

PROJECT PLANNING AND MANAGEMENT

SOCIAL COST–BENEFIT ANALYSIS

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CHAPTER

10

Chapter Introduction

Financial analysis evaluates a project from the perspective of:

- Investors
- Project owners
- Lenders
- The operating organization

Social Cost–Benefit Analysis evaluates the project from the perspective of society as a whole.

Central Evaluation Question

Does the project increase the overall economic and social welfare of the country or community after considering all benefits, costs and external effects?

Learning Objectives

By the end of this chapter, students will be able to:

- Explain Social Cost–Benefit Analysis
- Distinguish financial and economic analysis
- Identify social costs and benefits
- Explain market-price distortions
- Convert financial prices into economic prices
- Distinguish traded and non-traded goods
- Apply shadow pricing
- Explain the shadow wage rate
- Estimate the economic value of foreign exchange
- Account for externalities
- Value environmental and social effects
- Calculate Economic Net Present Value
- Calculate the Economic Internal Rate of Return
- Apply the benefit–cost ratio
- Conduct distributional analysis
- Perform sensitivity and risk analysis
- Make an economic-feasibility recommendation

Chapter Roadmap

This chapter covers:

1. Meaning and purpose of SCBA
2. Financial versus social appraisal
3. Social costs and benefits
4. Market-price distortions
5. Economic and shadow prices
6. Traded and non-traded goods
7. Foreign-exchange valuation
8. Shadow wage rate
9. Externalities
10. Environmental and social valuation
11. Social discount rate
12. Economic investment criteria
13. Distributional effects
14. Risk and sensitivity analysis
15. Integrated case application

Opening Reflection

Discussion Question — A project has:

- Negative financial NPV
- High employment creation
- Significant public-health benefits
- Reduced pollution
- Improved access for poor households

Should the government reject the project because it is not financially profitable?

What Is Social Cost–Benefit Analysis?

Social Cost–Benefit Analysis is the systematic evaluation of a project's costs and benefits from the perspective of the entire economy or society.

Alternative Names

SCBA may also be called:

- Economic Cost–Benefit Analysis
- Economic Appraisal
- National Economic Analysis
- Social Appraisal
- Economic Evaluation

Purpose of SCBA

SCBA determines whether a project:

- Uses national resources efficiently
- Produces benefits greater than its economic costs
- Corrects market failures
- Generates positive externalities
- Supports national-development objectives
- Improves social welfare

Perspective of Analysis

Financial Analysis

Looks at cash flows received or paid by the project entity.

Economic Analysis

Looks at real resource benefits and costs to society.

Fundamental SCBA Principle

A project is economically desirable when:

$$\begin{array}{c} \text{Present Value of Social Benefits} \\ > \\ \text{Present Value of Social Costs} \end{array}$$

Social Welfare Perspective

SCBA considers effects on:

- Consumers
- Producers
- Workers
- Government
- Communities
- The environment
- Future generations
- The national economy

Why Financial Analysis Is Insufficient

Market prices may not reflect true social values because of:

- Taxes
- Subsidies
- Import duties
- Price controls
- Unemployment
- Monopoly
- Externalities
- Foreign-exchange restrictions

Projects Requiring SCBA

SCBA is particularly important for:

- Roads
- Hospitals
- Schools
- Water supply
- Irrigation
- Energy
- Environmental projects
- Large public infrastructure
- Projects receiving public support

Private Projects and SCBA

Private projects may also require economic analysis when they:

- Receive tax incentives
- Use scarce public resources
- Affect communities
- Generate significant pollution
- Require public guarantees
- Have major national-development effects

Financial Analysis

Financial analysis examines whether a project can:

- Generate revenue
- Cover operating costs
- Repay debt
- Provide investor returns
- Maintain liquidity
- Remain financially sustainable

Economic Analysis

Economic analysis examines whether the project:

- Creates net economic benefits
- Uses scarce resources efficiently
- Improves national income
- Corrects market failures
- Produces beneficial external effects
- Supports wider development

Main Differences

Financial Analysis	Economic Analysis
Project-owner perspective	Society's perspective
Market prices	Economic or shadow prices
Includes taxes and subsidies	Treats transfers separately
Focuses on financial cash flow	Focuses on real resource flow
Financial discount rate	Social discount rate
Financial NPV and IRR	Economic NPV and IRR

Financial versus Economic Benefits

Financial Benefit

Revenue received by the project.

Economic Benefit

Value created for society, whether or not the project receives payment.

Example: Public Road

The road authority may collect no toll revenue. However, the project may generate:

- Travel-time savings
- Vehicle-cost savings
- Fewer accidents
- Improved market access
- Regional-development benefits

Financial versus Economic Costs

Financial Cost

A payment made by the project.

Economic Cost

The value of the real resources used or opportunities forgone.

Example: Donated Land

Financial cost

ETB 0

Economic cost

The value of the land in its best alternative use

Transfer Payments

Transfer payments move purchasing power between members of society without directly using real resources. Examples:

- Taxes
- Subsidies
- Grants
- Social transfers
- Interest on domestic public debt

Treatment of Taxes

Project's Financial Perspective

Taxes are cash outflows.

Society's Perspective

Taxes are generally transfers from the project to government. They are normally excluded from resource-cost calculations.

Treatment of Subsidies

Project's Perspective

Subsidies are financial inflows or cost reductions.

Society's Perspective

Subsidies are transfers financed by taxpayers or government resources.

Import Duties

Import duties increase the financial cost of imported inputs. In economic analysis, the duty is generally excluded because it is a transfer to government.

Interest Payments

Interest paid to domestic lenders is generally treated as a financing transfer rather than a direct economic resource cost. The underlying capital resource is reflected in the project's investment cost.

Foreign Interest Payments

Interest and fees paid abroad may represent a foreign-exchange outflow and may require separate treatment in broader economic or fiscal analysis.

Depreciation

Depreciation is:

- An accounting expense
- Not a direct resource outflow
- Excluded from economic cash flows

The original investment cost is recorded when the resource is acquired.

