Adaptive Management and Monitoring

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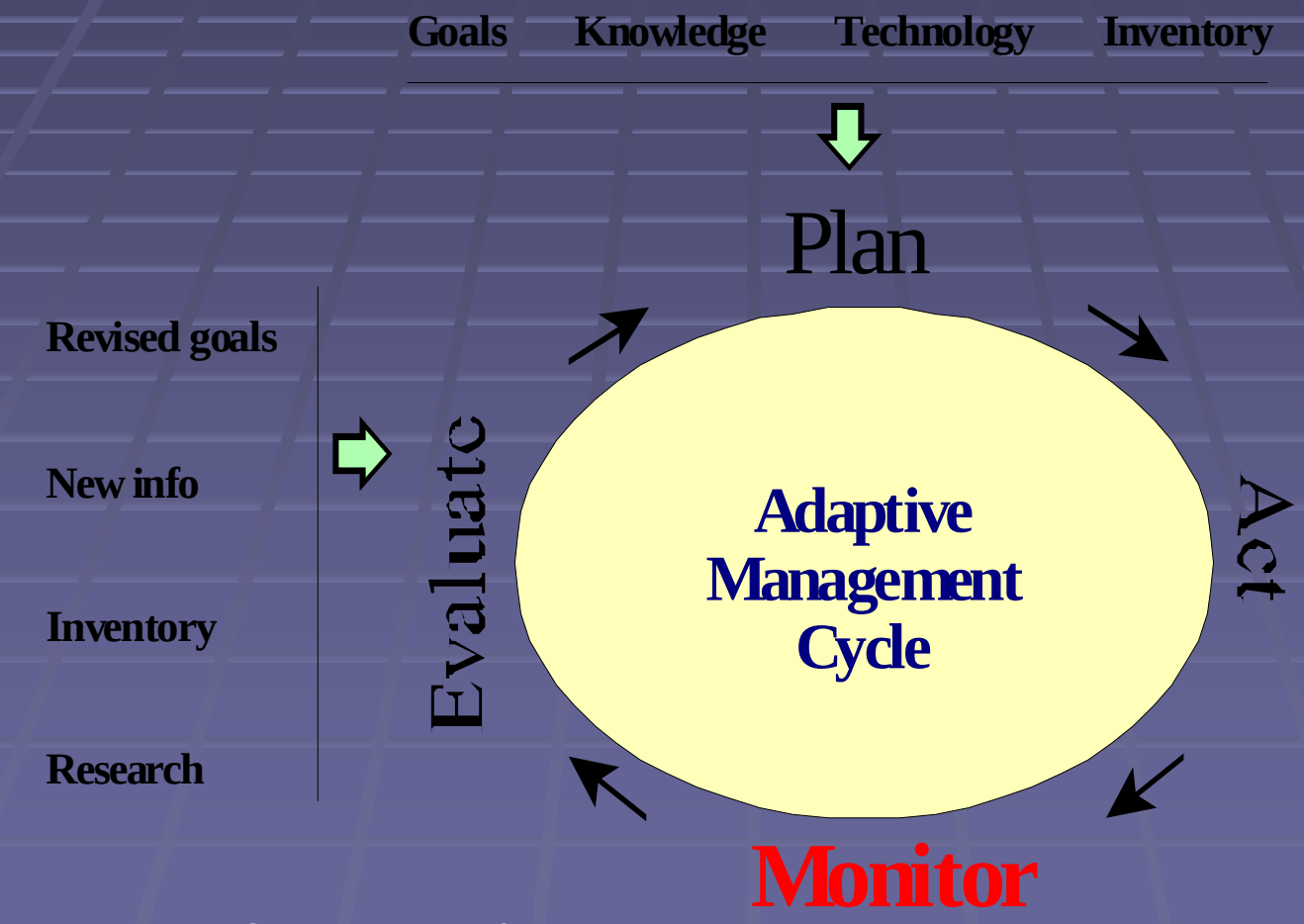
The Purpose of Adaptive Process: ***Confront Problem with Data***

"Problems are defined not only by the scale in time and space but also by the choice of processes most responsible for generating and responding to change [emphasis added] (Holling, 1981:3)."

This is NOT Adaptive Management
It is Total Quality Management



Courtesy of Steve Trexler

Total Quality Management versus Adaptive Management

- TQM is equivalent of “thermostat”
  - Control is set at 68° F (Target)
  - If temp goes below 68° furnace kicks in
- Adaptive Management asks the question:
  - “Why am I set at 68°?” (Hypothesis/Policy)
    - What problem am I trying to solve?
    - What are the uncertainties?
    - What are my assumptions?
    - What are alternative Hypotheses? Measures?

Management hypothesis: Establishment of emergent marsh (or shrub/scrub) will ensure habitat conditions for a suite of wetland wildlife species (list species desired) while maintaining dabbling duck use during October through mid-December and late February through March at objective levels (_____ use-days/acre).

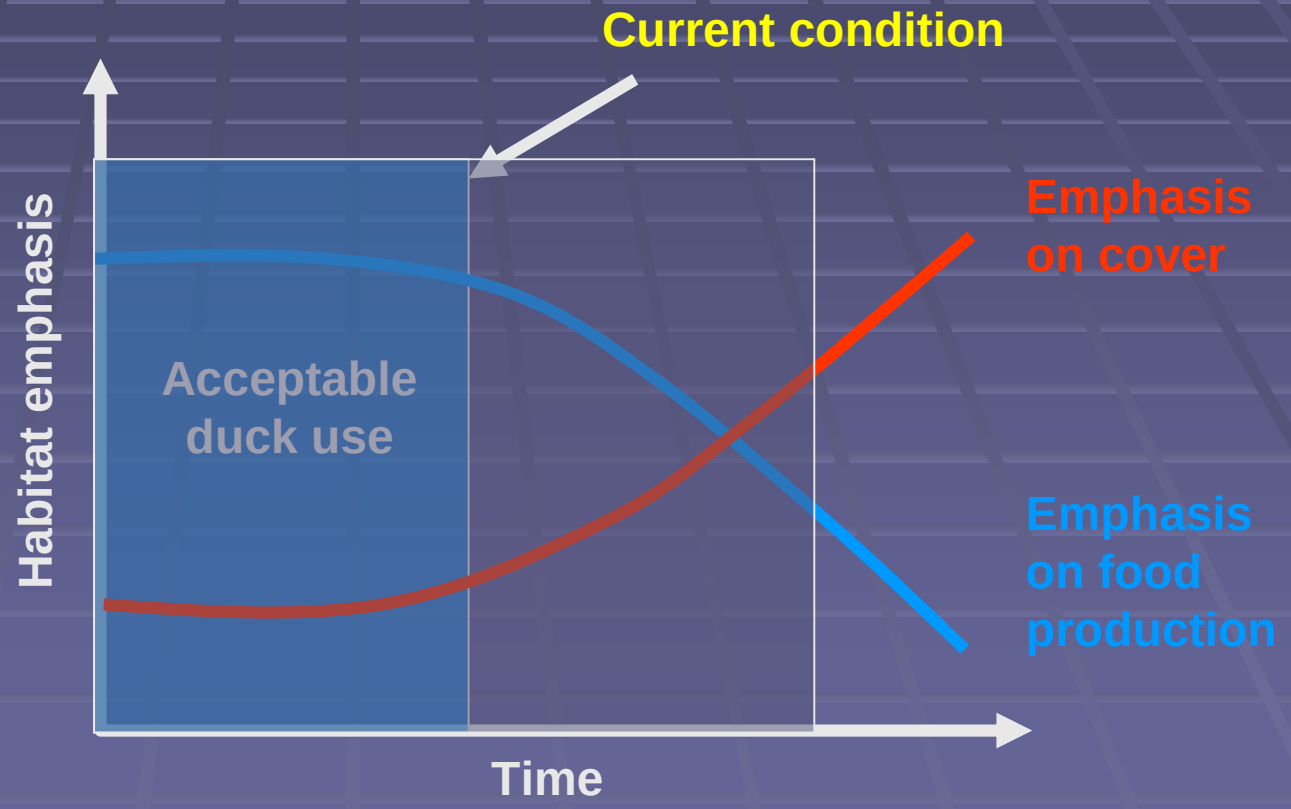
Management options:

