New Sources of Water for Energy Development and Growth: Interbasin Transfers: A Short Course (Summer Conference, June 7-10) 1982

6-7-1982

Assessing Feasibility of a Project

Michael D. Yokell

Michael D. Yokell, *Assessing Feasibility of a Project*, *in* NEW SOURCES OF WATER FOR ENERGY DEVELOPMENT AND GROWTH: INTERBASIN TRANSFERS (Natural Res. Law Ctr., Univ. of Colo. Sch. of Law 1982).

ASSESSING FEASIBILITY OF A PROJECT

Michael D. Yokell
Economist, Energy & Resource Consultants, Inc., Boulder

New Sources of Water for Energy
Development and Growth: Interbasin Transfers

a short course sponsored by the
Natural Resources Law Center
University of Colorado School of Law
June 7-10, 1982

F

ECONOMICS OF INTERBASIN TRANSFERS OF WATER: A SHORT COURSE

PRESENTED BY:

MICHAEL D. YOKELL
PRINCIPAL, ECONOMICS
ENERGY AND RESOURCE CONSULTANTS, INC.
BOULDER, COLORADO
(303) - 449 - 5515

OVERVIEW

- Fundamentals of Benefit Cost Analysis (BCA)
- Special Considerations Stemming from Interbasin Water Transfers
- Historical and Institutional Requirements of BCA for Water System Planning in the U.S.

RECOMMENDED TEXTS:

HIRSCHLEIFER, J. ET. AL. WATER SUPPLY ECONOMICS, TECHNOLOGY & POLICY, UNIVERSITY OF CHICAGO, 1969.

HOWE, C. ET AL. INTERBASIN TRANSFERS OF WATER, JOHNS HOPKINS, 1971.

JAMES, L. ET AL. ECONOMICS OF WATER RESOURCES PLANNING, MCGRAW HILL, 1971.

RECOMMENDED JOURNALS:

- AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS
  (AMERICAN ASSOCIATION OF AGRICULTURAL ECONOMISTS)

- JOURNAL OF ENVIRONMENTAL ECONOMICS AND MANAGEMENT
  (AMERICAN ASSOCIATION OF ENVIRONMENTAL ECONOMISTS)

- LAND ECONOMICS
  (UNIVERSITY OF WISCONSIN)

- NATURAL RESOURCES JOURNAL
  (UNIVERSITY OF NEW MEXICO LAW SCHOOL)

- WATER RESOURCES RESEARCH
  (THE AMERICAN GEOPHYSICAL UNION) *BEST

Civil Engineering + Economics

OTHER SOURCES OF INFORMATION:

- AMERICAN SOCIETY OF CIVIL ENGINEERS
- AMERICAN GEOPHYSICAL UNION
- ARMY CORPS OF ENGINEERS
  (U.S. ARMY)
- BUREAU OF RECLAMATION
  (U.S. DOI)
- SOIL CONSERVATION SERVICE
  (U.S. DA)

FUNDAMENTALS OF BENEFIT COST ANALYSIS (BCA)

- WHOSE BENEFITS, WHOSE COSTS?
- CATEGORIZATION OF BENEFITS, COSTS
- MEASUREMENT OF BENEFITS, COSTS
- DISCOUNTING
- WHEN IS A PROJECT ECONOMICALLY JUSTIFIED?

WHOSE BENEFITS, WHOSE COSTS?

- NATIONAL ECONOMIC BENEFITS
- REGIONAL BENEFITS
- LOCAL BENEFITS
- INTEREST GROUP BENEFITS (E.G. FARMERS, RANCHERS)
- COMPANY SPECIFIC BENEFITS (E.G. A PARTICULAR FARM, MINE)

CATEGORIZATION OF BENEFITS, COSTS

- By Purpose
  - Flood Control
  - Drainage
  - Water Supply
    - Municipal
    - Industrial
    - Agricultural
  - Power
  - Navigation
  - Water Quality Control
  - Recreation
  - Fish & Wildlife Enhancement

  Most interbasin transfers are for water supply, with ancillary flood control, power, and recreation benefits

- By Type
  - Direct benefits, costs
  - Secondary or induced benefits, costs
  - Employment benefits
  - Environmental costs

