



Economic Aspects of Integrated Flood Management

WMO/GWP Associated Programme on Flood Management (APFM)



World Meteorological Organization



Economy

“Application of reason to choice”

- to understand issue
- to determine the best means of managing floods and the risk **by** flooding

How and why people make decisions about the use of valuable resources to obtain maximum **(net)** benefits.

Various constraints

physical, financial, social, political, legal and environmental

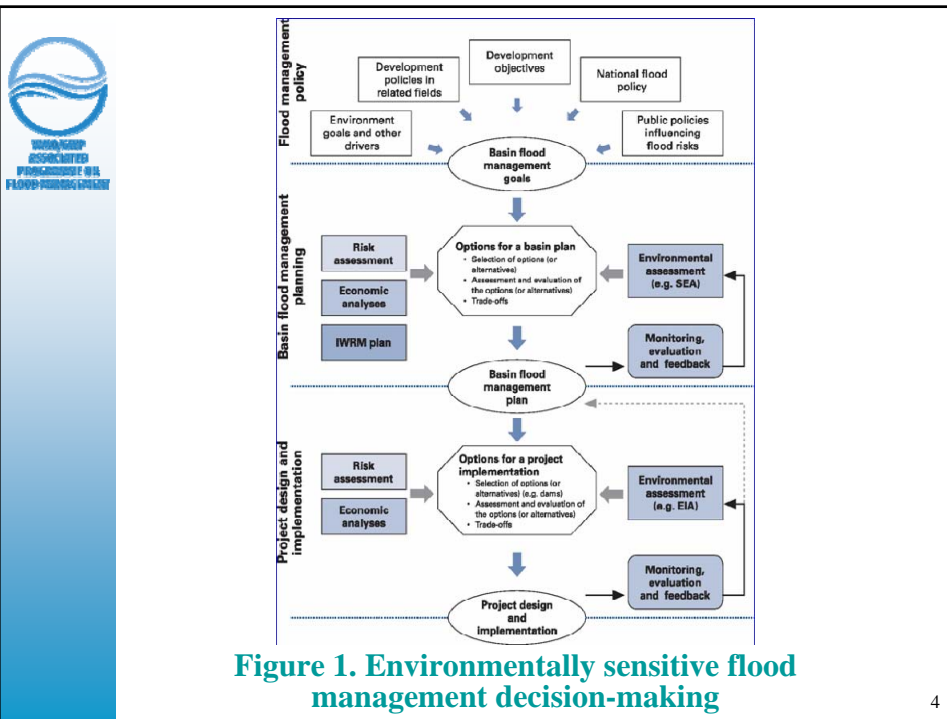
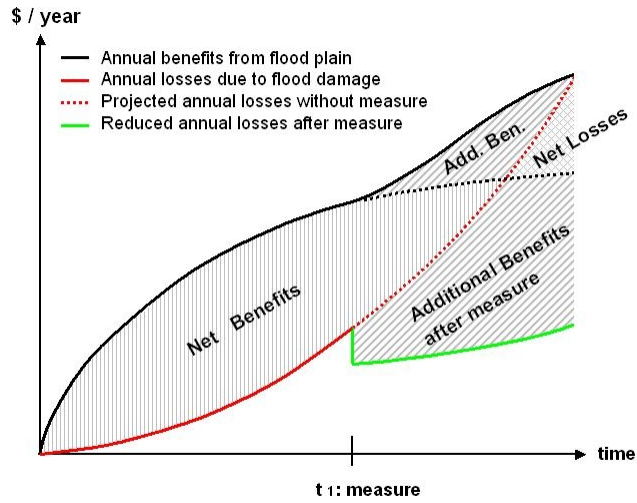


Figure 1. Environmentally sensitive flood management decision-making



Economic analysis

(Purpose)

- **To simplify the complex to a level that we can comprehend**
- **To gain an understanding of what the choice involves**

To enable comparison of proposed options and judge the economic viability

It is the understanding that matters and not the numbers

The numbers are a succinct means of summarizing the complex

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Appraisal method

- **Cost-benefit analysis**
- **Multi-criteria analysis**

Public participation

- **Public should determine the weights of the qualitative and subjective elements (social value) in appraisal**
- **Participation raise the level of public consciousness**
- **Participation enhance the interaction between stakeholders**

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Cost-benefit Analysis

- Identifying items of benefit and cost
- Selecting appropriate prices
- Adjusting the future prices to present value

Economic analysis:

- use economic price
- measure the legitimacy of using national resources

Financial analysis:

- use market price
- check the balance of investment and the sustainability of project

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Benefits of project

- Primary benefits
- Secondary benefits

Primary benefits

Direct benefits

- Reduction in physical damage
- Increase of land value and production

Indirect benefits

- Avoiding disruption to business, transport networks and public services
- Avoiding the costs of emergency response and recovery