Food production on all suitable flooded sites

Food production on 75% of suitable sites

Food production on 50% of suitable sites

No food production



Courtesy Dale Humburg, MDC

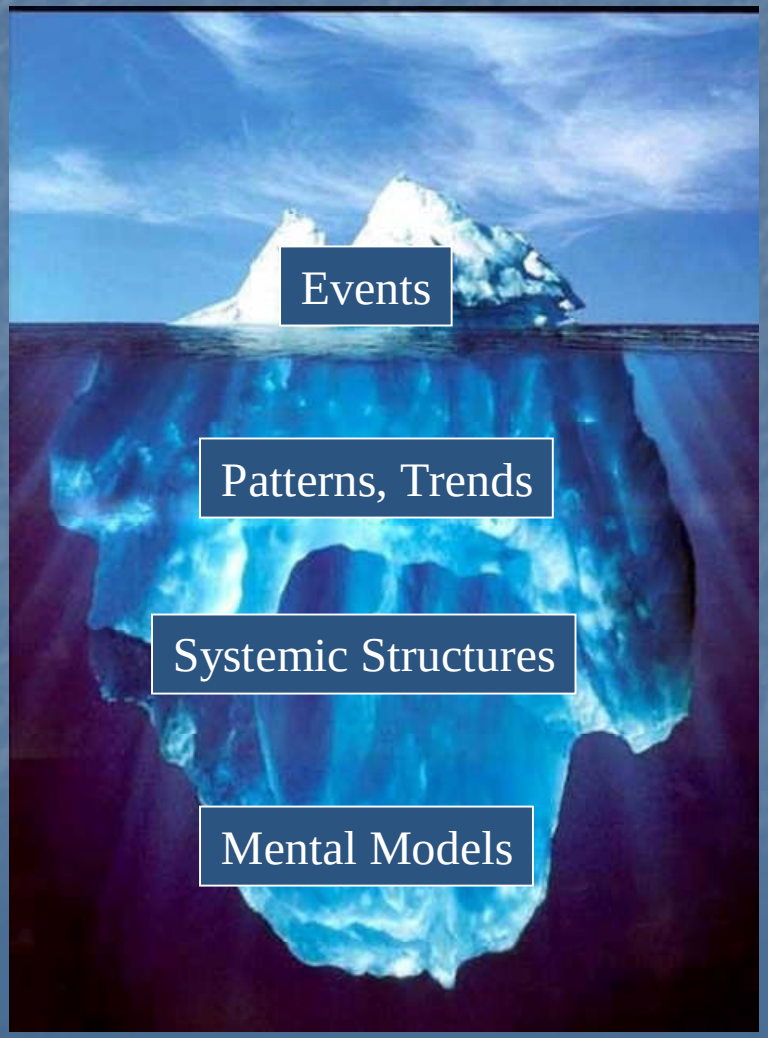
Why TQM Fails

- TQM is based on detection and correction of error – which is self limiting.
  - “Find poor quality and fix it”
  - If temperature returns to 68° job is done.
  - But what if errors persist?
  - Dare to Question -- why “68°?” (tactical → strategic?)
- Defensive Routines Kick In
  - Fear of failure or sense of threat
  - Not discussable, un-discussable, un-discussability
  - Government and corporations don’t like policies being questioned.

Two Streams of Inquiry

Attribute	Analytical	Integrative
Philosophy	▪Narrow and targeted ▪Disproof by experiment ▪Parsimony is the rule	▪Broad and Exploratory ▪Multiple lines of converging evidence ▪Requisite simplicity is the goal
Perceived Organization	▪Biotic interactions ▪Fixed Environment ▪Single Scale	▪Biophysical Interactions ▪Self organization ▪Multiple scales with cross scale interactions
Causation	▪Single and Separable	▪Multiple and only partially separable
Hypotheses	▪Single hypotheses and separable	Multiple and competing hypotheses
Uncertainty	▪Eliminate Uncertainty	▪Incorporate Uncertainty
Statistics	▪Standard Statistics ▪Concern with Type I error	▪Non-standard statistics ▪Concern with Type II error
Evaluation Goal	▪Peer assessment to reach ultimate consensus	▪Peer assessment, judgment to reach partial consensus
Danger	▪Exactly the right answer for the wrong question	▪Exactly the right question but the useless answer.

Ways of explaining reality



What just happened?

What's been happening?
Have we been here or some place similar before?

What are the forces at play contributing to these patterns?

What about our thinking allows this situation to persist?