Social Benefits

Social benefits are increases in welfare caused by the project. They may be:

- Direct
- Indirect
- Tangible
- Intangible
- Marketed
- Non-marketed
- Intended
- Unintended

Direct Benefits

Direct benefits arise from the project's principal outputs. Examples:

- Agricultural production
- Electricity supplied
- Patients treated
- Water delivered
- Travel time saved

Indirect Benefits

Indirect benefits occur through secondary effects. Examples:

- New businesses along a road
- Increased land productivity
- Better school attendance
- Reduced healthcare burden
- Increased investment

Tangible Benefits

Tangible benefits can be measured relatively easily in monetary terms. Examples:

- Increased production
- Reduced transport costs
- Higher income
- Lower operating costs
- Reduced crop losses

Intangible Benefits

Intangible benefits are difficult to measure directly. Examples:

- Improved dignity
- Social cohesion
- Reduced anxiety
- Greater security
- Cultural preservation
- Community empowerment

Social Costs

Social costs are reductions in welfare or uses of scarce resources caused by the project. Examples:

- Construction resources
- Operating inputs
- Pollution
- Displacement
- Accident risk
- Ecosystem loss
- Opportunity cost of land

Direct Costs

Direct costs include:

- Labour
- Materials
- Land
- Equipment
- Energy
- Maintenance
- Operating services

Indirect Costs

Indirect costs may include:

- Increased congestion
- Community disruption
- Environmental damage
- Pressure on public services
- Loss of traditional livelihoods
- Noise and health effects

Incremental Principle

Only costs and benefits caused by the project should be included.

$$\text{Incremental Effect} = \text{With-Project Situation} - \text{Without-Project Situation}$$

With-Project Scenario

The with-project scenario describes expected conditions when the project is implemented.

Without-Project Scenario

The without-project scenario describes what is expected to happen if the project is not implemented. It is not always the same as the current situation.

Current versus Without-Project Situation

Suppose road conditions are deteriorating. Without the project:

- Travel time may continue increasing.
- Vehicle costs may rise.

The proper comparison is not necessarily with today's conditions.

Avoiding Double Counting

Benefits should not be counted more than once. Do not count both:

- Increased property value
- Entire present value of the same transport-time savings

when the property value already reflects those savings.

What Is a Market Failure?

A market failure occurs when market prices and private decisions do not produce an efficient allocation of resources.

Main Sources of Market Failure

- Externalities
- Public goods
- Monopoly
- Information asymmetry
- Unemployment
- Price controls
- Distortionary taxes
- Foreign-exchange controls

Public Goods

Public goods are generally non-rival and non-excludable. Examples:

- Street lighting
- National defence
- Flood protection
- Public-health surveillance

Externalities

An externality is a cost or benefit imposed on third parties and not fully reflected in market transactions.

Positive Externality

Examples:

- Vaccination reduces disease transmission
- Education benefits society
- Reforestation improves watershed protection
- Research produces knowledge spillovers

Negative Externality

Examples:

- Air pollution
- Water contamination
- Noise
- Traffic congestion
- Greenhouse-gas emissions

Monopoly Distortion

A monopolist may charge a price above the economic resource cost. The market price may therefore overstate the real cost to society.

Unemployment Distortion

Where unemployment is high, the market wage may exceed the opportunity cost of employing additional labour. This may justify a shadow wage lower than the financial wage.

Price Controls

Controlled prices may differ from:

- Supply cost
- Demand value
- Import-parity price
- Export-parity price

Economic analysis should adjust distorted prices.

What Is an Economic Price?

An economic price represents the opportunity cost or social value of a good, service or resource.

What Is a Shadow Price?

A shadow price is an estimated economic value used when the observed market price does not reflect the true social opportunity cost.

When Shadow Prices Are Needed

Shadow prices may be needed for:

- Foreign exchange
- Labour
- Land
- Public services
- Environmental resources
- Controlled commodities
- Subsidized inputs

Financial-to-Economic Conversion

A simplified conversion is:

$$\text{Economic Value} = \text{Financial Value} \times \text{Conversion Factor}$$

Conversion Factor

$$\text{Conversion Factor} = \text{Economic Price} \div \text{Financial Price}$$

Conversion-Factor Example

Financial cost

ETB 10,000,000

Conversion factor

0.85

Economic cost

ETB 8,500,000

Standard Conversion Factor

A Standard Conversion Factor may be used to convert the domestic-currency value of certain non-traded goods into approximate economic values.

Specific Conversion Factors

Specific conversion factors may be applied separately to:

- Construction
- Transport
- Electricity
- Skilled labour
- Unskilled labour
- Agricultural products
- Machinery

Opportunity-Cost Principle

The economic cost of a resource equals the value of the benefit forgone from its best alternative use.

Economic Cost of Land

The economic cost of land may be based on:

- Agricultural production forgone
- Rental value
- Market value adjusted for distortions
- Alternative development value
- Environmental services lost

Sunk Costs in SCBA

Past costs that cannot be changed by the current decision are excluded.
However, assets already owned may have relevant opportunity costs.

Traded Goods

Traded goods are goods that are:

- Imported
- Exported
- Potentially importable
- Potentially exportable

Non-Traded Goods

Non-traded goods are not normally traded internationally because of:

- High transport costs
- Local-service characteristics
- Legal restrictions
- Physical limitations
- Limited markets

Border-Price Principle

Traded goods are generally valued using border prices because these reflect the opportunity cost to the national economy.

Import-Parity Price

$$\begin{aligned} \text{Import-Parity Price} = & \\ & \text{CIF Border Price} \\ & + \text{Economic Inland Transport} \\ & + \text{Handling} \end{aligned}$$

Taxes and import duties are generally excluded.

CIF Price

CIF means:

- Cost
- Insurance
- Freight

It represents the value of an imported good delivered to the national border or port.

Import-Parity Example

CIF value

ETB 20 million

Economic inland transport and handling

ETB 2 million

Economic import cost

ETB 22 million

Export-Parity Price

$$\begin{aligned} \text{Export-Parity Value} = & \\ & \text{FOB Border Price} \\ & - \text{Economic Transport to Border} \\ & - \text{Handling} \end{aligned}$$

FOB Price

FOB means:

- Free on Board

It represents the value of an exported product at the national border or port before international freight and insurance.

Export-Parity Example

FOB export price

ETB 30 million

Transport and handling to the border

ETB 3 million

Economic output value

ETB 27 million

Import Substitution

If a project replaces imports, its economic benefit may be measured by the foreign-exchange cost of the imports avoided, adjusted for domestic distribution differences.

Export Generation

If the project creates exports, the economic benefit may be based on net foreign-exchange earnings at border prices.