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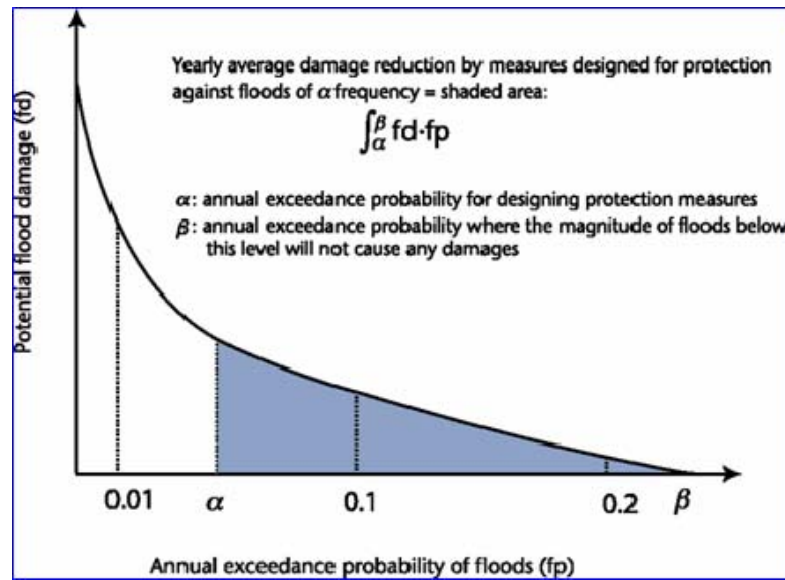


Figure 2. Damage frequency curve

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Secondary benefits

- New investment
- activation of economic development activities

Costs of project

- Construction cost
- Relocation or restoration
- Preventive expenditure or mitigating costs

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Non-market valuation

Markets may fail to make optimum allocation of resources because of

- **Absence of competitive markets**
 - **Presence of externalities**
 - **No reflection of environmental and societal values etc.**
- Value of a prevented fatality or prevented injury;
 - Value of time lost prevented;
 - Value of health benefits;
 - Value of design quality;
 - Value of environmental services lost (air quality, landscape, water, biodiversity, noise, recreational and amenity values for forests etc.); and
 - Value of dis-amenity. (The Green Book, HM Treasury)

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Non-market valuation method

1. Stated preference method

- **Contingent Valuation Method (CVM)**
Willingness to pay (WTP)
Willingness to accept compensation (WTA)

2. Revealed preference method

- **Travel cost method (TCM)**
parks, forests, lakes, reservoirs, historical sites etc.
- **Hedonic pricing**
noise, flood risk, air quality etc.
- **Replacement costs**
true costs of replacement

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Limitations of cost-benefit analysis

- Market imperfections
- Quantification of intangibles
- Income distribution
- Discount rate and intergeneration equity

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Economic evaluation techniques

Net benefits: Benefits minus cost (losses ?)

- should use constant price
- should be adjusted for the time value of money

Discounting technique

$$B = \frac{b_t}{(1 + r)^t}$$

t = year

r = discount rate

b_t = Value at t

B = Present value

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Net Present Value (NPV)

- Present value of net benefits

Internal rate of return (IRR)

- P: Interest rate that the NPV is zero

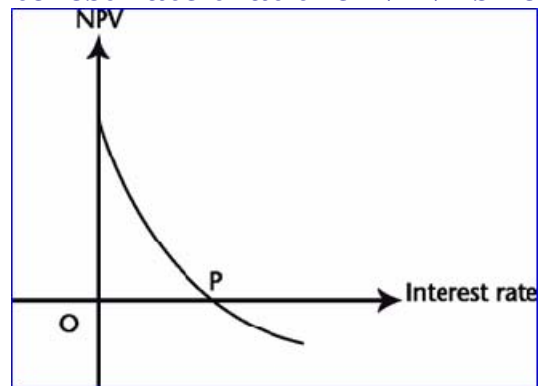


Figure 3. The relationship between the NPV and the interest rate

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Multi-criteria analysis (MCA)

- Judging the expected performance of each development option against a number of criteria or objectives
- Taking an overall view on the basis of a pre-assigned importance to each criterion

The essence of MCA lies in the preparation of a performance matrix and performance indicators

How to determine weights?

Inter-temporal comparisons

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MCA and CBA

MCA → CBA

CBA → MCA

Project appraisal method is

- **to support stakeholders in the process of making choice**
 - **to provide a rigorous analytical framework in and through which they can argue, debate and negotiate choice**
- with**

Capacity building of stakeholders

Appropriate institutional mechanism

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Sources of financing

Flood management projects are difficult to collect charges from beneficiaries because

- **Difficult to determine the extent of benefit**
- **Poverty of the beneficiaries**
- **Only focus on structural measures that require large financial resources**

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Risk-based approach to flood management

- **Opportunity for financial contribution from individuals and communities**
Flood proofing, preparedness, emergency response and recovery
Source control at individual level
- **Involvement of communities enhance the mode of support**
Patrol of dykes and flood fighting

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Flood insurance

Challenge

- **Cost of operation**
- **Capacity of the flood affected people**
 - **Government subsidy**
 - **Reinsurance**
 - **Help of local communities and local administration**

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<http://www.apfm.info>

Thank you !