Courtesy Jan Sendzimir

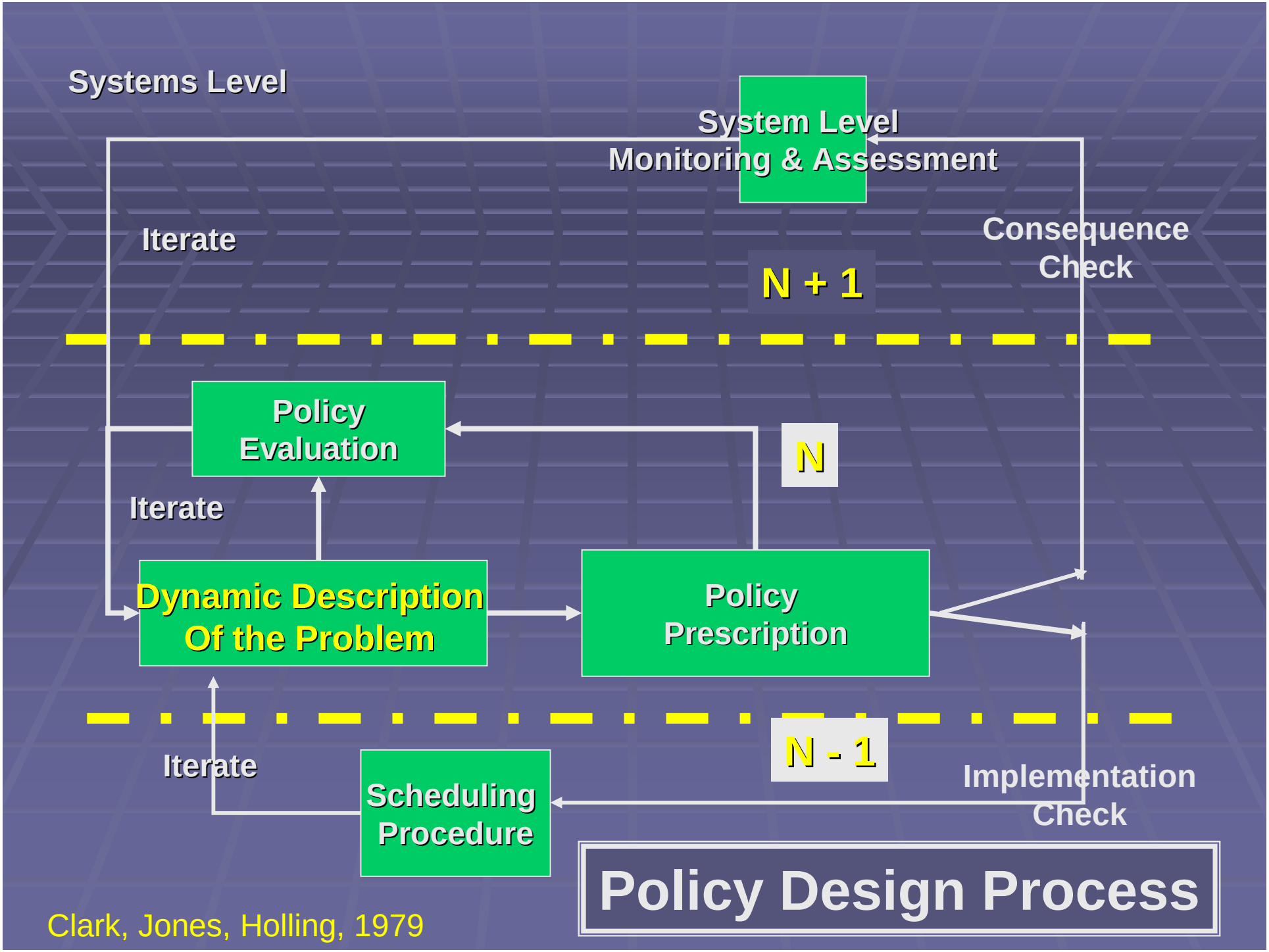
Adaptive Management Literature NEVER uses the word “Plan”

Planning

- Applies established procedures to solve a largely understood problem within an accepted framework.
- Planning is problem solving
- Planning focuses on generating a series of executable actions

Design

- Design inquires into the nature of a problem to conceive a framework for solving that problem.
- Design is problem setting or framing.
- Design focuses on learning about the nature of an unfamiliar problem

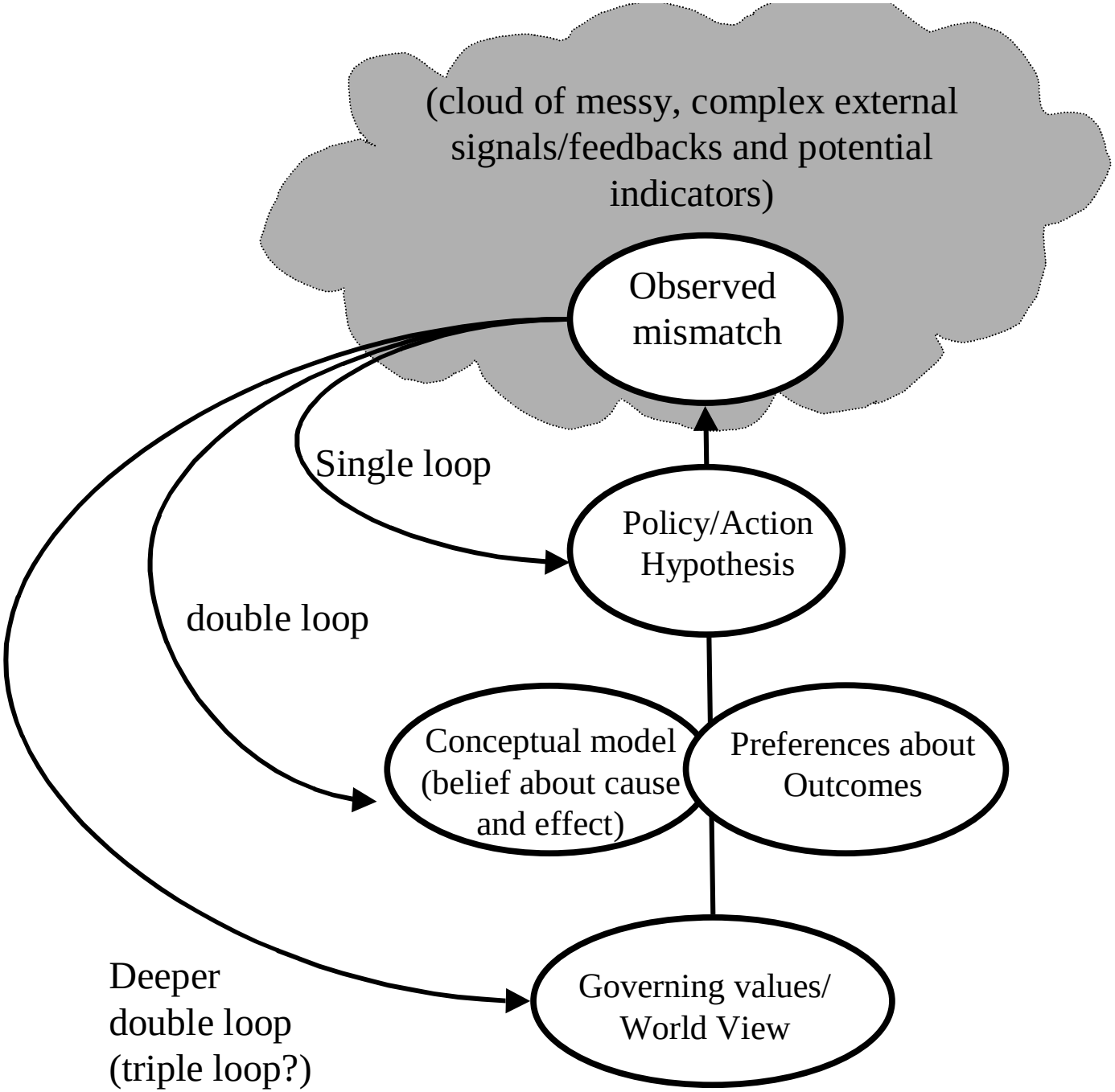

Systems Level
System Level
Monitoring & Assessment
Iterate
Consequence
Check
N + 1
Policy
Evaluation
N
Iterate
Dynamic Description
Of the Problem
Policy
Prescription
N - 1
Iterate
Scheduling
Procedure
Implementation
Check
Policy Design Process
Clark, Jones, Holling, 1979

