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Adaptive Management for Protected Areas

Why 'adaptive management'?

There are **complicated problems** – predictable when understood

Computing & Communications

Transport & Aerospace

Aspects of Medicine

Mostly excellent delivery

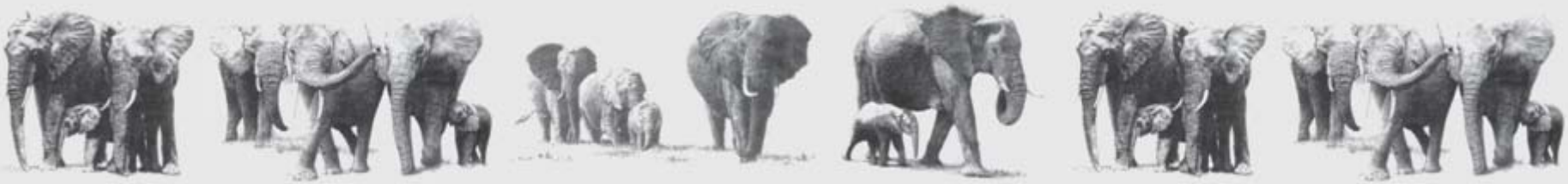
Other problems often throw up **surprises** – are **complex problems**

Agriculture

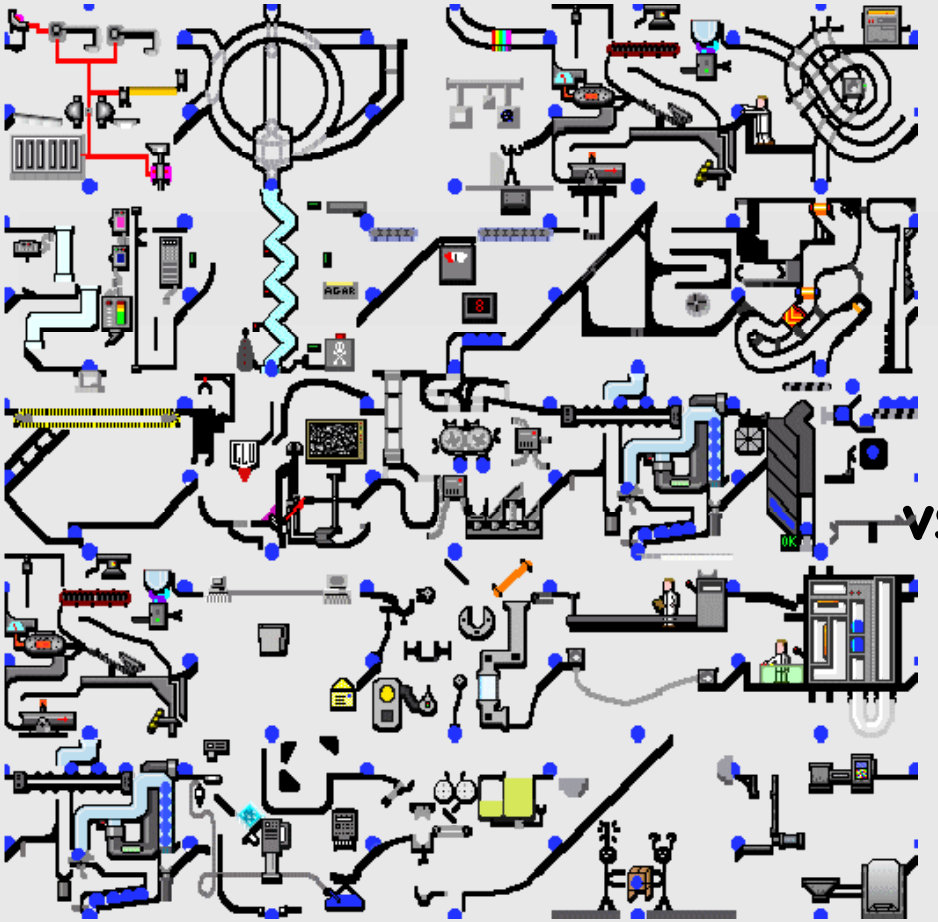
Natural Resource Management

Ecology

Mixed success – if success can even be defined!



COMPLICATED VS COMPLEX



vs.

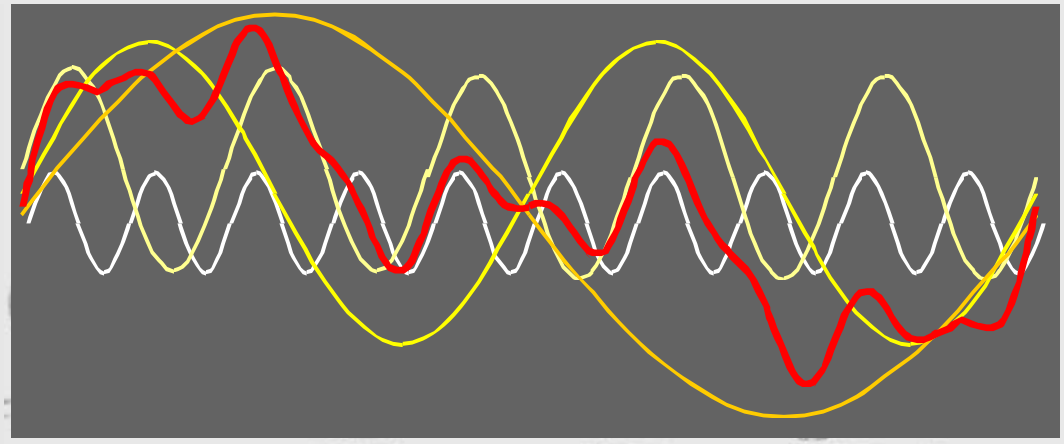
COMPLEX

(like an ecosystem)