Non-Traded Input Valuation

Non-traded inputs may be valued using:

- Opportunity cost
- Decomposition into traded and non-traded components
- Specific conversion factors
- Standard Conversion Factor

Decomposition Method

A construction cost may be decomposed into:

- Imported materials
- Domestic traded materials
- Skilled labour
- Unskilled labour
- Taxes
- Contractor profit
- Other services

Each component may receive a separate economic adjustment.

Why Foreign Exchange May Need Adjustment

The official exchange rate may not reflect the economic scarcity of foreign exchange because of:

- Exchange controls
- Import restrictions
- Tariffs
- Subsidies
- Parallel-market premiums
- Foreign-exchange shortages

Shadow Exchange Rate

The shadow exchange rate estimates the economic value of foreign currency to the national economy.

Shadow Exchange-Rate Factor

$$\text{SERF} = \text{Shadow Exchange Rate} \div \text{Official Exchange Rate}$$

Foreign-Exchange Adjustment Example

Official exchange rate

ETB 100 / \$

Shadow exchange rate

ETB 120 / \$

SERF

1.20

A foreign-exchange requirement of \$1 million has an economic value of ETB 120 million.

Foreign-Exchange Benefits

Economic foreign-exchange benefits may arise from:

- Export earnings
- Import substitution
- Reduced foreign consultancy
- Local spare-parts production
- Lower imported-fuel requirements

Foreign-Exchange Costs

Economic costs may arise from:

- Imported equipment
- Imported raw materials
- Foreign technical services
- Foreign licences
- Overseas maintenance
- Imported energy

What Is the Shadow Wage Rate?

The shadow wage rate is the economic opportunity cost of employing labour in the project.

Market Wage versus Shadow Wage

Market Wage

The financial payment to the worker.

Shadow Wage

Reflects the economic value of production or income forgone elsewhere.

When Shadow Wage May Be Lower

The shadow wage may be lower than the market wage when:

- Unemployment is high
- Labour is seasonally underemployed
- Workers have low alternative productivity
- Wages are institutionally fixed above opportunity cost

When Shadow Wage May Be Higher

The shadow wage may exceed the observed wage when:

- Skilled workers are scarce
- Training costs are significant
- Recruitment removes workers from productive employment
- Migration creates social costs

Shadow Wage Formula

A simplified approach is:

$$\text{Economic Labour Cost} = \text{Financial Wage} \times \text{Shadow Wage Factor}$$

Shadow Wage Example

Financial wage bill

ETB 20 million

Shadow wage factor

0.70

Economic labour cost

ETB 14 million

Skilled and Unskilled Labour

Different conversion factors may be used for:

- Skilled labour
- Semi-skilled labour
- Unskilled labour
- Foreign specialists
- Seasonal workers

Employment Is Not a Free Benefit

The wage payment should not automatically be counted as a social benefit. Employment benefits may arise through:

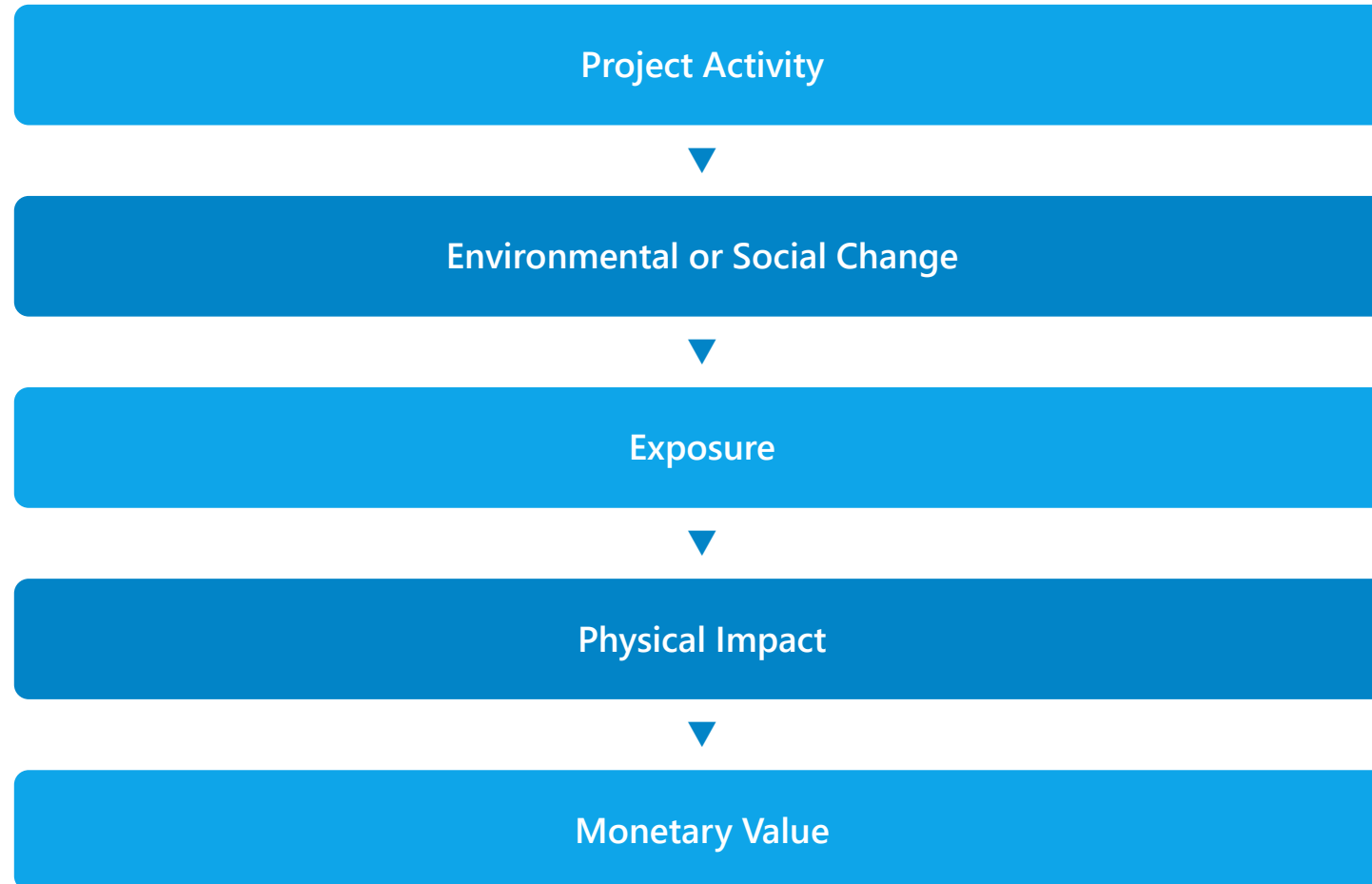
- Income above opportunity cost
- Skills development
- Reduced unemployment
- Social stability
- Distributional improvement