Applied Science Strategy

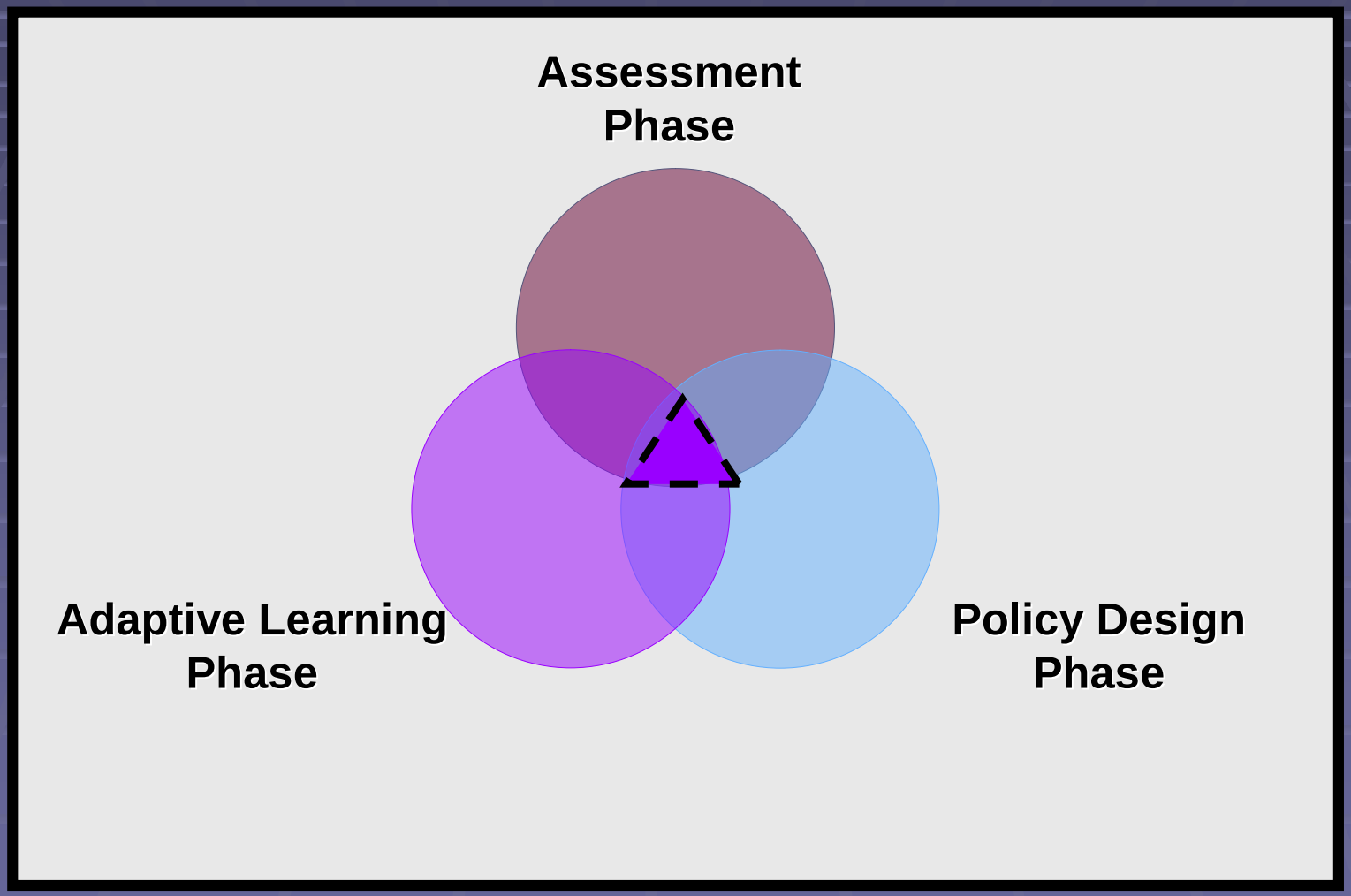
Ogden, Davis and Brandt(2003:150-151)

illustrates how differing levels of feedback are integrated into assessment management and policy:

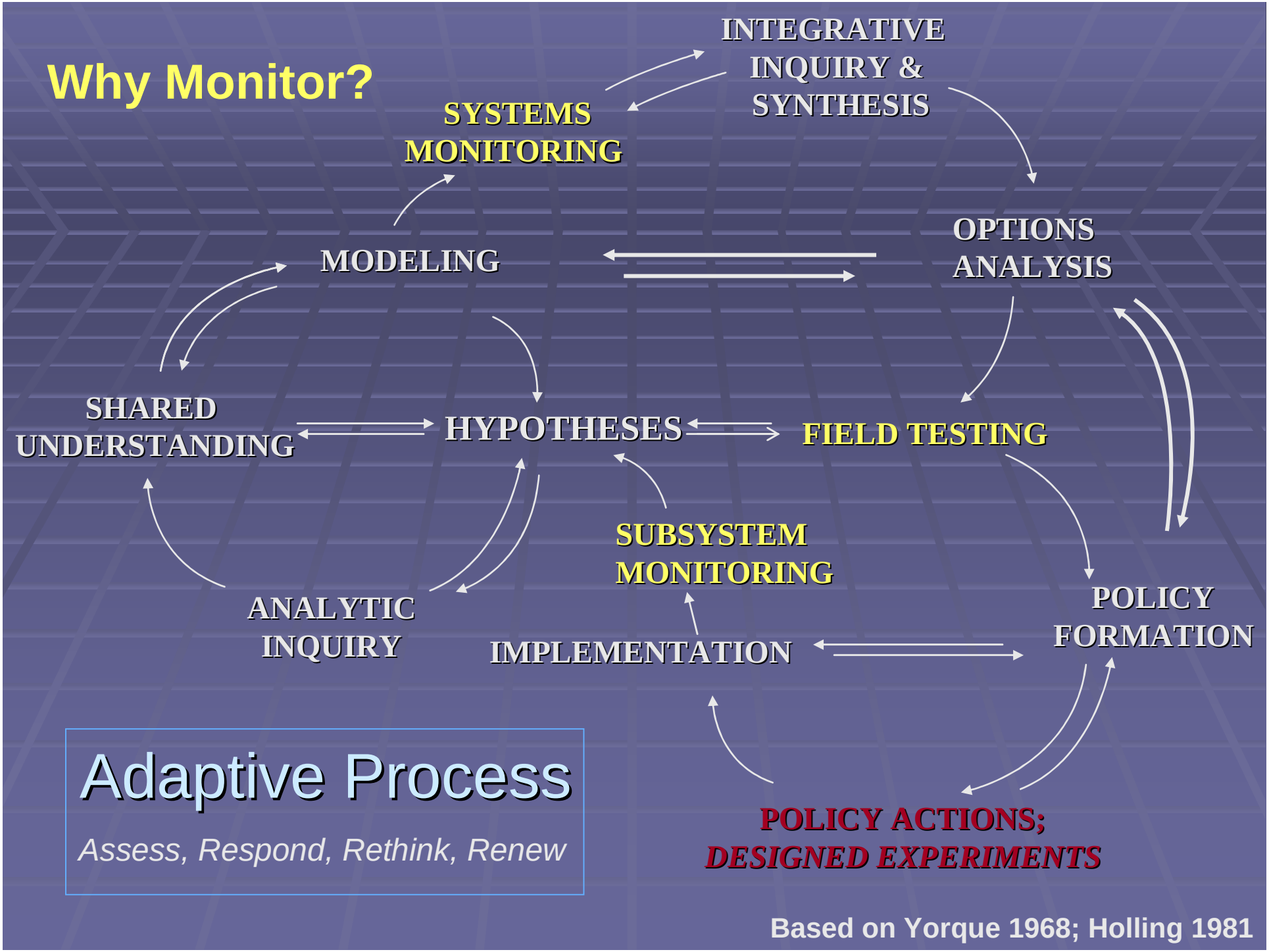
- The **first loop** is when feedback is consistent with predictions and objectives of the plan.
  - The design of the plan remains unchanged and the implementation continues as previously scheduled.
- The **second loop** occurs when unexpected responses are detected.
  - This event triggers an updating and new round of modeling to identify corrective changes in restoration plan.
  - These types of changes could range from simple operational modifications to changes in the plan itself requiring Congressional Authorization.
- The **third loop** of feedback and learning where improved understanding of the social ecological system originating from monitoring, research and modeling are incorporated.
  - This would lead to alterations in conceptual models; design of monitoring and assessment plans and to revisions in the design or operation of the restoration plan itself


(cloud of messy, complex external signals/feedbacks and potential indicators)
Observed mismatch
Single loop
Policy/Action Hypothesis
double loop
Conceptual model (belief about cause and effect)
Preferences about Outcomes
Governing values/ World View
Deeper double loop (triple loop?)

