



Adaptive Flood Management

Kamran Emami
KuritKara Engineers
Tehran, Iran

Increased Flood Risk

Pakistan, 2010

New Orleans,
2005

Japan, 2011

Queensland,
2010

Mumbai, 2005

S. Asia, 2004

Thailand, 2011

The Most important Challenges of flood Engineers

- Managing substantial increase of flood risks with limited resources;
- Avoiding adverse environmental consequences of flood projects;
- Coping with uncertainty in all relevant aspects

Shongweni Dam – South Africa

Main characteristics

Purpose:	Recreation
Storage capacity:	6,6 Mm ³
Spillway length:	125,0 m
Fusegate height:	6,5 m
Number of units:	10
Former discharge capacity:	1245 m ³ /s
New discharge capacity:	5000 m ³ /s
Discharge capacity increase:	300%



1995 Most outstanding Civil Engineering Achievement in Technical Excellence Award

Adaptive Management

Now in early years of 21st century, it has become obvious, that the approach to flood management is increasingly adaptive and non-structural.

Adaptive Management

Adaptive management (AM) is a structured, iterative process of optimal decision making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring.

- Adaptive management is a tool which should be used not only to change a system, but also to learn about the system

Adaptive Management

- The challenge in using the adaptive management approach lies in finding the correct balance between gaining knowledge to improve management in the future and achieving the best short - term outcome based on current knowledge

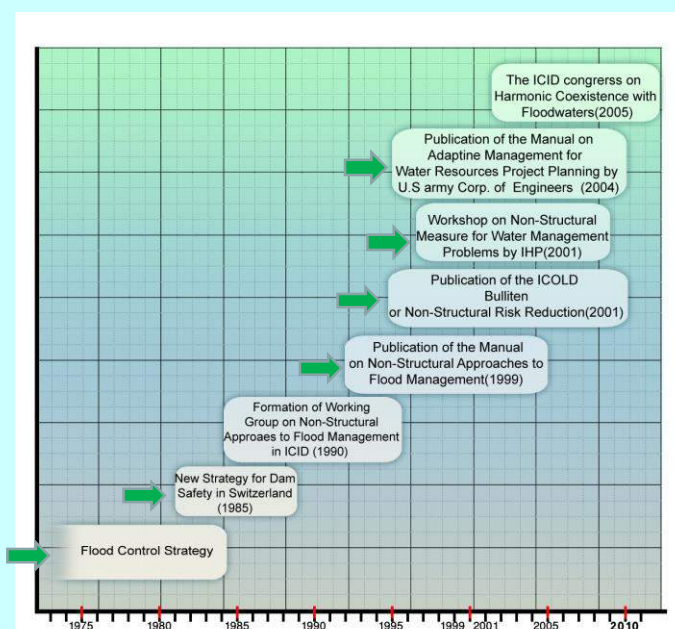
Adaptive Management Cycle

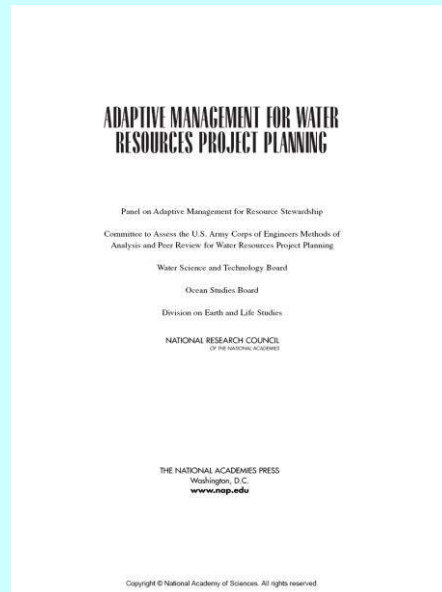


Historical Background of AM

- The use of adaptive management techniques can be traced back to ancient civilizations
- The origin of the adaptive management concept can be traced back to ideas of scientific management pioneered by Frederick Taylor in the early 1900s
- The term 'adaptive management' evolved in natural resource management workshops through decision makers, managers and scientists focusing on building simulation models to uncover key assumptions and uncertainties