COMPLICATED

(like a jet aircraft or an electronic circuit board)

= 'knowable'



State of Ecosystem

Consequences in the socio-economic system

Fire

Soil type

Rainfall

Herbivory

etc

Human actions again influence biophysical system

Whether using the services provided (fuel wood; fisheries; water; etc)

Or

Managing the system according to best available knowledge

WHAT IS ADAPTIVE MANAGEMENT?

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

"learning while doing"

ADAPTIVE MANAGEMENT

- *"nothing endures but change"* (Heraclitus 540 BC - 480 BC)
- SANParks uses an adaptive management approach to help conserve a diverse range of complex environments
- Therefore if scientists and managers do not adapt and learn (and co-operate), management will fail to the detriment of species and ecosystems under its protection

Adaptive Management

"The process of treating natural resource management as an experiment such that the practicality of trail and error is added to the rigour and explicitness of the scientific experiment, producing learning that is both relevant and valid."

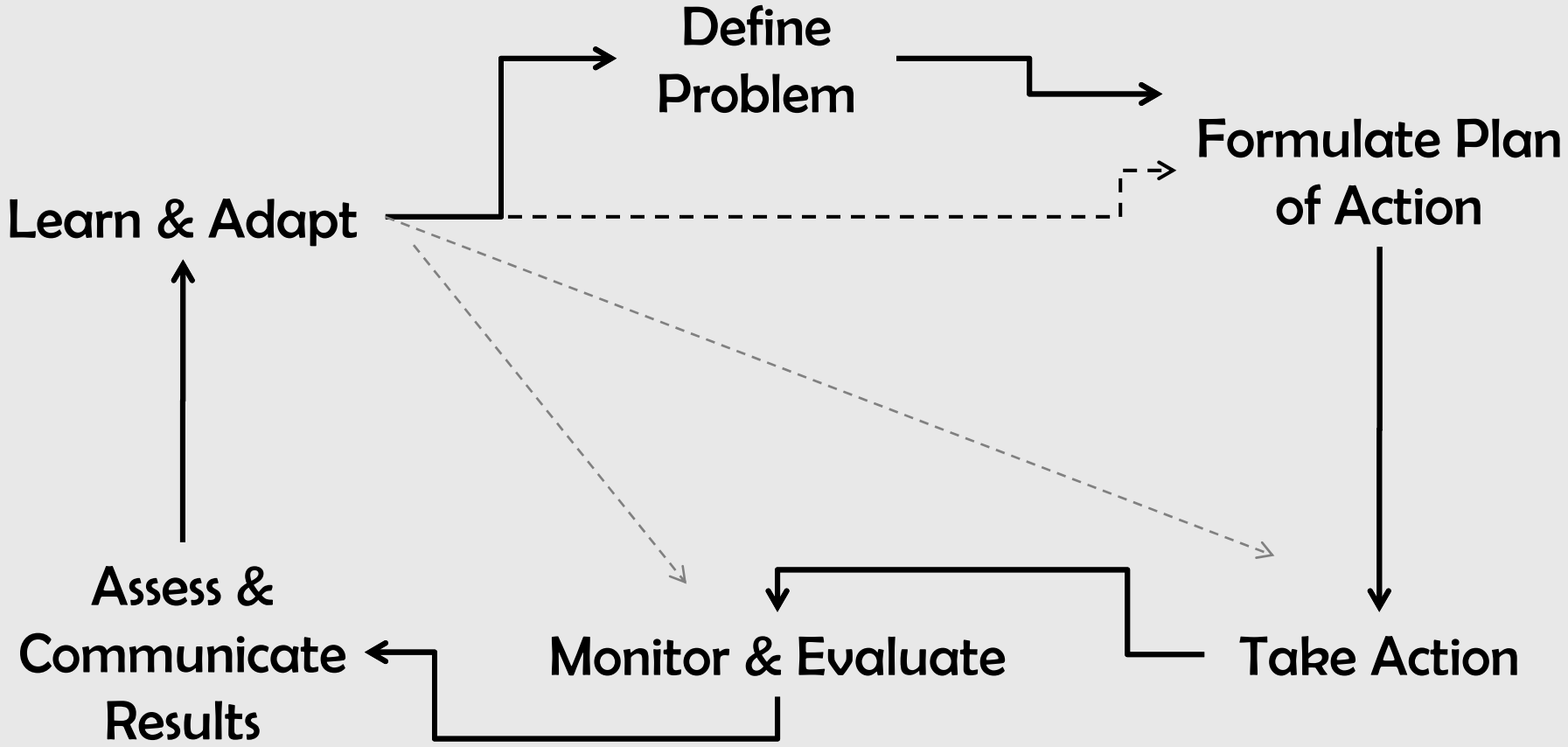
3 documented "types"