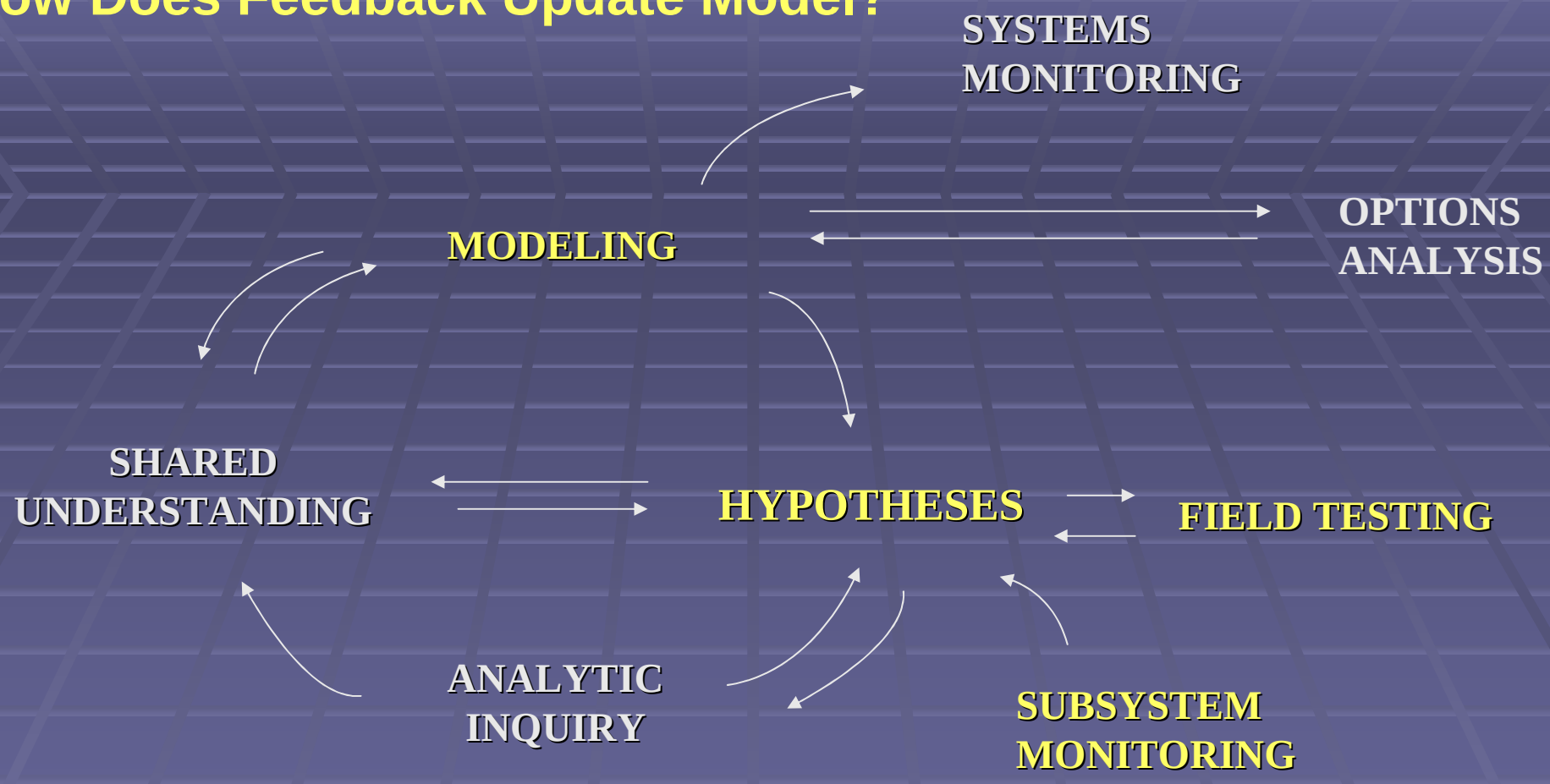
Three Phases of Adaptive Process



Ralf Yorque, 1968; Holling, 1981

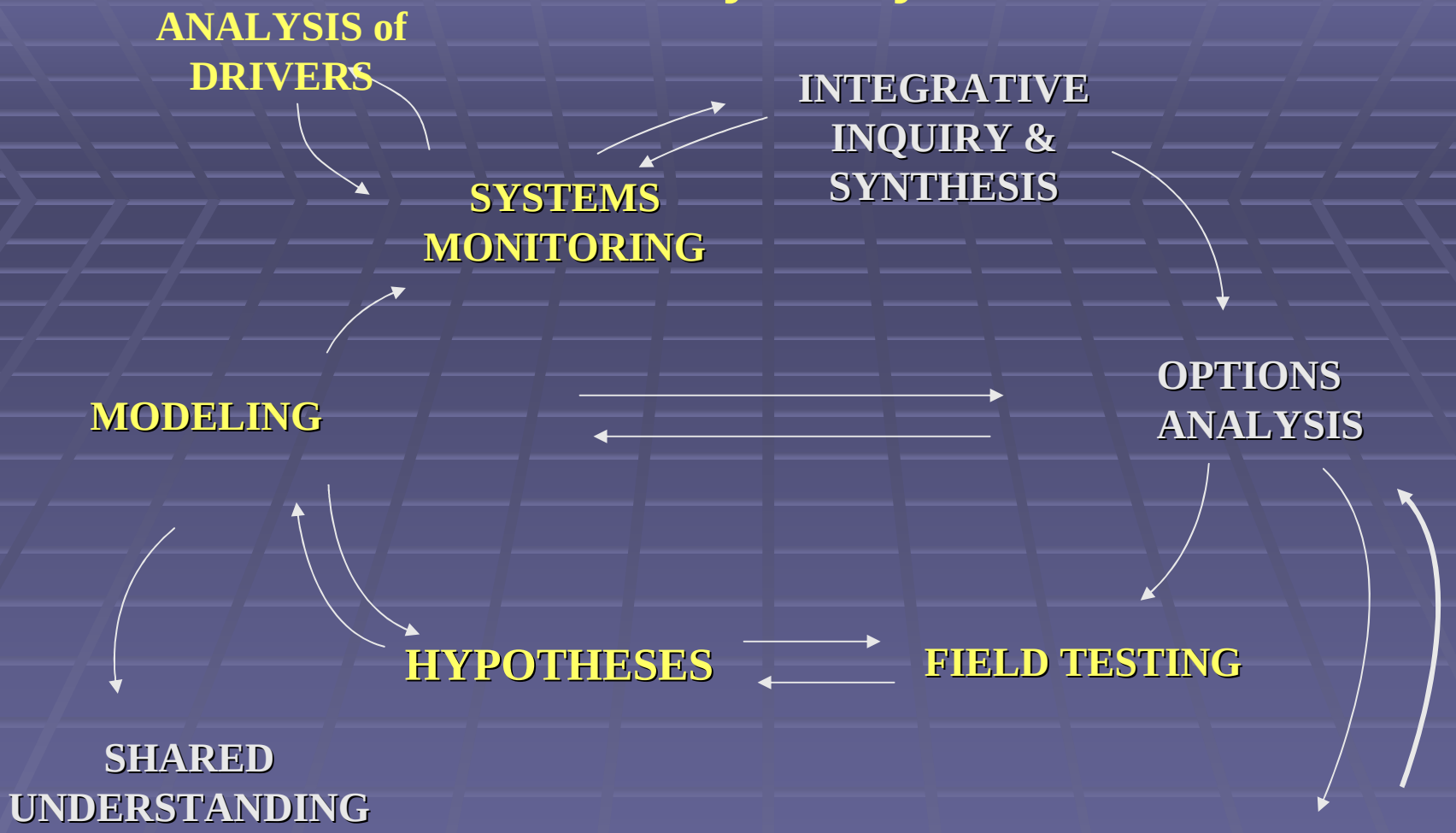

Why Monitor?
INTEGRATIVE INQUIRY & SYNTHESIS
SYSTEMS MONITORING
MODELING
OPTIONS ANALYSIS
SHARED UNDERSTANDING
HYPOTHESES
FIELD TESTING
SUBSYSTEM MONITORING
ANALYTIC INQUIRY
IMPLEMENTATION
POLICY FORMATION
POLICY ACTIONS; DESIGNED EXPERIMENTS
Adaptive Process
Assess, Respond, Rethink, Renew
Based on Yorque 1968; Holling 1981

How Does Feedback Update Model?