Evolution of Flood Management Strategies






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	Nature of Change	
Design Element	From Traditional	Broadening To
Scope	Project	System of projects
Purpose	Single purpose	Multiple and sometimes conflicting objectives
Means	Structural	Nonstructural
Focus	Construction	Long-term Management
Risk Recognition	Little	Extensive

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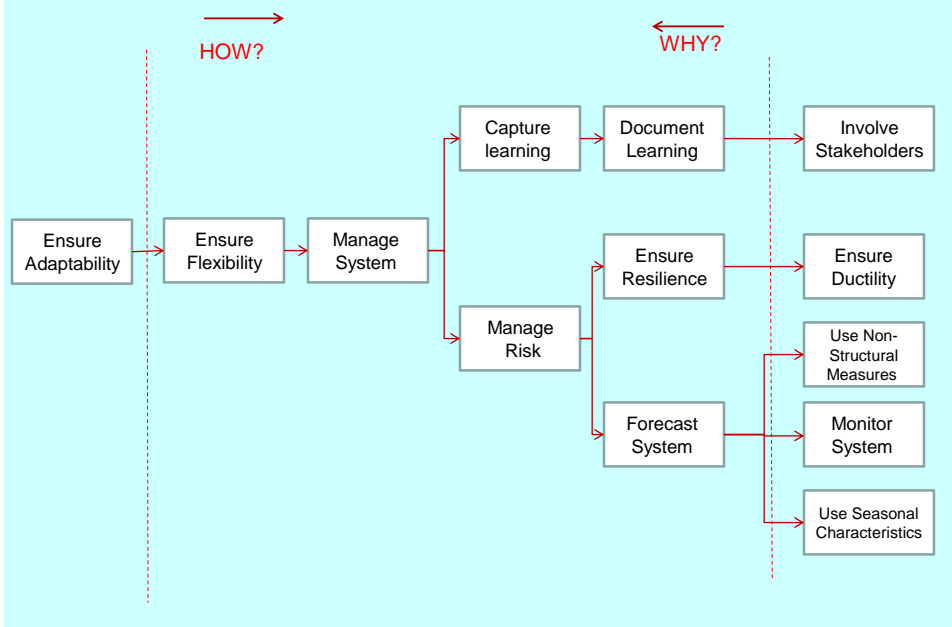
Strategies of Adaptive Flood Management –

- Adaptability (Changing Threat to Opportunity) 
- Flexible Decision Making (to cope with uncertainties)
- Monitoring and vigilance
- Learning while doing
- Application of New knowledge and technologies
- Avoiding costly irreversible mistakes
- Updating the Objectives

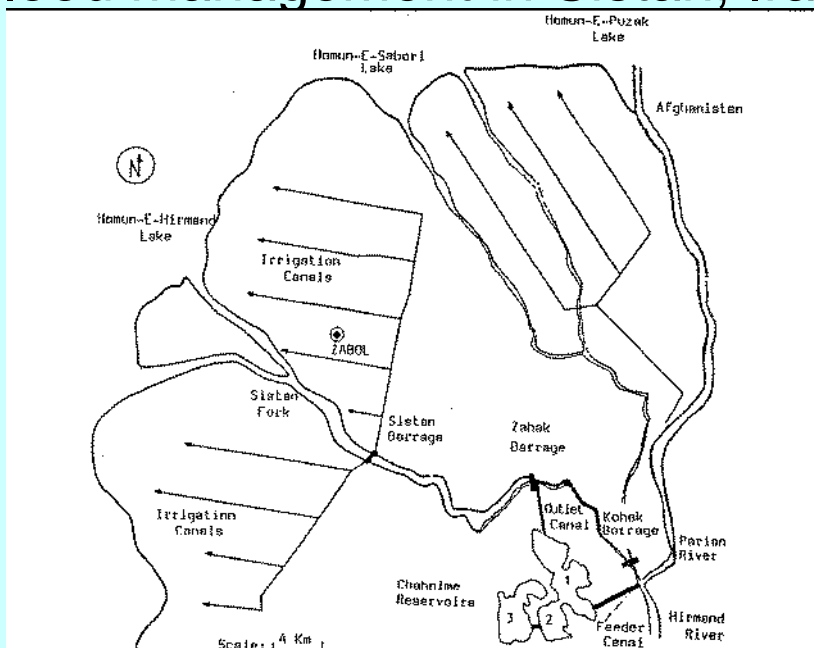
strategies of Adaptive Flood Management- 2