Externality Valuation

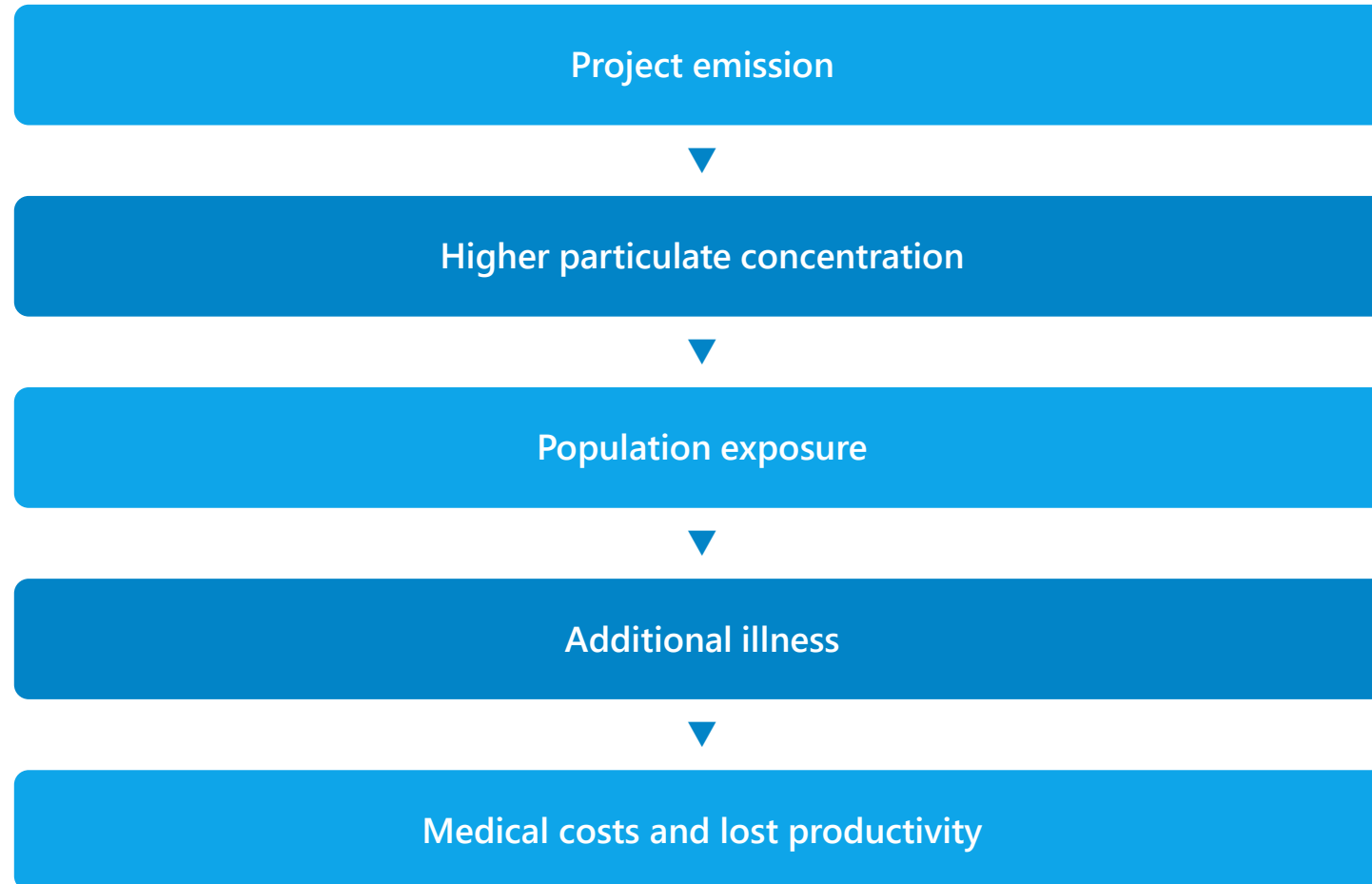
External effects should be:

1. Identified
2. Quantified physically
3. Valued monetarily where feasible
4. Included in economic cash flows

Physical Impact Pathway



Example: Air Pollution



Positive-Externality Example

An irrigation project may produce:

- Increased crop production
- Reduced drought vulnerability
- Improved food security
- Increased rural employment
- Regional market development

Negative-Externality Example

A manufacturing project may generate:

- Air emissions
- Wastewater
- Noise
- Traffic congestion
- Health risks
- Ecosystem damage

Valuation Approaches

Externalities may be valued through:

- Market-price method
- Avoided-cost method
- Replacement-cost method
- Productivity-change method
- Human-capital method
- Stated-preference methods
- Revealed-preference methods

Avoided-Cost Method

The value of a benefit is estimated from the costs avoided because of the project. Examples:

- Avoided medical treatment
- Avoided flood damage
- Avoided transport cost
- Avoided water-treatment cost

Replacement-Cost Method

The value of a lost resource is estimated using the cost of replacing or restoring it. Examples:

- Replacing water infrastructure
- Replanting forest
- Restoring soil
- Rebuilding community assets

Productivity-Change Method

Environmental changes may affect production. Examples:

- Water pollution reduces fish output
- Soil erosion reduces crop yields
- Irrigation increases agricultural production
- Improved air quality reduces lost workdays

Human-Capital Approach

This method may value health effects through:

- Medical expenditure
- Lost income
- Lost working days
- Reduced productivity

It may not capture the full welfare value of health and life.

Willingness to Pay

Willingness to pay estimates how much people value obtaining a benefit or avoiding a loss.

Contingent Valuation

Contingent valuation uses surveys to ask individuals about their willingness to pay for non-market benefits. Examples:

- Cleaner water
- Protected biodiversity
- Improved public safety
- Reduced pollution

Travel-Cost Method

The travel-cost method estimates the value of recreational or natural sites using visitors' travel expenses and time.

Hedonic-Pricing Method

Hedonic pricing estimates the value of environmental attributes through differences in:

- Property prices
- Wages
- Rental values

Benefit Transfer

Benefit transfer applies valuation estimates from existing studies to a similar new context. It is less costly but requires careful adjustment.