- *Active (classic/true) adaptive management*
- *Passive adaptive management*
- *Documented Trail and Error Management*

A 4th "type" is:

- ***Strategic Adaptive Management***

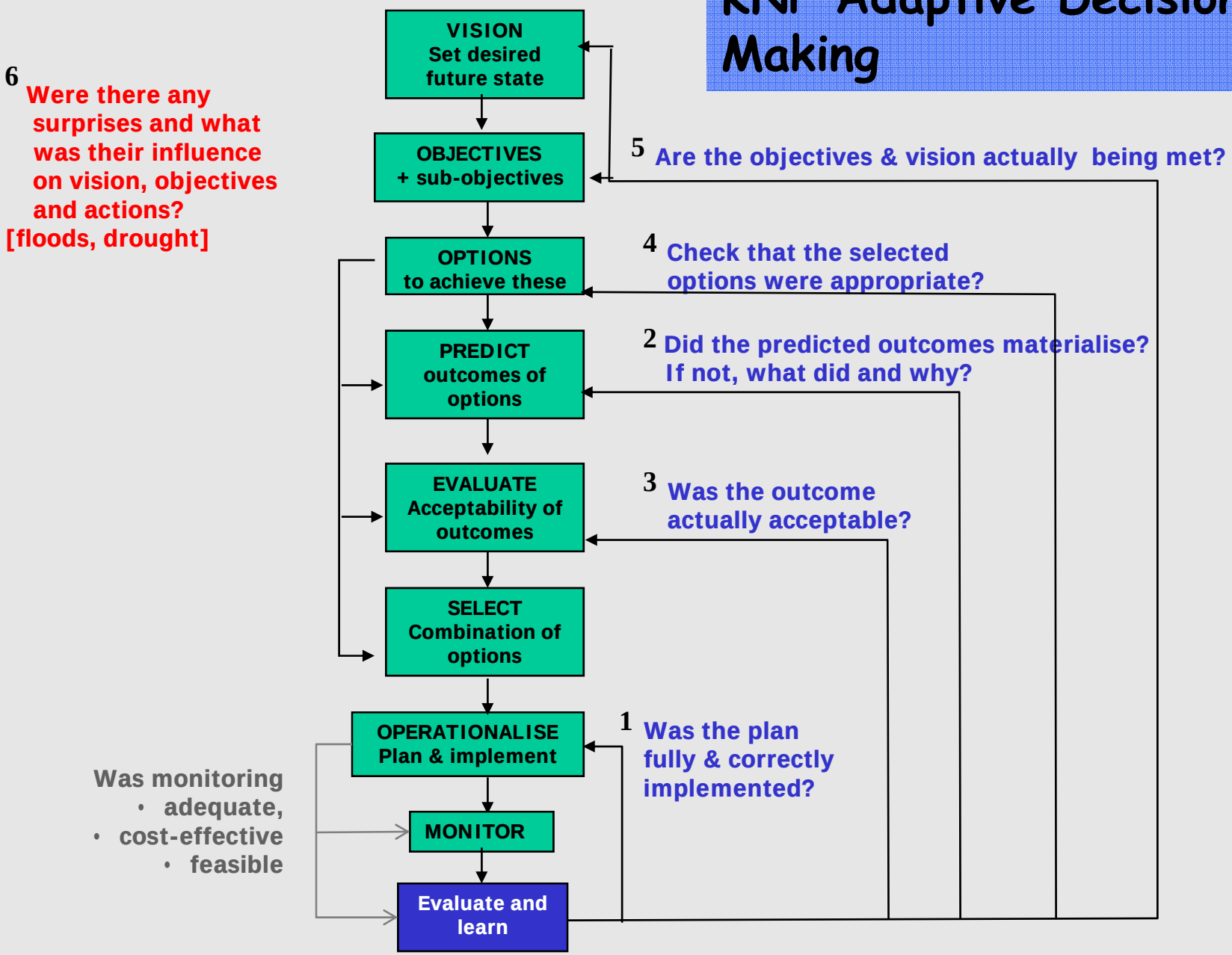
BASIC ITERATIVE PROCESS OF DECISION MAKING



What is 'adaptive management'

- Implementing management actions as landscape scale experiments
- Do something
- Cannot wait for 'more data / information / understanding'- can never have enough.
- Do nothing (**but** not by default- well considered decision)
- Forecast possible responses
- Monitoring outcome (not just monitoring – analysing and interpreting)
- LEARN about ecosystems, management, responses
- Feedback into management process
    - Evaluate & feedback at all stages of the process