MEASUREMENT OF BENEFITS, COSTS

- ALL BENEFITS/COSTS FOR A WATER PROJECT MUST BE CALCULATED ON A "WITH/WITHOUT PROJECT" BASIS

- VALUATION METHODS THAT HAVE BEEN USED:

  - BASED ON PROJECTED CHANGES IN MARKET PRICES AND QUANTITIES FOR COMMODITIES

  - BASED ON PROJECTED CHANGES IN MARKET PRICE FOR LAND

  - BASED ON SIMULATED PROJECTED CHANGES IN MARKET PRICES AND QUANTITIES WHERE NO ACTUAL MARKET EXISTS

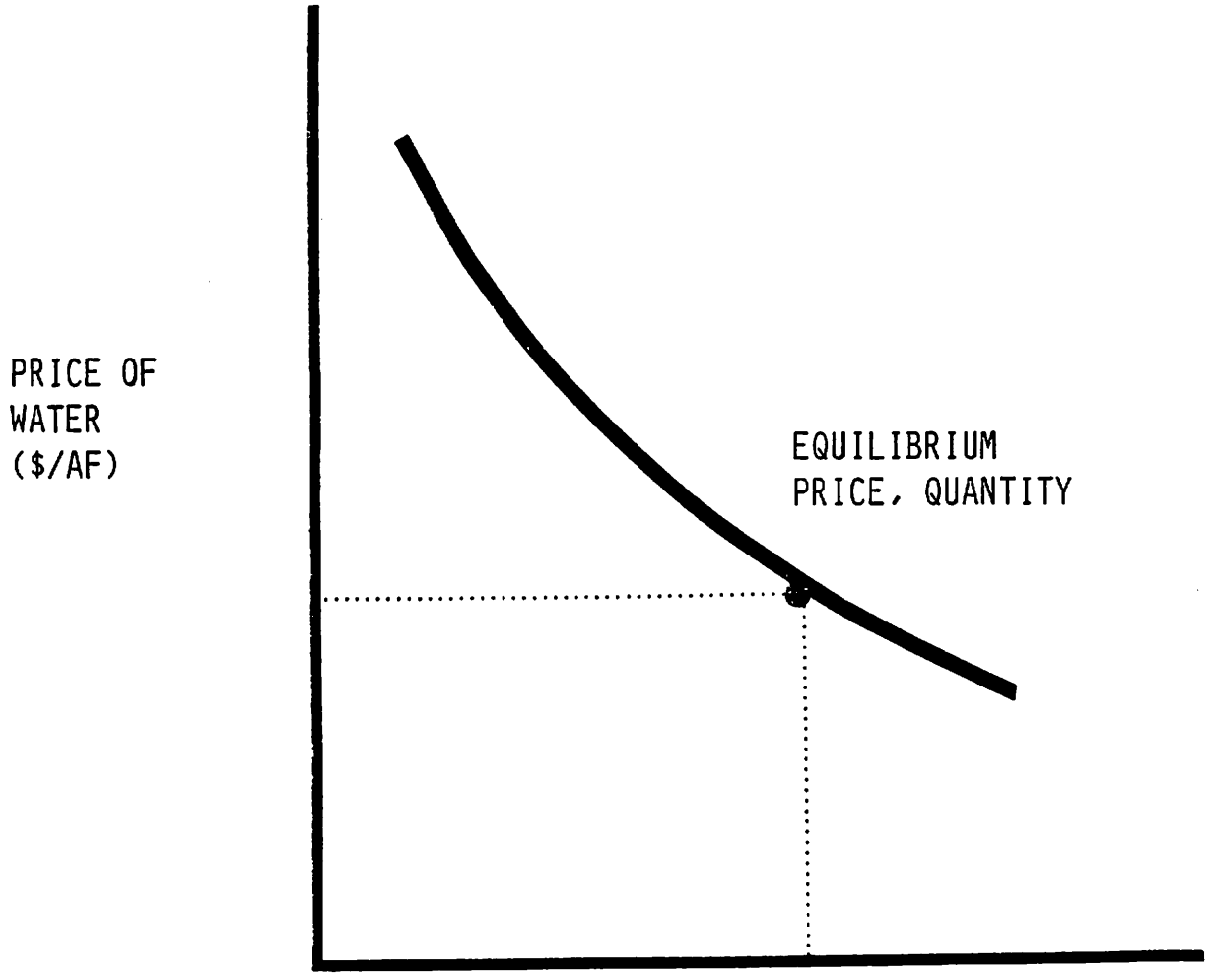
  - BASED ON SURVEY RESEARCH TO DETERMINE WILLINGNESS TO PAY

  - BASED ON COSTS OF ALTERNATIVE PROJECTS

- WHEN USING MARKET PRICES AND QUANTITIES, THE DEMAND CURVE IS FUNDAMENTAL

- EXAMPLE: ASSUME PRESENT IRRIGATION USE IS FROM PUMPING AND THAT USERS WITHDRAW AS MUCH AS THEY'RE WILLING TO PAY TO PUMP. THEN PRESENT PRICE IS MARGINAL VALUE OF WATER.

DEMAND FOR WATER



- AGRICULTURAL BENEFITS TYPICALLY ARE ESTIMATED USING CHANGES IN MARKET PRICES AND QUANTITIES

  - CAUTION:

    LARGE INTERBASIN TRANSFERS MAY CAUSE SUBSTANTIAL CHANGES IN LOCAL PRICES OF AGRICULTURAL COMMODITIES

- BENEFITS ASSOCIATED WITH URBAN OR RURAL DEVELOPMENT CAN BE ESTIMATED USING PROJECTED CHANGES IN LAND VALUES