Valuing Carbon Emissions

Climate impacts may be valued using:

- Carbon-market prices
- Social cost of carbon
- Abatement cost
- Regulatory values

Intangible Effects

Where monetary valuation is unreliable:

- Report the effect separately
- Quantify physical indicators
- Use multicriteria analysis
- Conduct qualitative assessment
- Avoid assigning false precision

Output-Valuation Principle

The economic value of output depends on what the project's production does in the economy. It may:

- Replace imports
- Generate exports
- Increase domestic consumption
- Divert resources from another use
- Improve service quality

Incremental Consumption

If project output increases consumption, benefits may include:

- Consumer willingness to pay
- Consumer surplus
- Improved service access
- Reduced scarcity

Consumer Surplus

Willing to Pay

What consumers are willing to pay.

Actually Pay

What they actually pay.

Producer Surplus

Revenue Received

Revenue received by the producer.

Variable Economic Cost

Variable economic cost of production.

Rule of Half

When a project causes a price change and increases consumption, the benefit to new consumers may sometimes be approximated using the rule of half.

$$\text{Benefit to New Demand} \approx \frac{1}{2} (P_0 - P_1)(Q_1 - Q_0)$$

Existing and Generated Demand

Existing Demand

Users already consuming the good or service.

Generated Demand

Additional consumption caused by lower cost, better access or increased supply.

Cost-Saving Benefit

A project may create benefits by reducing the economic cost of an existing activity. Examples:

- Lower vehicle-operating cost
- Reduced electricity losses
- Reduced crop spoilage
- Reduced treatment cost
- Lower travel time

Time-Saving Benefits

Time savings may be valued using:

- Wage rates
- Productivity value
- Different values for work and non-work time
- User-group-specific assumptions

Why Discount Social Cash Flows?

Economic benefits and costs occurring at different times must be converted into comparable present values.

Social Discount Rate

The social discount rate reflects society's valuation of present benefits and costs relative to future benefits and costs.

Financial versus Social Discount Rate

Financial Discount Rate

Reflects investor opportunity cost and financial risk.

Social Discount Rate

Reflects the economic opportunity cost of capital or social time preference.

Social Time Preference

Current Consumption

Consumption enjoyed today.

Future Consumption

Consumption deferred to the future.

Economic Opportunity Cost of Capital

This approach reflects the return forgone when resources are diverted from alternative investments.

Discount-Rate Selection

The selected rate should be:

- Consistent with national guidance
- Appropriate for the project type
- Applied consistently
- Tested through sensitivity analysis

Present Value of Economic Benefit

$$PV(B_t) = B_t \div (1 + r_s)^t$$

Where r_s is the social discount rate.

Present Value of Economic Cost

$$PV(C_t) = C_t \div (1 + r_s)^t$$

Long-Term Projects

The choice of discount rate is especially important for:

- Climate projects
- Forest projects
- Dams
- Education
- Public health
- Projects affecting future generations

Discounting and Future Generations

A high discount rate gives relatively low present value to long-term future benefits and costs. This may raise ethical and policy concerns.

Main Economic Criteria

SCBA commonly applies:

- Economic Net Present Value
- Economic Internal Rate of Return
- Economic Benefit–Cost Ratio
- Net Benefit–Investment Ratio
- Switching values

Economic Net Present Value

$$ENPV = \sum (EB_t - EC_t) \div (1 + r_s)^t$$

EB_t = economic benefits · EC_t = economic costs · r_s = social discount rate

ENPV Decision Rule

- Accept if $ENPV > 0$
- Reject if $ENPV < 0$
- Indifferent if $ENPV = 0$

Meaning of Positive ENPV

A positive ENPV indicates that the project is expected to increase social welfare after accounting for the opportunity cost of resources.

Economic Internal Rate of Return

The Economic Internal Rate of Return is the discount rate that makes ENPV equal to zero.

$$0 = \sum (EB_t - EC_t) \div (1 + EIRR)^t$$

EIRR Decision Rule

Accept the project when:

$$\text{EIRR} > \text{Required Social Discount Rate}$$

Benefit–Cost Ratio

$$\text{BCR} = \text{PV of Economic Benefits} \div \text{PV of Economic Costs}$$

BCR Decision Rule

- Accept if $BCR > 1$
- Reject if $BCR < 1$
- Indifferent if $BCR = 1$

Economic-Criteria Example

Present value of benefits

ETB 600 million

Present value of costs

ETB 450 million

ENPV

$600 - 450 = \text{ETB } 150 \text{ million}$

BCR

$600 \div 450 = 1.33$

Interpretation

The project generates:

- ETB 150 million in net economic value
- ETB 1.33 in present economic benefits for each ETB 1.00 of present economic cost

Net Benefit–Investment Ratio

A Net Benefit–Investment Ratio may compare:

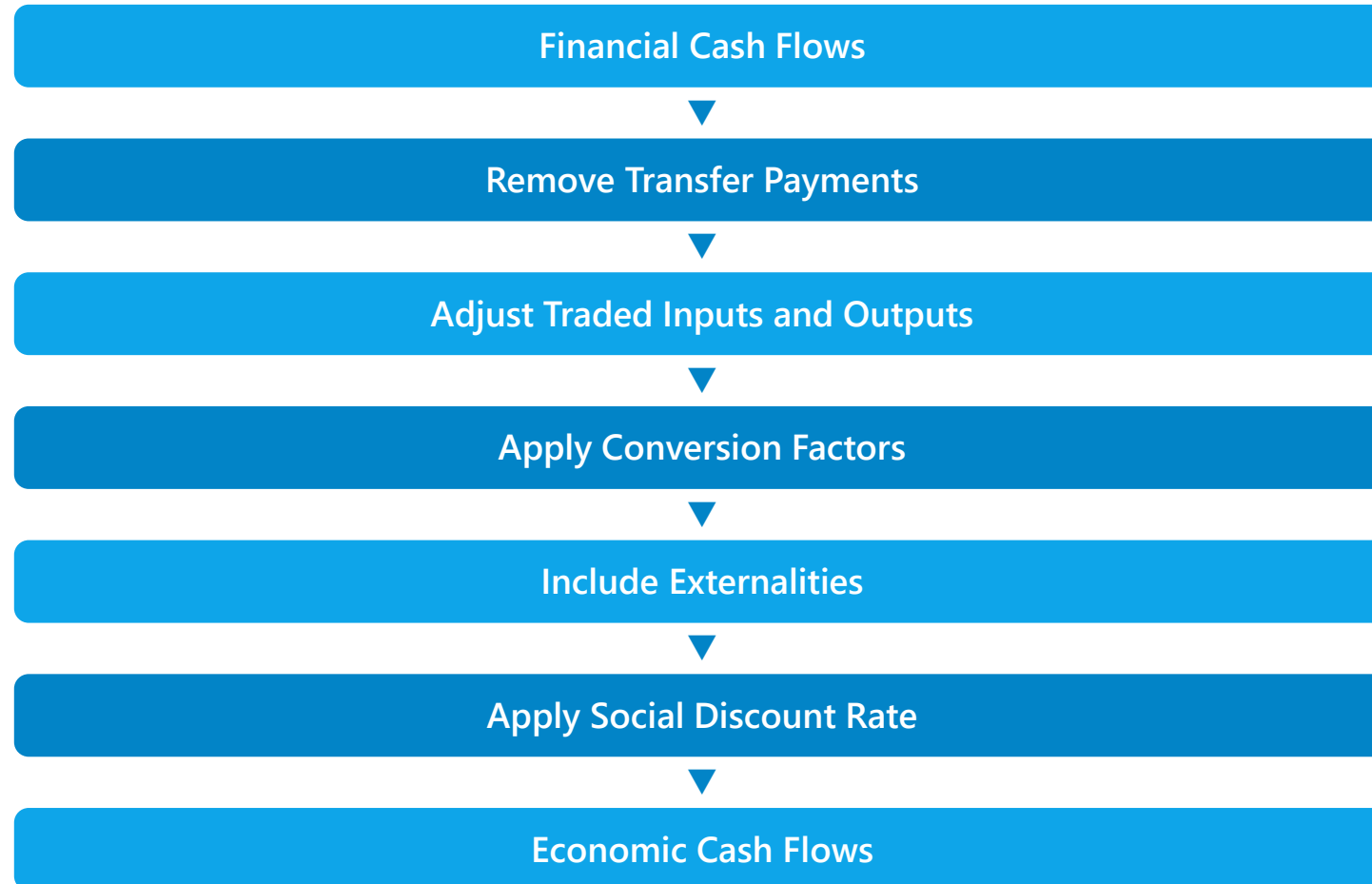
- Present value of net operating benefits
- Present value of investment costs

It can support project ranking under limited capital.

Economic Payback

Economic payback estimates the time required for cumulative economic benefits to recover economic investment costs. It should not replace ENPV.

Conversion Process



Step 1 — Start with Financial Estimates

Begin with:

- Investment cost
- Operating costs
- Revenue
- Working capital
- Residual value
- Project life

Step 2 — Remove Transfers

Remove or separately treat:

- Indirect taxes
- Import duties
- Subsidies
- Domestic interest
- Grants
- Other pure transfers

Step 3 — Revalue Traded Items

Use:

- Import-parity prices
- Export-parity prices
- Shadow exchange rates
- Border-price adjustments

Step 4 — Revalue Non-Traded Inputs

Apply:

- Opportunity costs
- Specific conversion factors
- Standard Conversion Factor
- Shadow wage factors

Step 5 — Add External Benefits

Examples:

- Time savings
- Health improvements
- Reduced pollution
- Knowledge spillovers
- Employment-related welfare effects
- Ecosystem benefits

Step 6 — Add External Costs

Examples:

- Pollution
- Displacement
- Congestion
- Accident risk
- Carbon emissions
- Biodiversity loss
- Community disruption

Step 7 — Calculate Economic Indicators

Calculate:

- ENPV
- EIRR
- BCR
- Sensitivity results
- Distributional impacts

Conversion Table

Financial Item	Financial Treatment	Economic Treatment
Import duty	Project cost	Transfer — remove
Subsidy	Project benefit	Transfer — remove
Unskilled labour	Market wage	Shadow wage
Imported machinery	Market cost	Border price
Pollution	Often omitted	Add external cost
Health benefit	May not be revenue	Add economic benefit

Efficiency versus Distribution

A project may produce positive total economic benefits but distribute them unevenly. SCBA should therefore consider:

- Who gains
- Who loses
- When benefits occur
- Whether vulnerable groups benefit

Stakeholder Groups

Distributional analysis may cover:

- Poor households
- Wealthier households
- Workers
- Consumers
- Producers
- Government
- Local communities
- Foreign investors

Beneficiary Incidence

Beneficiary incidence examines which groups receive the project's services or benefits.

Cost Incidence

Cost incidence examines which groups bear:

- Taxes
- User fees
- Displacement
- Pollution
- Resource loss
- Opportunity costs

Distributional Matrix

Stakeholder	Benefits	Costs	Net Effect
Consumers	High	User fees	Positive
Workers	Employment	Time and effort	Positive
Nearby community	Infrastructure	Pollution	Mixed
Government	Tax and development	Subsidy	Mixed

Poverty Impact

A project may affect poverty through:

- Employment
- Income
- Access to services
- Prices
- Land acquisition
- Health
- Resilience
- Distribution of benefits

Social Weights

Some approaches assign greater weight to benefits received by lower-income groups. This reflects distributional or equity objectives.

Distribution-Weighted Benefit

$$\text{Weighted Benefit}_i = \text{Benefit}_i \times \text{Social Weight}_i$$

Distributional Caution

Social weights require:

- Clear policy justification
- Transparent assumptions
- Consistent application
- Sensitivity analysis

Employment Distribution

Employment analysis should consider:

- Number of jobs
- Job duration
- Wage levels
- Gender distribution
- Local employment
- Skill development
- Job quality

Economic and Fiscal Analysis

A project may be economically worthwhile but create significant pressure on the government budget. Fiscal analysis should therefore accompany SCBA.

Fiscal Benefits

Government may receive:

- Taxes
- Fees
- Dividends
- Concession payments
- Reduced public expenditure
- Increased future tax base

Fiscal Costs

Government may incur:

- Capital grants
- Subsidies
- Operating support
- Guarantees
- Compensation
- Maintenance expenditure
- Tax exemptions

Fiscal Sustainability

Assess whether government can finance:

- Construction commitments
- Operating subsidies
- Maintenance
- Debt guarantees
- Future replacement
- Contingent liabilities

Contingent Liabilities

Contingent liabilities may arise from:

- Loan guarantees
- Minimum-revenue guarantees
- Public–private partnerships
- Exchange-rate guarantees
- Disaster obligations
- Contract termination clauses

Economic-Appraisal Uncertainty

Economic results depend on uncertain assumptions concerning:

- Demand
- Prices
- Project cost
- Timing
- Externalities
- Discount rate
- Climate conditions
- Beneficiary response

Sensitivity Analysis

Sensitivity analysis measures how economic indicators change when one key variable changes.