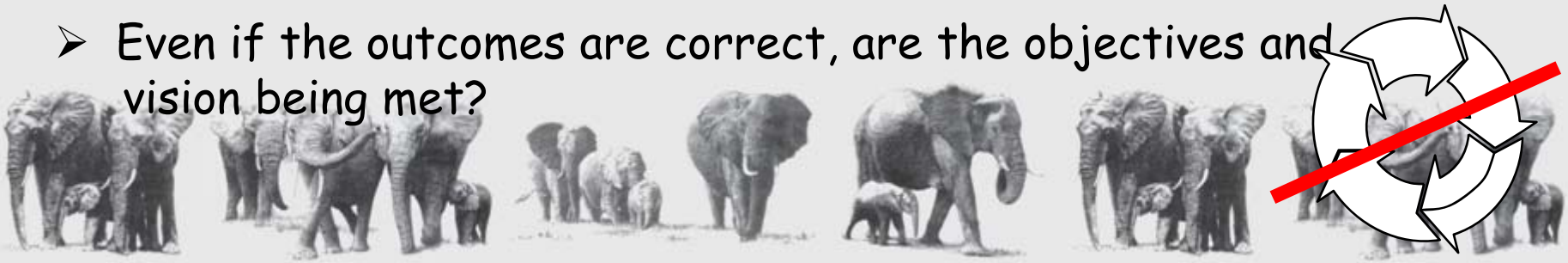
KNP Adaptive Decision Making



SAM is *not* happening when-

Key feedback loops are not in place

- Check: that you did what you said you were going to do
- that your monitoring programme is cost effective, feasible and detecting what it is supposed to
- whether there is change in the ecosystem
- is that change acceptable?
- that your measurable endpoints are still valid
- whether the objectives are still valid
- Even if the outcomes are correct, are the objectives and vision being met?



Adaptive vs 'trial and error'

AM	T & E
Consciously setting goals & exploring options, mindful of scenarios	No linked objectives, thresholds or monitoring
Continuous research, management & integrated learning to adjust approaches based on growing understanding	Objectives may be set, but no self evaluation. Learning is disjunct and does not lead to a more systemic approach to management
Thresholds as hypotheses – management experiments direct monitoring approaches	Reactive (when things don't work the way you anticipated), which may take you away from overall desired outcome (you are anyway not checking this)
Feedback systems in place & functioning (asking the right questions) and across multiple levels	May have feedbacks, but not functioning across levels

SANParks specific

- Uses a variation:
  - Strategic Adaptive Management
- Based on the approach of forecasting (modelling etc) ecosystem change and responding in time

IN PRACTICE - SANPARKS

- Knowing what to conserve and where, is the first step towards effective protected area management
- When and How to manage on the other hand is complicated by the complexities of natural systems functioning under unnatural conditions

How much is too much?

Hands-off or intervene?

LEARNING AND KNOWLEDGE

The challenge in using AM approach:

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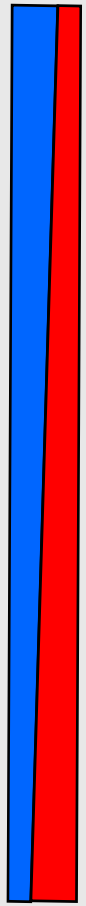
gaining knowledge to improve management in the future

achieving the best short-term outcome based on current knowledge

OBJECTIVES HIERARCHY

Societal values



Vision

Objective 1

Objective 2

Objective n

Sub-obj 1

Sub-obj 2

Sub-obj n

Etc.

Etc.

