SERF = 1.079 and SCF = 0.927
- ◆ The project makes use of generators (imports) and consulting services (non-traded). The CIF price of a generator is USD100, with import tax of 20%.
 - ✓ The economic and financial costs are the same for the consulting services and equals VND2,000,000.
- ◆ The border price of a generator: USD100
- ◆ (Financial) domestic price of a generator in USD:
 - ✓ $100 \times (1 + 20\%) = \text{USD}120$
- ◆ (Financial) domestic price of a generator in VND:
 - ✓ $120 \times 19.187 = \text{VND}2,302,440$
- ◆ (Financial and economic) domestic price of consulting services:
 - ✓ VND2,000,000

Example

- ◆ Economic price of imported generators:

	Domestic currency	Foreign currency
Domestic price	$1,918,700 \times 1.079$ $= \text{VND}2,069,800$	100×1.079 $= \text{USD}107,9$
Border price	$100 \times 19,187$ $= \text{VND}1,918,700$	$\text{USD}100$

- ◆ Economic price of non-traded consulting services:

	Domestic currency	Foreign currency
Domestic price	$\text{VND}2,000,000$	$2,000,000/19,187$ $= \text{USD}104,2$
Border price	$2,000,000 \times 0.927$ $= \text{VND}1,853,996$	$104,2 \times 0.927$ $= \text{USD}96,6$

Shadow Wage for Unskilled Labor

- ◆ Financial cost of labor: cost to the project
- ◆ Economic (shadow) cost of labor: cost to the society
- ◆ The sources of supply of unskilled labour for a project are usually the rural and informal sectors where underemployment is prevalent.
- ◆ Supply curve of unskilled labor is assumed to be horizontal (i.e. perfectly elastic).
- ◆ The shadow wage rate (SWR) is the supply price of labor, or the wage received by unskilled labors for agricultural or informal jobs.
- ◆ In order to attract unskilled labors, the financial wage (w^f) paid by the project is higher than what they receive without the project.
- ◆ Shadow wage rate factor (SWRF) or conversion factor for wages
$$\text{SWRF} = \text{SWR}/w^f (< 1)$$
- ❖ For skilled labor, similar approach may be adopted. The economic price is the wage that the labor received in the prior employment.
- ❖ If the skilled labor's prior or project wage is subject to tax, it has to be adjusted.

SWRF Used in Economic Analysis

Project	Year	Appraisal agency	SWRF
Tate & Lyle Nghe An Sugar Project	1999	IFC	0.50
Urban Water Supply Project	2004	WB	0.70
Long Thanh - Dau Giay Highway Project	2008	ADB	0.55
MD Sustainable Likelihood Integrated Climate Strength Project	2016	WB	0.80

Tate & Lyle Sugar Project

- ◆ Shadow wage rate factor (SWRF)

$$\text{SWRF} = 0.5$$

- ◆ Labor costs during construction (per year)

- ✓ Financial cost: \$3.0 million
- ✓ Economic cost: $\$3.0 \text{ million} \times 0.5 = \1.5 million

- ◆ Labor costs during operation (per year)

- ✓ Financial cost: \$1.5 million
- ✓ Economic cost: $\$1.5 \text{ million} \times 0.5 = \0.75 million

Economic Value of Land

- ◆ Land is a nontradable whose supply curve is perfectly inelastic.
- ◆ When the land market is not much distorted and there are active transactions, the market price of the land can be used as its economic value.

$$V = P_M$$

- ◆ When the land rental market exists and is competitive, the economic value of land can be calculated from the cash flow of annual rents.

$$V = r/(k - g)$$

- ◆ r is the rent in the first year
 - ◆ g is the annual real growth rate of the rent
 - ◆ k is the economic cost of capital.
- ◆ When the land market and land rental market do not exist, the economic value of land can be calculated from the net income generated from the land.

$$V = R/(k - g)$$

- ◆ R is the net income generated by the land in the first year.

Value of Land (compensation) in the HLD Expressway Project

- ◆ Nearly 280 hectares of land are used for the HCMC - Long Thanh - Dau Giay (HLD) Highway Project.
- ◆ Land compensation price is calculated based on the market prices of land in the wards of District 9, HCM City and the districts of Dong Nai, whose land is used for the project.
- ◆ On the financial side, the total compensation cost of land (2007 prices, excluding the cost of work-on-land compensation and provision cost): VND1842 billion.
- ◆ The average compensation rate: 658.000 VND/m².

A Survey of Land Market Prices (HLD Project)

Phu Huu Ward, D.9, HCMC	Official price	Market price
Building land		
- Nguyen Duy Trinh St., front	1,600,000	14,000,000
- 5m alley	800,000	7,000,000
- 3-5m alley	640,000	6,000,000
- 3m alley	480,000	5,000,000
- <3m alley	384,000	4,000,000
Agri. Land		
- Nguyen Duy Trinh St., front		
+ Perennial tree land	158,000	7,000,000
+ Annual tree land	135,000	6,500,000
- Byroad, front		
+ Perennial tree land	126,400	1,200,000
+ Annual tree land	108,000	1,000,000
- No road		
+ Perennial tree land	94,800	700,000
+ Annual tree land	81,000	500,000

A Survey of Land Market Prices (HLD Project)

Long Thanh Town, Dong N	Official price	Market price
Building land		
- Street 769, front		
- Position 1	2,000,000	3,000,000
- Position 2	900,000	2,000,000
- Position 3	400,000	1,400,000
- Position 4	110,000	800,000
Agri. Land		
- Street 769, front		
+ Perennial tree land	80,000	600,000
+ Annual tree land	80,000	500,000
- Byroad, front		
+ Perennial tree land	56,000	300,000
+ Annual tree land	56,000	200,000
- No road		
+ Perennial tree land	40,000	100,000
+ Annual tree land	40,000	80,000
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Tam An, Long Thanh, Dong Nai		
Building land	110,000	300,000
Agri. Land		
+ Perennial tree land	40,000	90,000
+ Annual tree land	40,000	80,000

Economic Value of Land: A Computation

- ◆ r is annual market rent, g is growth rate of r , k EOCK
- ◆ $V = r/(1+k) + r(1+g)/(1+k)^2 + r(1+g)^2/(1+k)^3 + \dots$ In perpetuity (1)
- ◆ $V^*(1+g)/(1+k) = r(1+g)/(1+k)^2 + r(1+g)^2/(1+k)^3 + \dots$ In perpetuity (2)
- ◆ Subtract (2) from (1)
 $V - V(1+g)/(1+k) = r/(1+k)$
 $V(1+k-1-g) = r$

 $V = r/(k-g)$