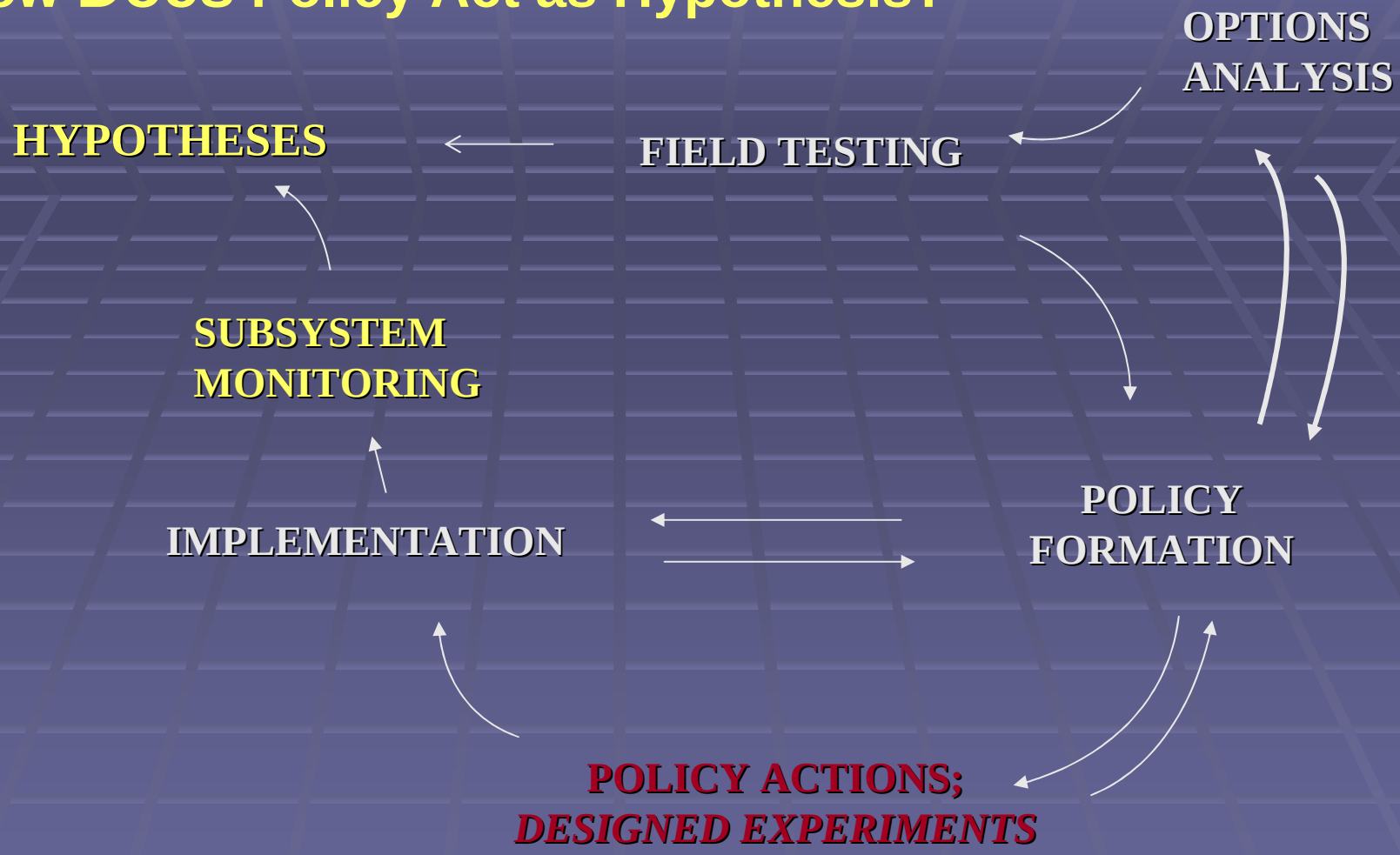
Adaptive Learning Phase

Why Do Systems Level Monitoring?



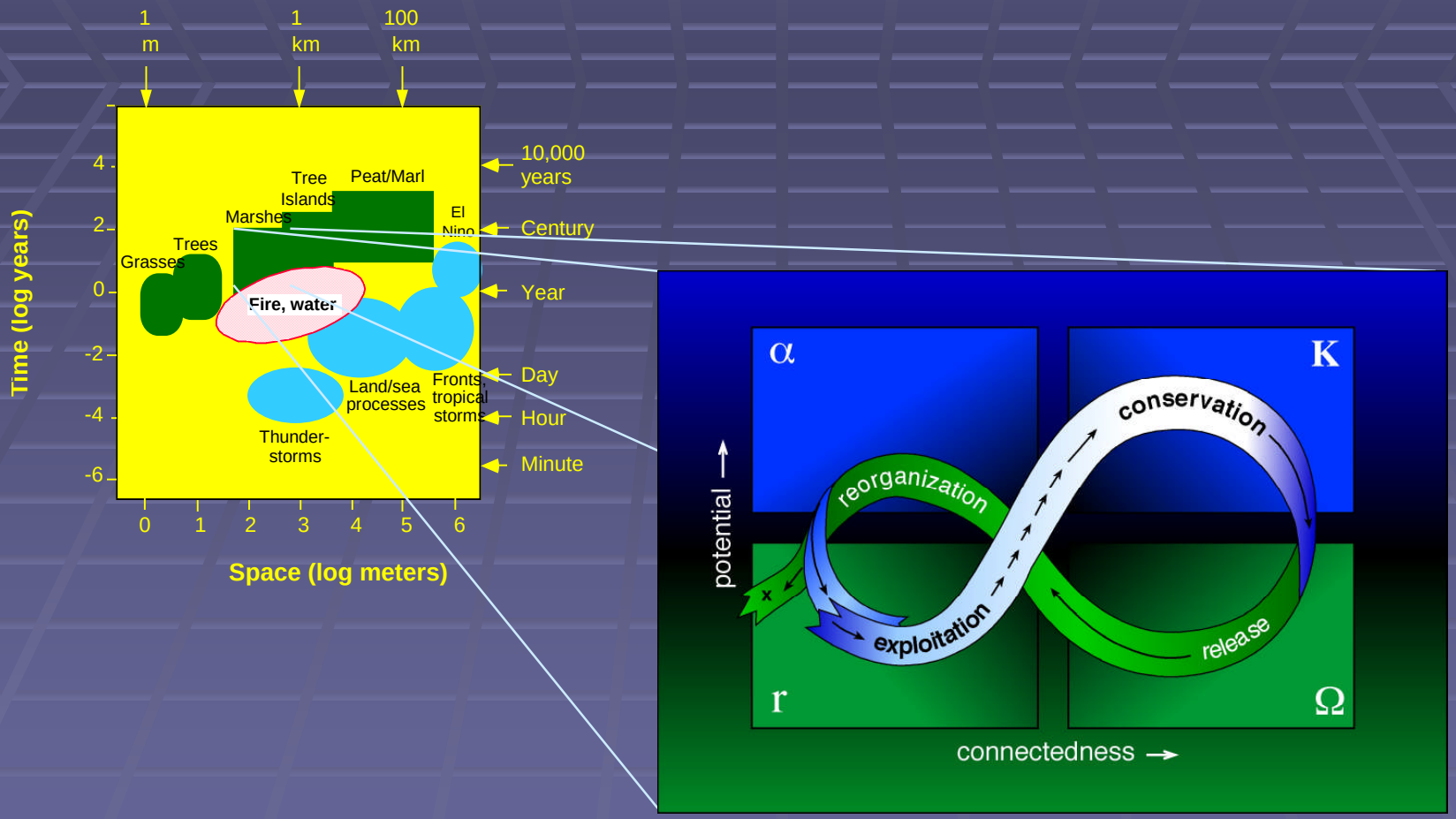
Adaptive Assessment Phase

How Does Policy Act as Hypothesis?