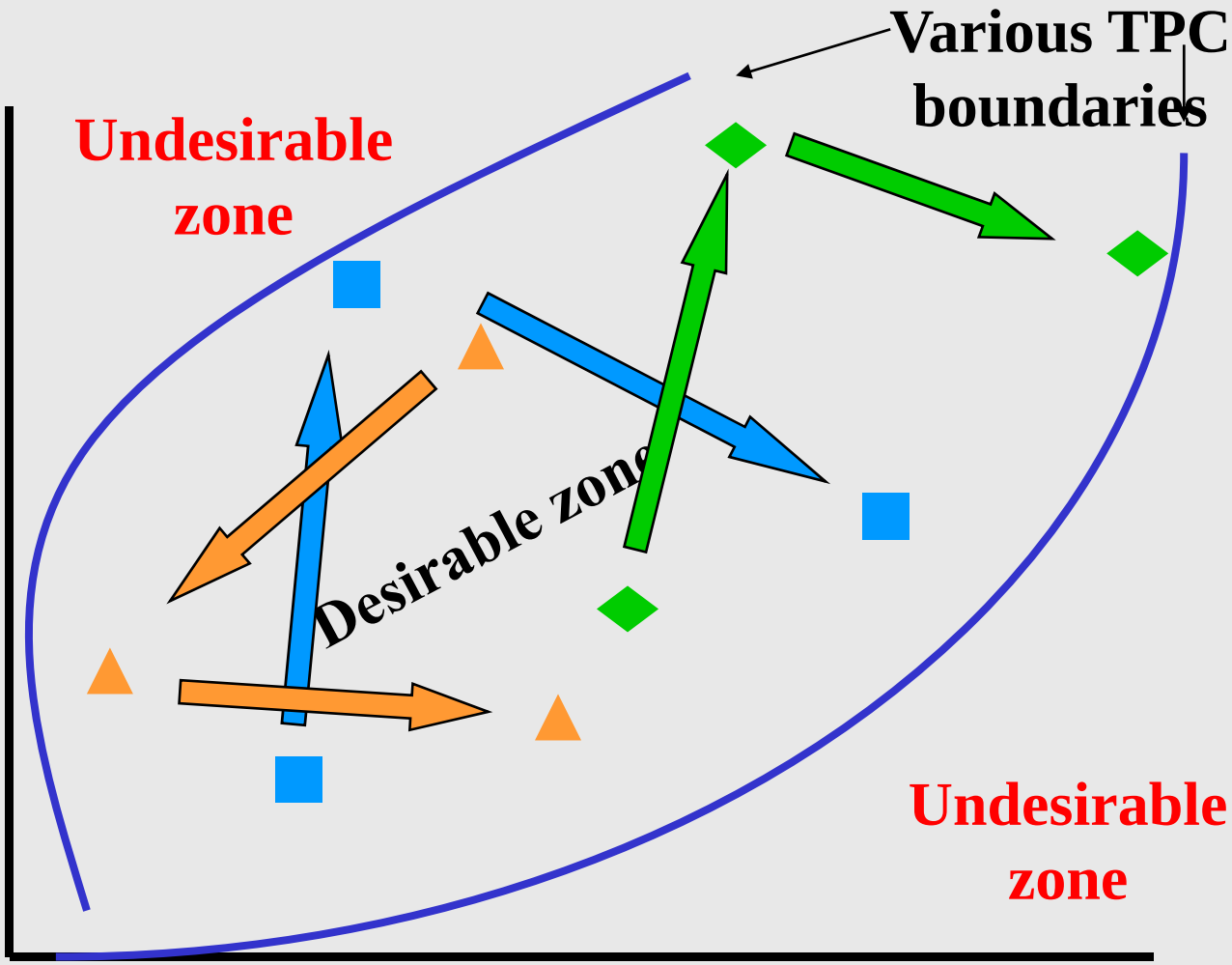
Conservation outcomes

Thresholds of potential concern

Scientific endpoints - measurable

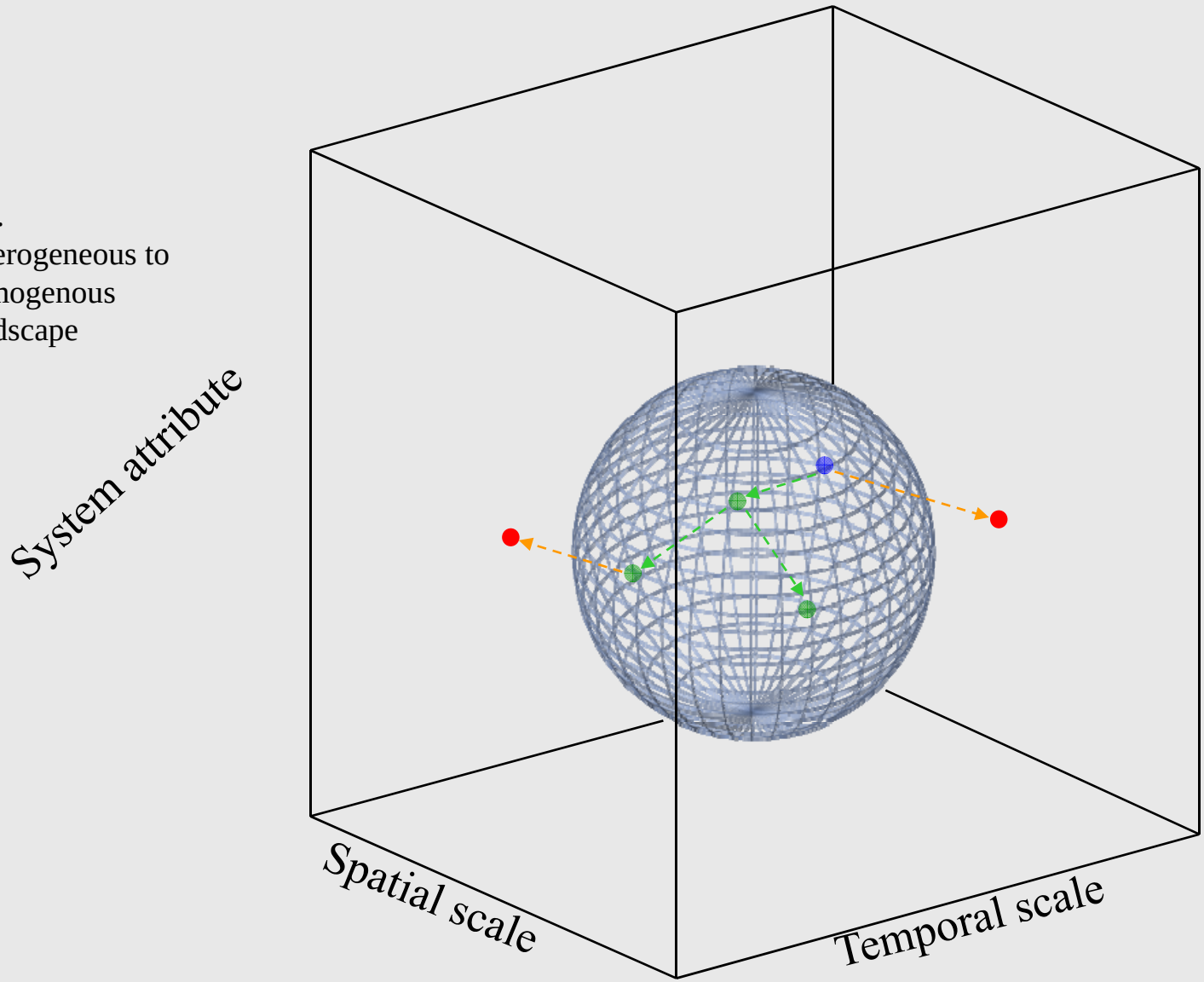
Thresholds of Potential Concern (TPC)