  - CAUTION:

    TO AVOID DOUBLE COUNTING, BE CAREFUL NOT TO ADD ANNUAL INCREASES IN NET RETURNS TO LAND TO THE CAPITALIZED VALUE

- RECREATION BENEFITS SOMETIMES ESTIMATED USING SIMULATED MARKET PRICES

  - E.G. "TRAVEL COST" METHOD:

    EXPENDITURES ON TRAVEL TO RECREATION SITES ARE USED AS A SURROGATE FOR WILLINGNESS TO PAY FOR RECREATION

  - CAUTION:

    ASSUMPTIONS CONCERNING EQUIVALENCE OF RECREATION SITES ARE CRITICAL

- ENVIRONMENTAL COSTS SOMETIMES ESTIMATED USING SURVEY RESEARCH METHODS

  - E.G. "HOW MUCH WOULD YOU BE WILLING TO PAY TO MAINTAIN ACCESS TO A POTENTIAL RESERVOIR SITE?"

  - CAUTION:

    SURVEY DESIGN IS CRITICAL

- COST OF ALTERNATIVE PROJECT METHOD IS <u>ONLY</u> USEFUL WHEN A DECISION HAS ALREADY BEEN MADE TO BUILD <u>SOME</u> PROJECT WITH IDENTICAL OBJECTIVES

  - METHOD IS OFTEN USED TO JUSTIFY RATHER THAN TO ANALYZE A PROJECT

- FINAL POINT

  DO NOT CONFUSE A PROJECT WITH NET BENEFITS WITH ONE WHICH IS SELF FINANCING - DISTRIBUTION OF REPAYMENT FOR PROJECT COSTS IS ROUGHLY INDEPENDENT OF NET BENEFITS