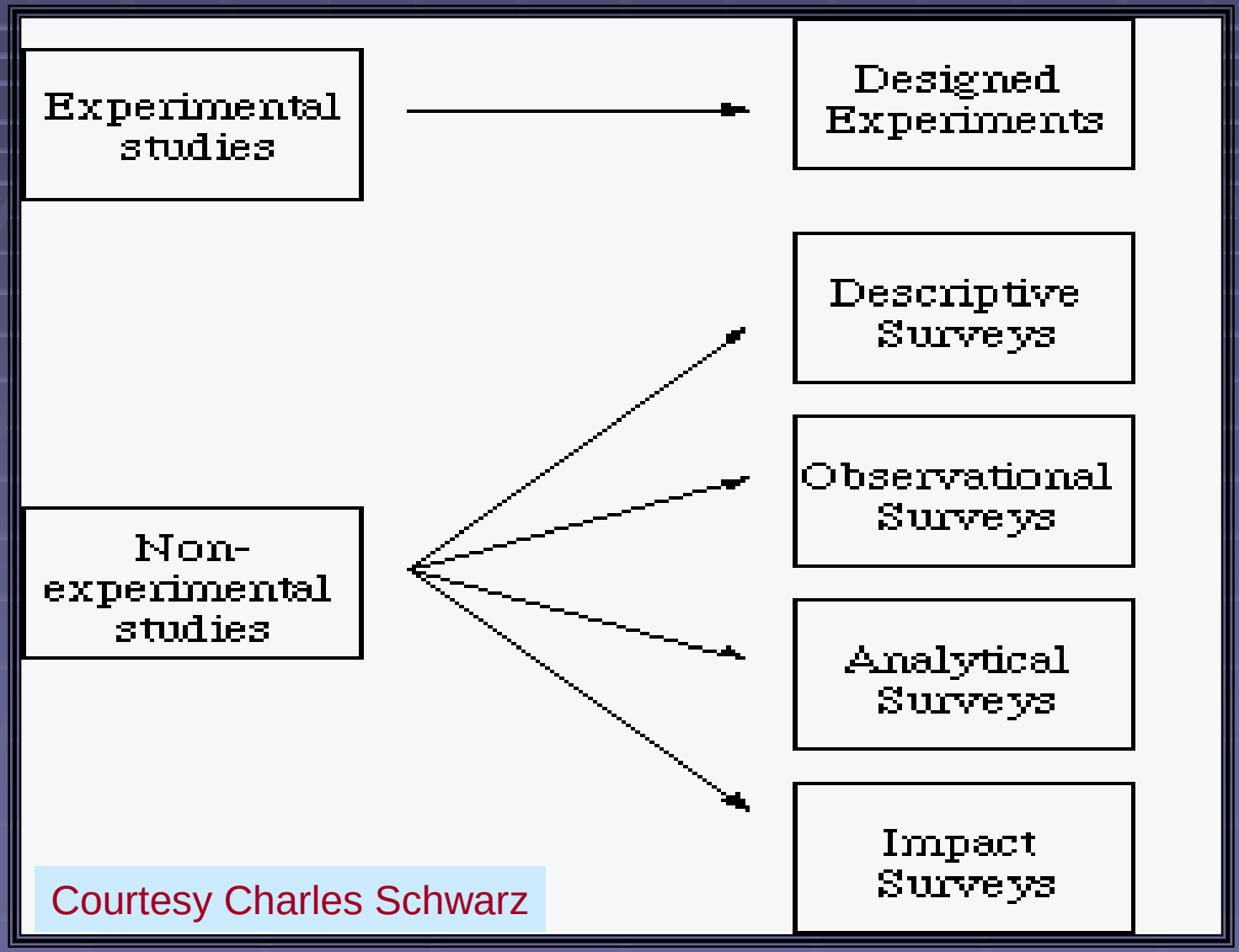
Policy Design Phase

Panarchy



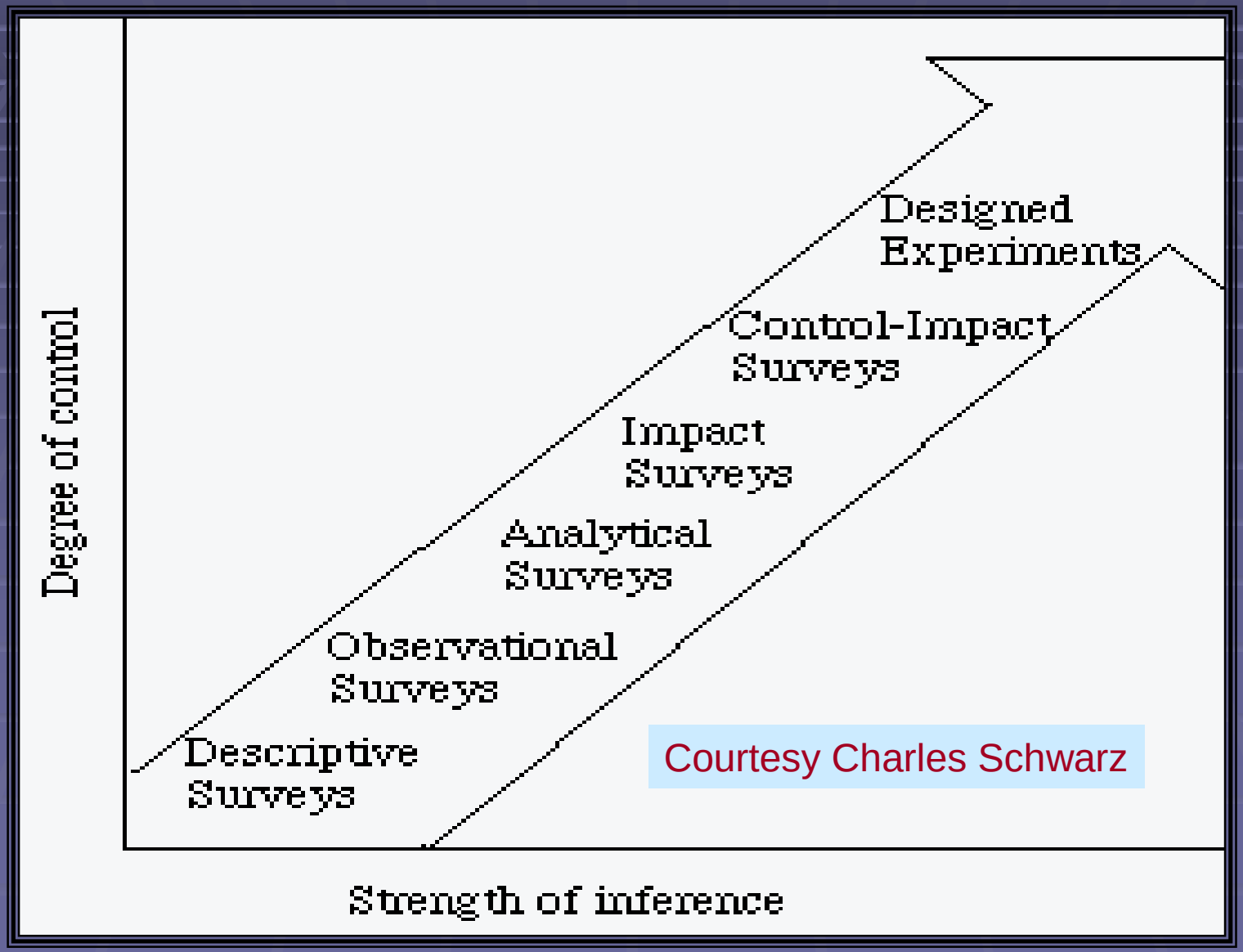
At What Scales Does Monitoring Need to Take Place?

Types of Environmental Studies



Courtesy Charles Schwarz

Increasing Levels of Control and Inference



Courtesy Charles Schwarz