- TPCs represent **hypotheses of the acceptable** spatial and temporal **limits of ecosystem flux**
- These limits are set for indicators of system change
- They are used as amber lights by both scientists and managers to prompt improved understanding and considered action
- TPCs are derived by expert panel consensus on a best-available-data basis

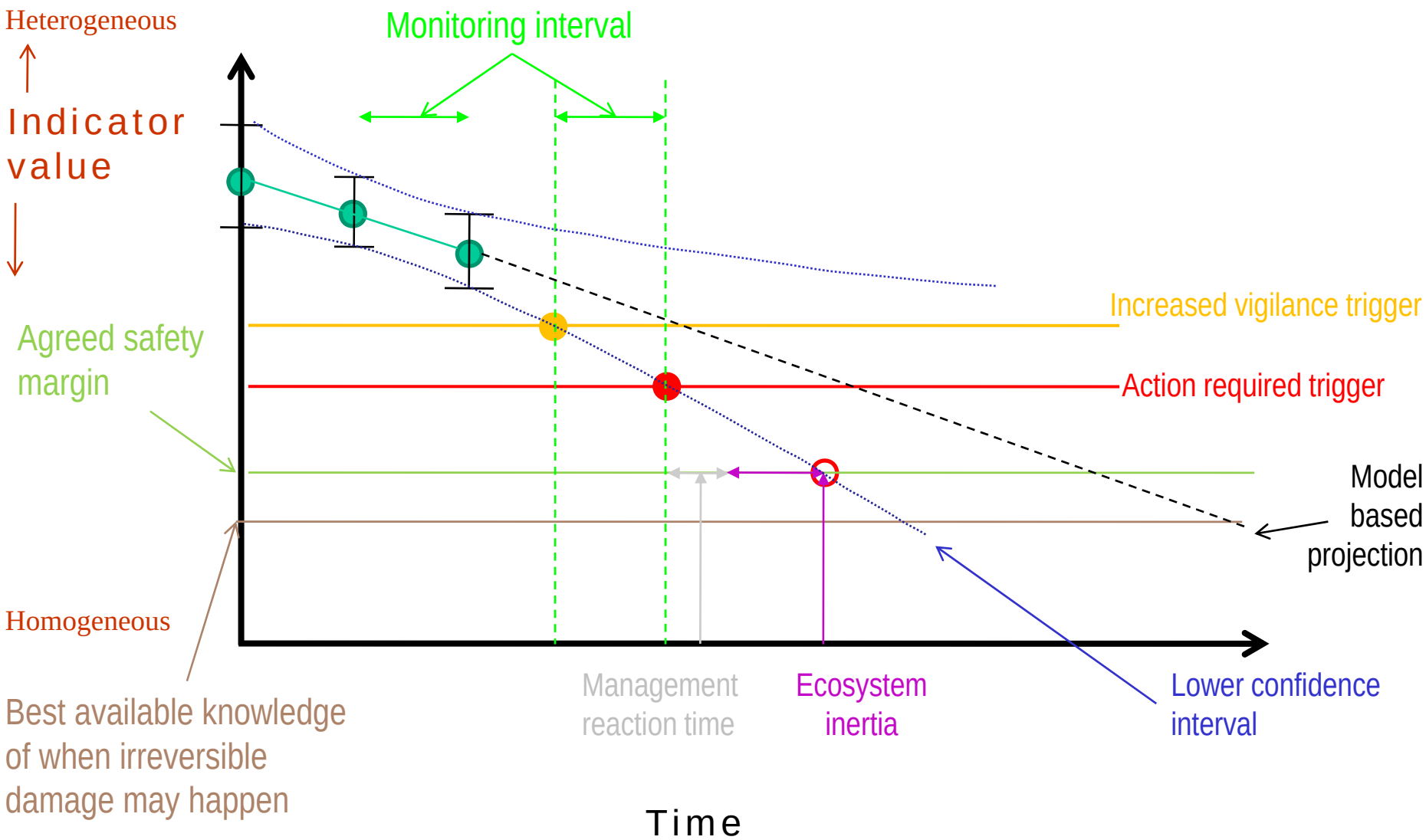


Various system components and their state positions

E.g.
heterogeneous to
homogenous
landscape

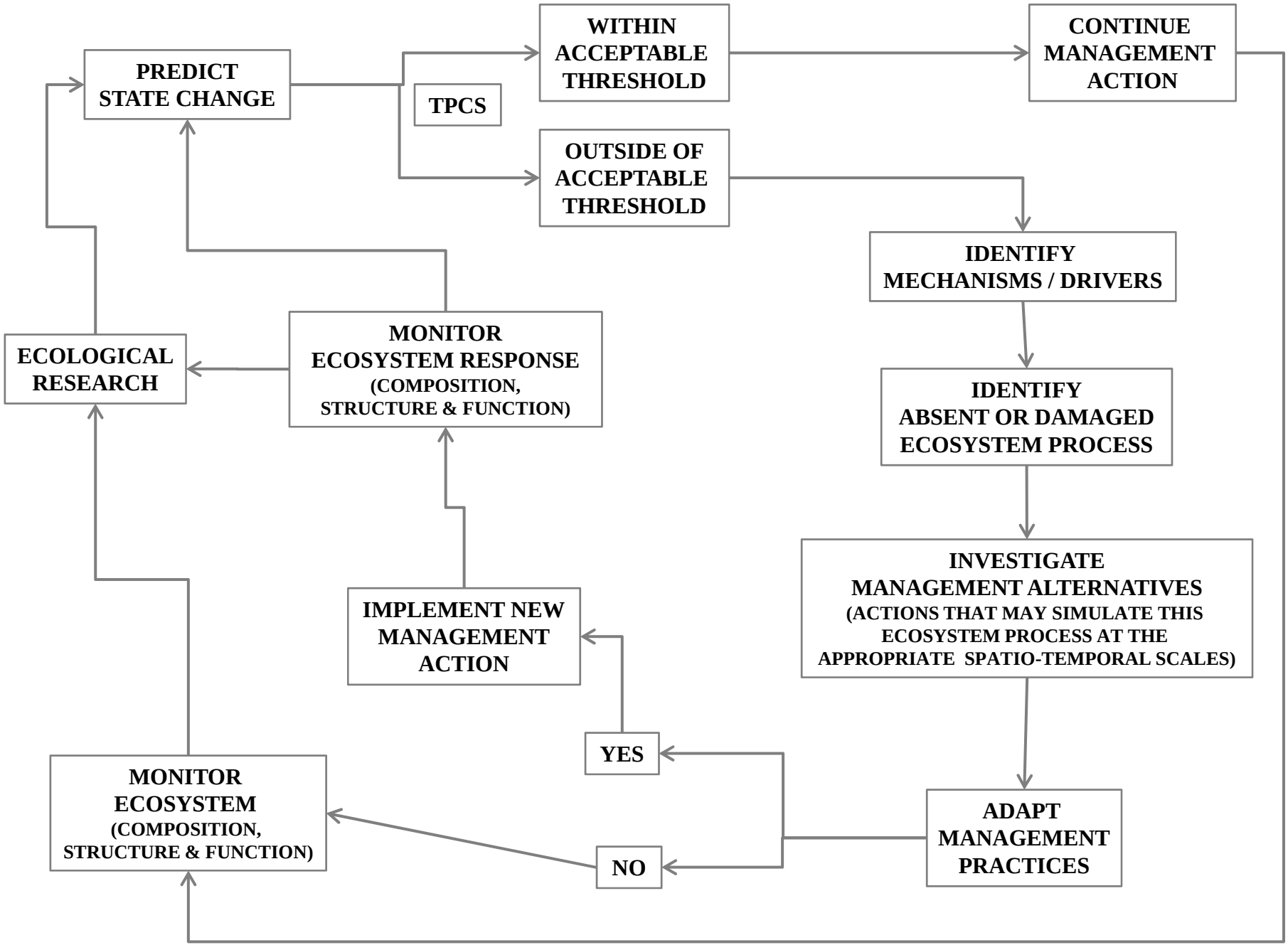


Basis behind thresholds of potential concern



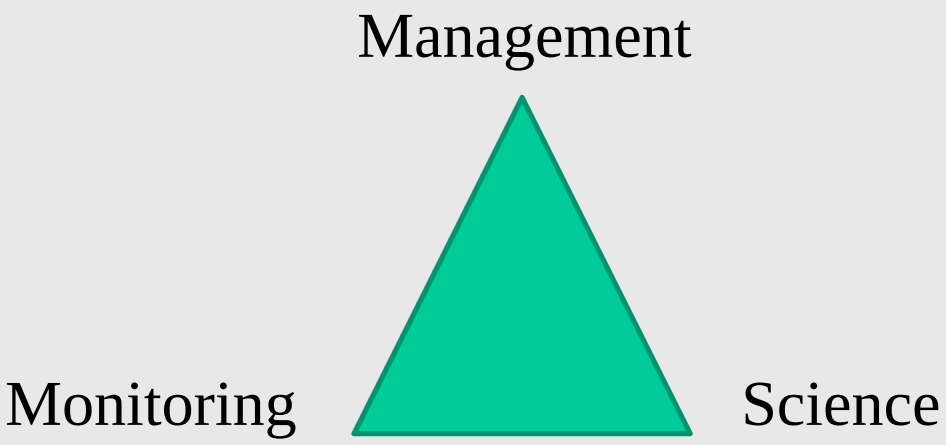
Using strategic adaptive management to integrate:

Vision
Objectives
Thresholds of potential concern
Feedback mechanisms
Drivers or mechanisms of change
Management (getting actions going)
Monitoring
Science


PREDICT STATE CHANGE
TPCS
WITHIN ACCEPTABLE THRESHOLD
CONTINUE MANAGEMENT ACTION
OUTSIDE OF ACCEPTABLE THRESHOLD
IDENTIFY MECHANISMS / DRIVERS
ECOLOGICAL RESEARCH
MONITOR ECOSYSTEM RESPONSE (COMPOSITION, STRUCTURE & FUNCTION)
IDENTIFY ABSENT OR DAMAGED ECOSYSTEM PROCESS
INVESTIGATE MANAGEMENT ALTERNATIVES (ACTIONS THAT MAY SIMULATE THIS ECOSYSTEM PROCESS AT THE APPROPRIATE SPATIO-TEMPORAL SCALES)
IMPLEMENT NEW MANAGEMENT ACTION
YES
MONITOR ECOSYSTEM (COMPOSITION, STRUCTURE & FUNCTION)
NO
ADAPT MANAGEMENT PRACTICES

So how to move from *trial & error*, to *adaptive management*?