DISCOUNTING

- DISCOUNTING IS THE PROCESS OF VALUING IN THE PRESENT A FUTURE BENEFIT OR COST

- A FUTURE REVENUE IS WORTH LESS IN THE PRESENT BECAUSE A SMALLER SUM COULD BE INVESTED IN THE PRESENT TO OBTAIN IT

- $$PV = \frac{FV}{(1 + R)^N}$$

  - R IS THE DISCOUNT RATE

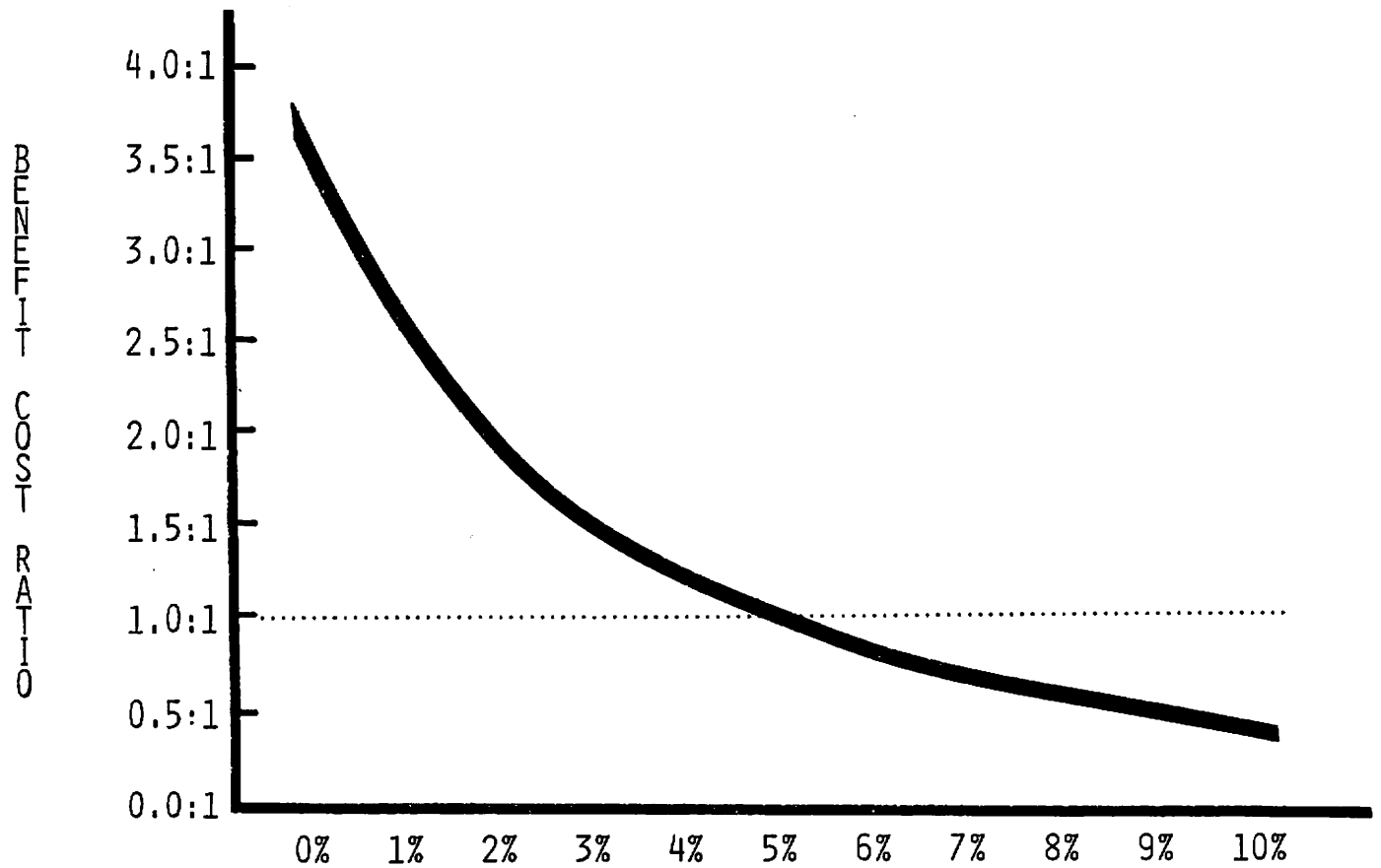
  - N IS THE NUMBER OF YEARS IN THE FUTURE

- FOR MAJOR WATER PROJECTS, THE HIGHER THE DISCOUNT RATE USED, THE LOWER THE BENEFIT/COST RATIO

  - THIS IS BECAUSE MOST COSTS OCCUR NEAR TO PRESENT, WHILE MOST BENEFITS OCCUR OVER A LONG PERIOD

BENEFIT-COST RATIOS FOR ANIMAS-LA PLATA PROJECT

(CALCULATED WITH A 100 YEAR PROJECTED PROJECT LIFE)



- DISCOUNT RATES SHOULD BE INFLATION-ADJUSTED IF CURRENT DOLLARS ARE USED TO MEASURE FUTURE BENEFITS AND COSTS

- DISCOUNT RATES USED MAY DIFFER FROM ONE PROJECT TO ANOTHER IF THE OPPORTUNITY COST OF CAPITAL DIFFERS

WHEN IS A PROJECT ECONOMICALLY JUSTIFIED?

