



Life Cycle Costing and Port Structures

Bruce Lambert



**US Army Corps
of Engineers**

Objectives

- ◆ What is Life Cycle Management
- ◆ How to incorporate into current plans
- ◆ Research challenges and sources for more information

What is Life Cycle Costing

- ◆ Avoiding unexpected system failure from negligent maintenance, budgeting or planning
- ◆ Generally starts at preconstruction of a project, but can be incorporated anytime
 - Do you build what you want or what you can you build?
 - How is this maintained?

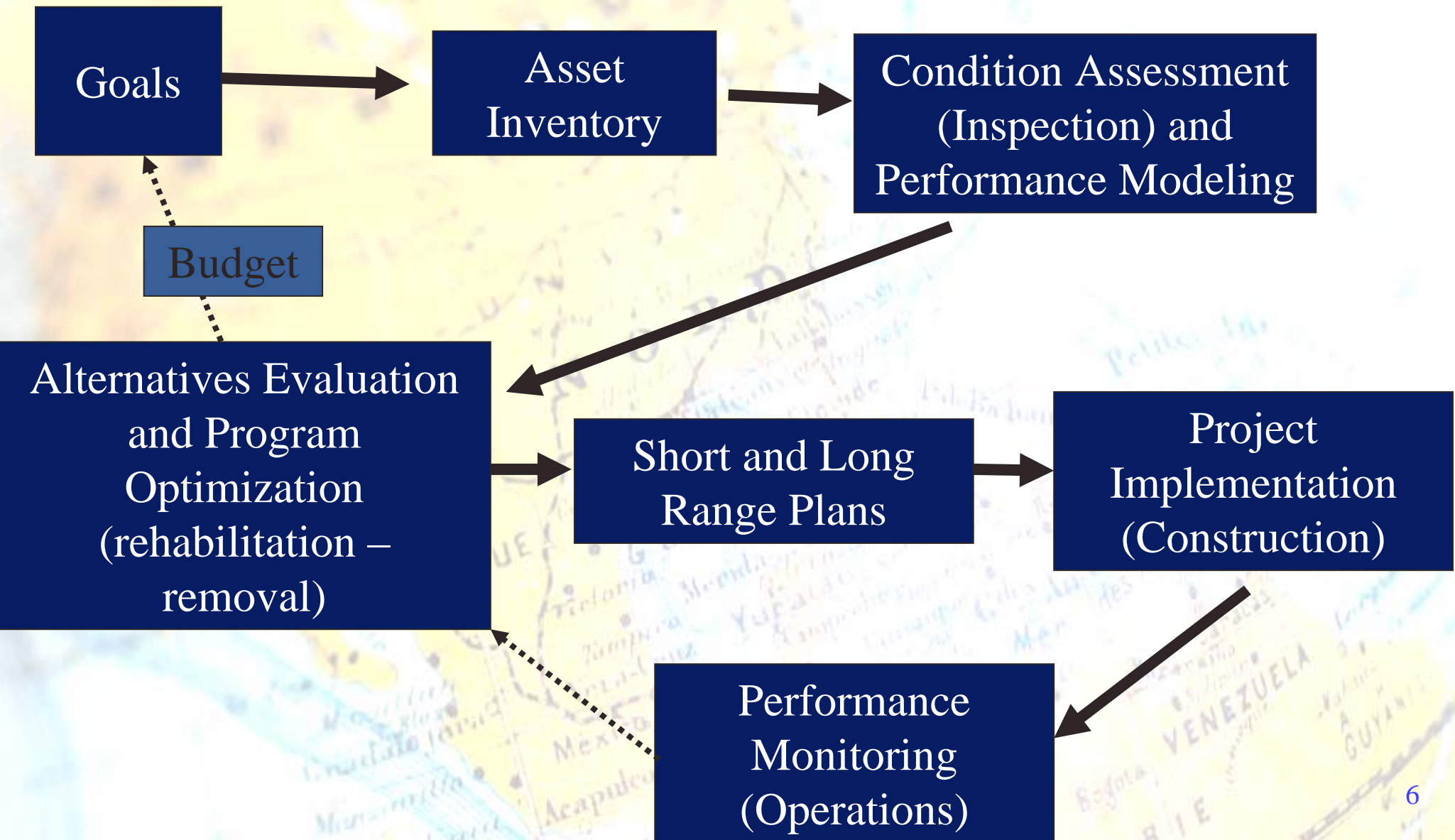
Challenge in Life Cycle Management for Infrastructure

- ◆ Engineering Design Standards -structures gauged on risk of structural “failure” or condition
- ◆ Lack of consistent inspection approaches
- ◆ Engineering standards for different components – mechanical versus structural
- ◆ Difficult to test large structures
- ◆ Long Design life – 50 -100 years
- ◆ Harshness of marine environment
- ◆ Structure become technically obsolete before becoming physically obsolete

Risks from Poor LCM

- ◆ Port closures
- ◆ Risk to structural integrity
- ◆ Safety – injury or loss of life
- ◆ Environmental exposures
- ◆ Potential liability issues

A Generic System for Managing Port Structures



Implementing Life Cycle Costing During Planning/Construction

- ◆ Determine required project needs and total costs over project cycle
- ◆ Parameters to consider when costing alternatives:
 - Net Present Value
 - Determine useful life
 - Loss of Revenue from failure
 - Maintenance costs
 - Demolition or removal costs
 - Tax structures

Inspection During Operation

◆ Three approaches –

- Fix as fail
- Inspect and rehabilitate
- Preventive maintenance

◆ Inspection types and frequency

- Initial design suggests inspection schedule
- Visual inspection not always accurate
- Other inspection types

Implementation Challenges?

- ◆ Projects have multiple uses
- ◆ Determining or guaranteeing a minimum standards for safe use or performance
- ◆ Planning and defining current and future needs
- ◆ Process must be developed involving data integration – data warehousing
- ◆ Education to port staff, commissioners and port users necessary
- ◆ Unforeseen operational or legislative pressures

Research gaps related to adopting life cycle management

- ◆ Movement to more portable models and tools for end users
- ◆ Recognition this is a data intense process
- ◆ Examine ways to reliability model condition assessments
- ◆ Understand how system responds to extreme events
- ◆ Non-destructive inspection techniques
- ◆ Recommendations for given repair needs
- ◆ Properly quantifying uncertainties – risk management

More Sources of Information

- ◆ “Life Cycle Management of Port Structures-
General Principles” – Report of WG 31,
Supplement to Bulletin 99 (1998)
- ◆ ASCE/AASHTO/FHWA/TRB
- ◆ PIANC – MarCom Technical Seminar, Feb 05
- ◆ USACE – Systems approach

Design of Movable Weirs and Storm Surge Barriers

InCom WG 26 – Jan 2006

- ◆ One of 6 goals – LCM
- ◆ Topics included design standards, costing structures, performance goals, and environmental considerations
- ◆ Enclosed CD-Rom with appendix materials

PIANC – Other Items

- ◆ PIANC Congress – Estoril Portugal, May 14-18, 2006
- ◆ Ports 07 –Cosponsor with ASCE-COPRI March 25-28, 2007



Bruce Lambert

Senior Economist, Institute for Water Resources
Secretary, U.S. Section of PIANC

703-428-6667

Bruce.Lambert@usace.army.mil