- Extensive risk recognition
- Focusing on long-term management rather than construction
- Structural Resilience 
- Harmony with Environment (step by step)
- Passive and Active AM
- Stakeholders Participation
- Enhanced Real time reactions

FAST diagram of AFM



Flood management in Sistan, Iran



Successes of AFM in Early Impoundment of Large dams in Iran



Successes of AFM in Early Impoundment of Large dams in Iran



Criteria for Selection Design flood for Large dams

American (PMF)

European (Q_{1000} - Q_{10000})

Japan (Q_{200} , $1.2Q_{200}$)

A saving of some \$50b in a Decade

Conclusions

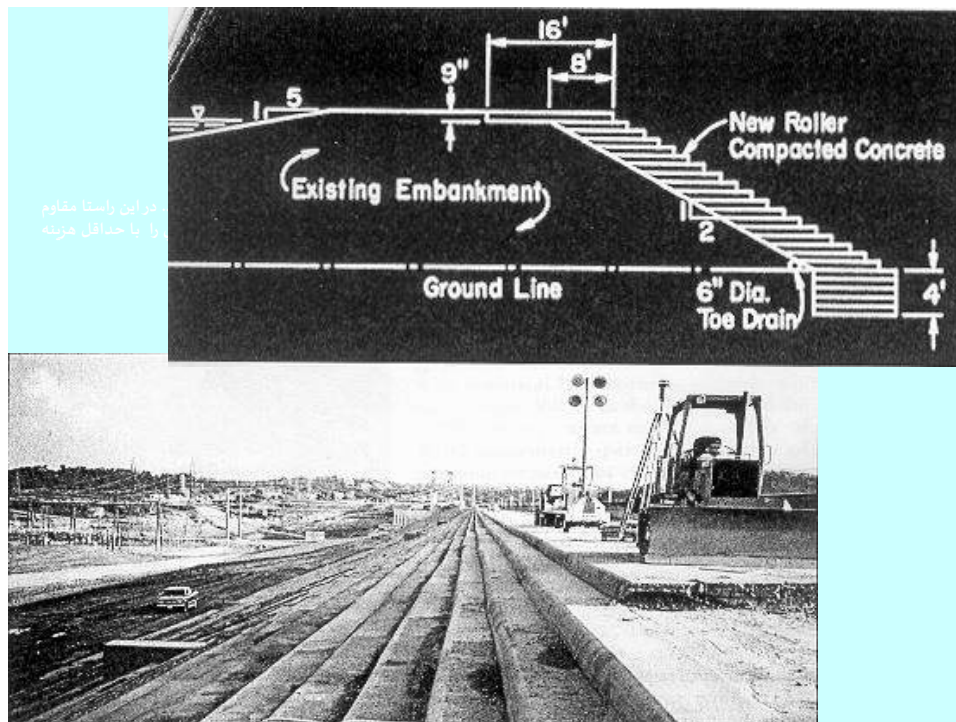
- Adaptive flood risk Management is an effective, efficient and versatile tool.
- AM emphasize of Non-structural approaches enhance adaptability, flexibility and sustainability.