- WHEN TWO CONDITIONS HOLD:
  - INCREASE IN NET INCOME IN IMPORTING REGION MUST EXCEED LOSS OF INCOMES IN EXPORTING REGION PLUS COSTS OF PHYSICAL TRANSFER SYSTEM
  - COST OF PROJECT MUST BE LESS THAN COST OF ALTERNATIVES WITH SAME SUPPLY OUTCOME

- USE NET BENEFIT CRITERION:

  NET BENEFITS = PRESENT VALUE OF BENEFITS

  - PRESENT VALUE OF COST

- DO NOT USE BENEFIT COST RATIOS, AS SOMETIMES THEY GIVE MISLEADING RESULTS

- A PROJECT IS <u>NOT</u> JUSTIFIED IF THE BENEFIT COST RATIO = 1

SPECIAL CONSIDERATIONS STEMMING FROM INTERBASIN TRANSFERS OF WATER

- BOTH DIRECT AND SECONDARY BENEFITS AND COSTS ALWAYS ACCRUE TO DIFFERENT PARTIES (Exporting basin, importing basin)

- FOR THIS REASON SECONDARY BENEFITS AND COSTS ARE PARTICULARLY IMPORTANT

- TRUE NATIONAL SECONDARY BENEFITS ONLY OCCUR WHEN THERE IS LABOR OR CAPITAL MARKET IMMOBILITY (E.G. A PROJECT CREATES NEW NET EMPLOYMENT, AND DOES NOT OFFSET EMPLOYMENT INCREASES IN IMPORTING BASIN WITH UNEMPLOYMENT IN EXPORTING BASIN.

HISTORICAL AND INSTITUTIONAL REQUIREMENTS OF BENEFIT COSTS ANALYSIS FOR WATER SYSTEM PLANNING IN THE U.S.

- HISTORICAL BACKGROUND

  - FLOOD CONTROL ACT OF 1936
  - BUREAU OF BUDGET CIRCULAR A-47 IN 1952
  - SENATE DOCUMENT No. 97, 1962
  - WATER RESOURCE PLANNING ACT OF 1965 AND WATER RESOURCES DEVELOPMENT ACT OF 1974:

    - PRINCIPLES & STANDARDS, 1973 (GUIDELINES)
    - PRINCIPLES & STANDARDS, 1979

  - PROPOSED REPEAL & REPLACEMENT WITH "PRINCIPLES & GUIDELINES"

CURRENT STATUS OF P&S

- Applies to:
  - Corps of Engineers
  - Bureau of Reclamation
  - Soil Conservation Service
  - TVA
- Still in effect
  - Requires calculation and display of:
    - National Economic Development Benefits (NED)
    - Regional Economic Development Benefits (RED)
    - Environmental Benefits (EQ)
    - Other Social Effects (OSE)

- PROPOSED CHANGES:

  - P&S BECOME ADVISORY, NOT MANDATORY

  - CURRENT P&S REQUIRES TRADEOFF ANALYSIS BETWEEN NED AND EQ BENEFITS. PROPOSED P&G REQUIRES NED MAXIMIZING PROJECT TO BE CHOSEN.

  - EQ, RED, AND OSE ACCOUNTS DO NOT HAVE TO BE DISPLAYED

EXAMPLES OF ABUSE IN BCA WHICH MAKE UNIFORM STANDARDS ADVISABLE

- VALUE OF HARVESTED TIMBER IN RESERVOIR AREA AS NET BENEFIT (ACTUALLY, THERE IS A NET LOSS IN THE PRESENT VALUE OF FUTURE TIMBER HARVESTS)

- FLOOD CONTROL BENEFITS ATTRIBUTED TO REDUCTIONS IN DAMAGES TO DEVELOPED PROPERTY WHEN DEVELOPMENT IS INDUCED BY PROJECT (ACTUAL BENEFITS ARE ZERO - WITH/WITHOUT CRITERION VIOLATED)