Key Sensitivity Variables

Test changes in:

- Investment cost
- Operating cost
- Economic benefits
- Implementation delay
- Project life
- Social discount rate
- External-cost assumptions
- Demand growth

Sensitivity Example

Base ENPV: ETB 150 million. Test:

- Costs increase by 20%
- Benefits decline by 15%
- Project is delayed by two years
- Social discount rate increases

Switching Value

A switching value identifies the percentage change in a variable required to reduce ENPV to zero.

Change in a variable that reduces ENPV to 0

Switching-Value Example

If project benefits can decline by 25% before ENPV becomes zero, the benefit switching value is 25%.

Scenario Analysis

Optimistic

Higher benefits and lower costs.

Base

Most realistic assumptions.

Pessimistic

Lower benefits, higher costs and delays.

Probability Analysis

Where data permit, probability distributions may be assigned to uncertain variables and used to estimate:

- Expected ENPV
- Probability of negative ENPV
- Range of possible outcomes

Risk-Adjusted Decision

A project with positive base-case ENPV may still require redesign when:

- Downside risk is severe
- Benefits depend on one uncertain factor
- Irreversible impacts are possible
- Poor groups bear major losses

Measurement Difficulties

Some effects are difficult to quantify, including:

- Cultural heritage
- Human dignity
- Social cohesion
- Biodiversity
- Security
- Psychological well-being

Forecasting Limitations

Long-term forecasts may be affected by:

- Technology
- Climate change
- Policy changes
- Population shifts
- Behavioural responses
- Economic shocks

Distributional Limitations

A positive ENPV does not guarantee that:

- Every stakeholder gains
- Poor households benefit
- Compensation is adequate
- Benefits are fairly distributed

Ethical Limitations

Monetizing certain effects may create ethical concerns, particularly when valuing:

- Human life
- Cultural loss
- Displacement
- Irreplaceable ecosystems
- Future-generation impacts

False Precision

A detailed monetary estimate may appear accurate even when it is based on uncertain assumptions. SCBA should present:

- Ranges
- Sensitivities
- Qualitative impacts
- Data limitations

SCBA and Decision-Making

SCBA should inform — not mechanically replace — judgment. Decision-makers should also consider:

- Rights
- Legal requirements
- Strategic priorities
- Environmental limits
- Institutional capacity
- Distributional fairness

MBA Case Exercise

Proposed Irrigation and Agro-Processing Project. The project includes:

- Irrigation infrastructure
- Agricultural production
- Agro-processing
- Rural roads
- Market facilities

Financial investment: ETB 1.2 billion

Financial Findings

Assume:

- Financial NPV: ETB 50 million
- Financial IRR: 13%
- Required financial return: 15%

The project appears financially unattractive to private investors.

Potential Economic Benefits

The project may produce:

- Higher crop production
- Reduced post-harvest loss
- Employment
- Foreign-exchange savings
- Improved food security
- Reduced transport costs
- Increased resilience

Potential Economic Costs

The project may cause:

- Land acquisition
- Water-use conflicts
- Ecosystem disturbance
- Construction disruption
- Public infrastructure costs
- Greenhouse-gas emissions

Financial-to-Economic Adjustment

Assume financial investment includes:

- Taxes and duties: ETB 150 million
- Subsidies: ETB 50 million
- Unskilled labour: ETB 200 million
- Imported machinery: ETB 300 million

Remove Taxes and Duties

Taxes and duties are transfers. Adjusted cost:

$$1.2 \text{ billion} - 150 \text{ million} = \text{ETB } 1.05 \text{ billion}$$

Further adjustments are still required.

Adjust Unskilled Labour

Unskilled labour financial cost

ETB 200 million

Shadow wage factor

0.70

Economic labour cost

$200 \times 0.70 = \text{ETB } 140 \text{ million}$

Economic-cost reduction

ETB 60 million

Adjust Imported Machinery

Imported machinery

ETB 300 million

Shadow exchange-rate factor

1.10

Economic cost

$300 \times 1.10 = \text{ETB } 330 \text{ million}$

Economic-cost increase

ETB 30 million

Include External Benefits

Assume present values of additional benefits:

- Transport savings: ETB 120 million
- Reduced crop losses: ETB 180 million
- Health and nutrition benefits: ETB 100 million
- Climate-resilience benefits: ETB 80 million

Total: ETB 480 million

Include External Costs

Assume present values of external costs:

- Ecosystem loss: ETB 60 million
- Resettlement effects: ETB 50 million
- Water-use impact: ETB 40 million

Total: ETB 150 million

Net External Benefit

$$\text{Net External Benefit} = 480 - 150 = \text{ETB } 330 \text{ million}$$

Economic-Appraisal Interpretation

The project may have weak financial returns but strong economic and social benefits. It may justify:

- Public financing
- Concessional finance
- A grant
- A public–private partnership
- Targeted subsidy

Economic Cash-Flow Exercise

Students should prepare an economic cash-flow table showing:

- Economic investment cost
- Economic operating cost
- Agricultural benefits
- Transport benefits
- Foreign-exchange benefits
- Environmental costs
- Residual value

ENPV Exercise

PV of total economic benefits

ETB 2.10 billion

PV of economic costs

ETB 1.55 billion

ENPV

$2.10 - 1.55 = \text{ETB } 550 \text{ million}$

BCR Exercise

$$\text{BCR} = 2.10 \div 1.55 \approx 1.35$$

Economic Recommendation

The project is economically feasible because:

- ENPV is positive
- BCR exceeds 1.00
- Wider economic benefits are substantial

Approval should remain conditional on effective management of environmental, social and fiscal risks.