Basic Requirements for AM:

- Efficient and reliable Water Managers and experts
- Comprehensive and reliable Monitoring System
- Preparedness and Plans for Emergencies
- Regulations to ensure flexibility and adaptability
- Resources and Training

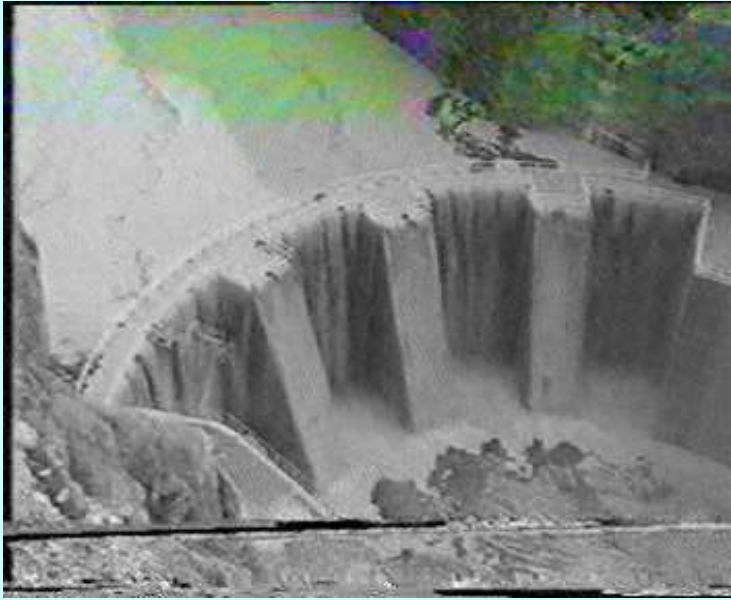
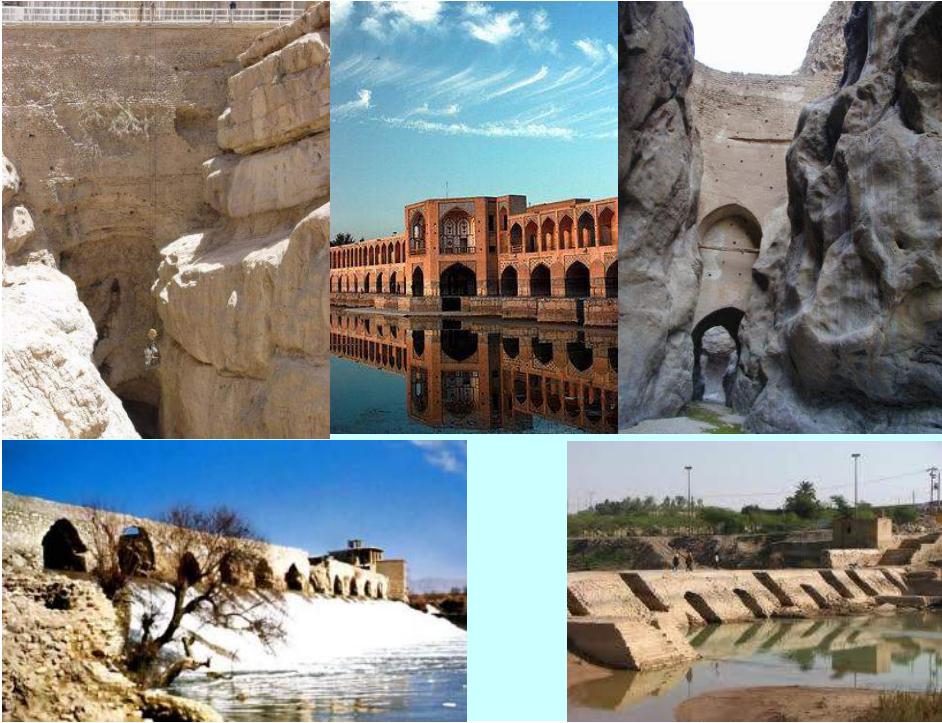
Overtopping Protection of Embankment dams





*Ocoee2 Dam (U.S.A.) has resisted
2500 overtopping in 30 years*





Karkheh, the Largest Dam in Iran