Distributional Exercise

Students should identify effects on:

- Smallholder farmers
- Commercial farmers
- Women
- Landless labourers
- Displaced households
- Consumers
- Government
- Private investors

Risk Exercise

Test:

- Construction cost increases by 25%
- Agricultural benefits decline by 20%
- Project completion is delayed by two years
- Social discount rate increases
- Environmental costs double

Group Assignment

Each group should prepare:

1. Financial and economic perspective comparison
2. With- and without-project scenarios
3. Social-cost and benefit inventory
4. Transfer-payment adjustments
5. Traded-goods valuation
6. Non-traded-goods conversion
7. Shadow wage calculation
8. Foreign-exchange adjustment
9. Externality valuation
10. Economic cash-flow statement
11. ENPV
12. EIRR
13. BCR
14. Distributional analysis
15. Sensitivity analysis
16. Final recommendation

Common SCBA Mistakes

- Using financial prices without adjustment
- Treating taxes as real resource costs
- Counting subsidies as economic benefits
- Ignoring opportunity costs
- Excluding externalities
- Counting employment wages as a full social benefit
- Ignoring the without-project scenario
- Double counting benefits
- Using an unsupported social discount rate

Common Valuation Mistakes

- Using import prices including duties
- Using export prices without deducting domestic transport
- Applying one conversion factor to all inputs
- Ignoring foreign-exchange scarcity
- Using market wages where labour markets are distorted
- Assigning precise values to highly uncertain impacts

SCBA Checklist

Confirm that:

- The perspective is society as a whole
- With- and without-project scenarios are defined
- Costs and benefits are incremental
- Transfer payments are removed
- Traded goods use border prices
- Non-traded goods are converted appropriately
- Labour uses suitable shadow values
- Externalities are included
- Distributional effects are disclosed
- Social discount rate is justified
- ENPV, EIRR and BCR are calculated
- Sensitivity analysis is completed

Knowledge Check

1. What is Social Cost–Benefit Analysis?
2. How does SCBA differ from financial analysis?
3. What is a transfer payment?
4. What is a shadow price?
5. What is an import-parity price?
6. What is an export-parity price?
7. What is a shadow exchange rate?
8. What is the shadow wage rate?
9. What is an externality?
10. What is the social discount rate?
11. How is ENPV calculated?
12. What does the BCR measure?
13. Why is distributional analysis required?
14. What is a switching value?

Knowledge Check Answers

1. Evaluation of project costs and benefits from society's perspective
2. SCBA uses economic values and includes external effects
3. Movement of purchasing power without direct use of real resources
4. Estimated economic value where market price is distorted
5. Economic cost of an imported good delivered to the project
6. Economic value of an exported good net of domestic delivery costs
7. Economic value of foreign currency
8. Economic opportunity cost of employing labour
9. Effect imposed on a third party outside the market transaction
10. Rate used to discount future social benefits and costs
11. Present value of economic benefits minus economic costs
12. Present economic benefits per unit of present economic cost
13. Total benefits may be distributed unevenly
14. Change in a variable required to make ENPV equal to zero

Individual Assignment

Select one proposed public or development project and prepare:

- Project description
- Financial-versus-economic comparison
- With-project scenario
- Without-project scenario
- Economic-benefit inventory
- Economic-cost inventory
- Transfer-payment adjustments
- Traded-input and output valuation
- Shadow wage calculation
- Foreign-exchange adjustment
- Externality valuation
- Economic cash-flow statement
- ENPV
- EIRR
- Benefit–Cost Ratio
- Distributional analysis
- Fiscal-impact analysis
- Sensitivity and scenario analysis
- Final economic-feasibility recommendation

Chapter Summary

- SCBA evaluates projects from the perspective of society.
- Financial prices may differ from economic values.
- Taxes, subsidies and many domestic financing flows are transfers.
- Economic costs represent opportunity costs.
- Economic benefits include direct and external welfare gains.
- Traded goods are generally valued using border prices.
- Non-traded goods may require conversion factors.
- Foreign exchange may require a shadow exchange rate.
- Labour may require a shadow wage rate.
- Externalities should be identified, quantified and valued where feasible.
- The social discount rate converts future economic effects to present values.
- ENPV measures net economic value creation.
- EIRR measures the project's economic rate of return.
- BCR compares the present value of economic benefits and costs.
- Distributional analysis identifies who gains and who loses.
- Sensitivity and scenario analysis test the robustness of economic feasibility.

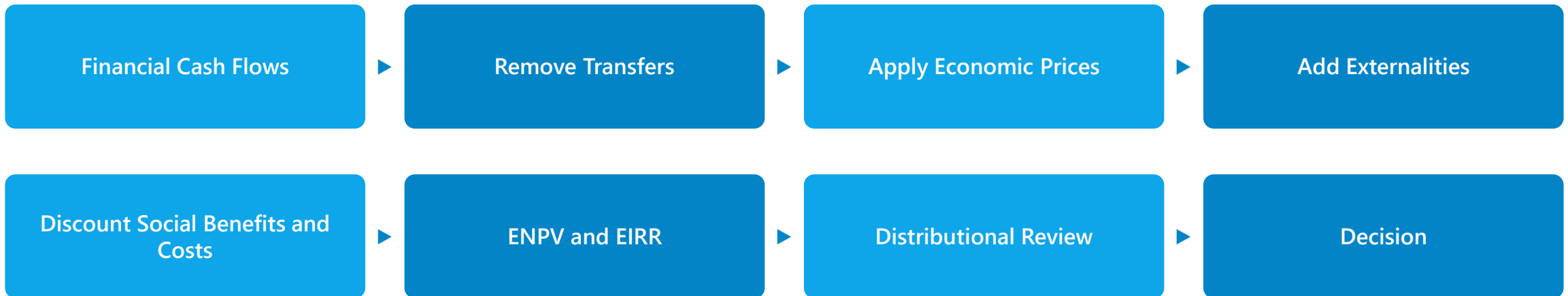
Key Message

Financial analysis

asks whether a project is profitable to its owners.

Social Cost–Benefit Analysis

asks whether the project makes society better off.



Next Chapter Preview

NEXT CHAPTER — Project Risk Analysis and Management. The next chapter will cover:

- Meaning of project risk
- Risk identification
- Risk categories
- Qualitative risk assessment
- Probability–impact analysis
- Quantitative risk analysis
- Expected Monetary Value
- Sensitivity analysis
- Scenario analysis
- Risk-response planning
- Risk registers
- Monitoring and escalation

THANK YOU

Questions and Discussion

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CLOSING MESSAGE

A project should not be approved merely because it generates financial returns. It should also demonstrate that the economic and social benefits created for society exceed the real opportunity costs, environmental effects and social burdens associated with its implementation.