Mindset changes for a knowledge-management partnership



1. Need to embrace a philosophical change to management

THE OLD		THE NEW
Balance of nature **No explicit scale** **Population/species focus**	→	**Flux of nature** **Spatio-temporal hierarchies** **Genes to landscapes foci**
"Command and control" to maintain balance	→	**Adaptive management to learn by doing**
Ecosystem management implicit consequence of population control	→	**Ecosystems, heterogeneity and flux to become explicit achievable goals**
We need more data	→	**We have enough to start**

2. Why is translating scientific understanding into conservation management practice difficult ?

Uncertain, limited knowledge base
Unpredictable systems

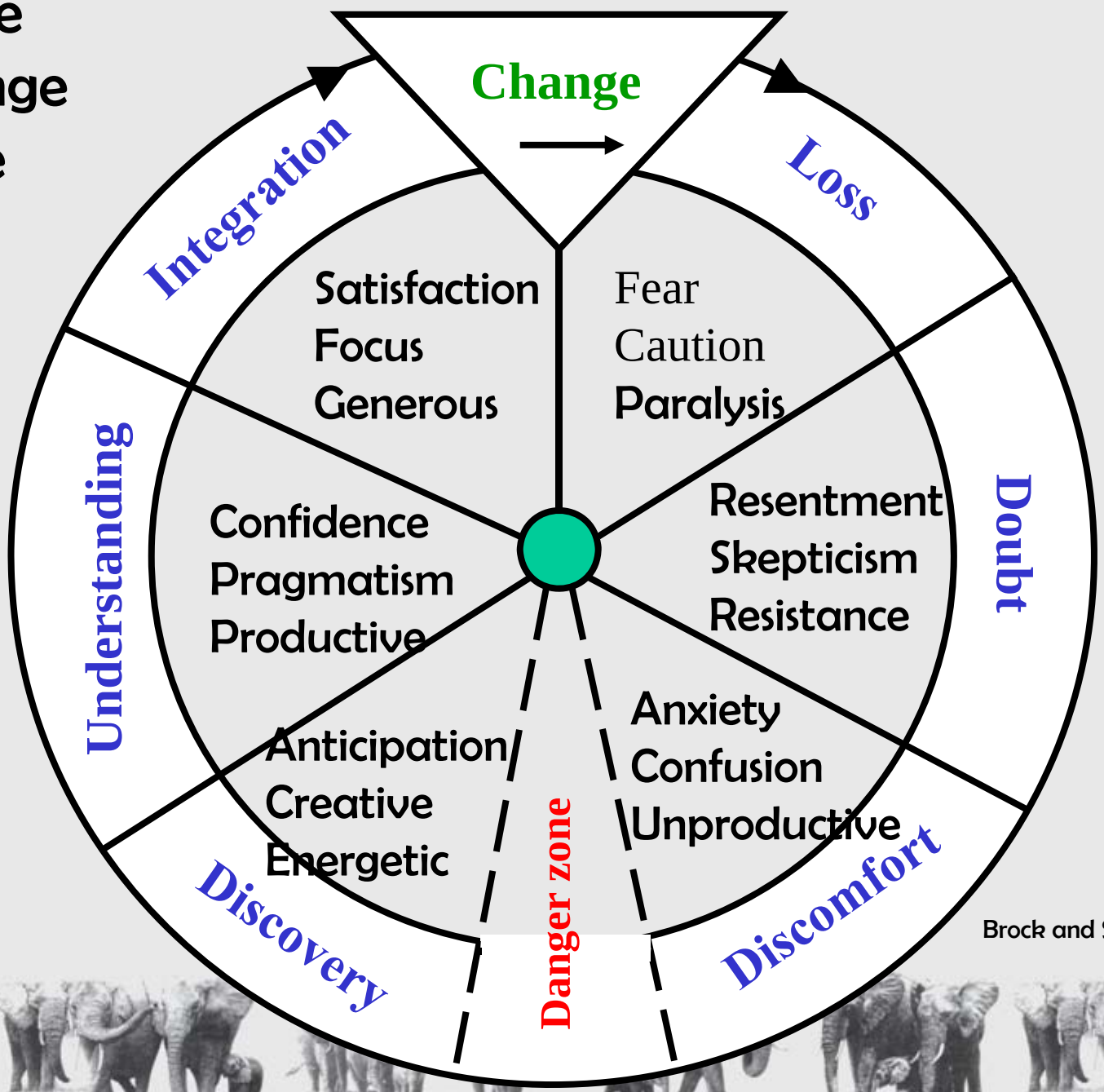
Ecologists' vast and complex understanding - relative to the simplicity of managers' tools

Inappropriate institutional design and reward systems

Contrasting and narrow science and management mindsets
Individual resistance to change

- Knowledge management partnership
- Institutional structure and function
- Behaviour of individuals

3. The Change Cycle



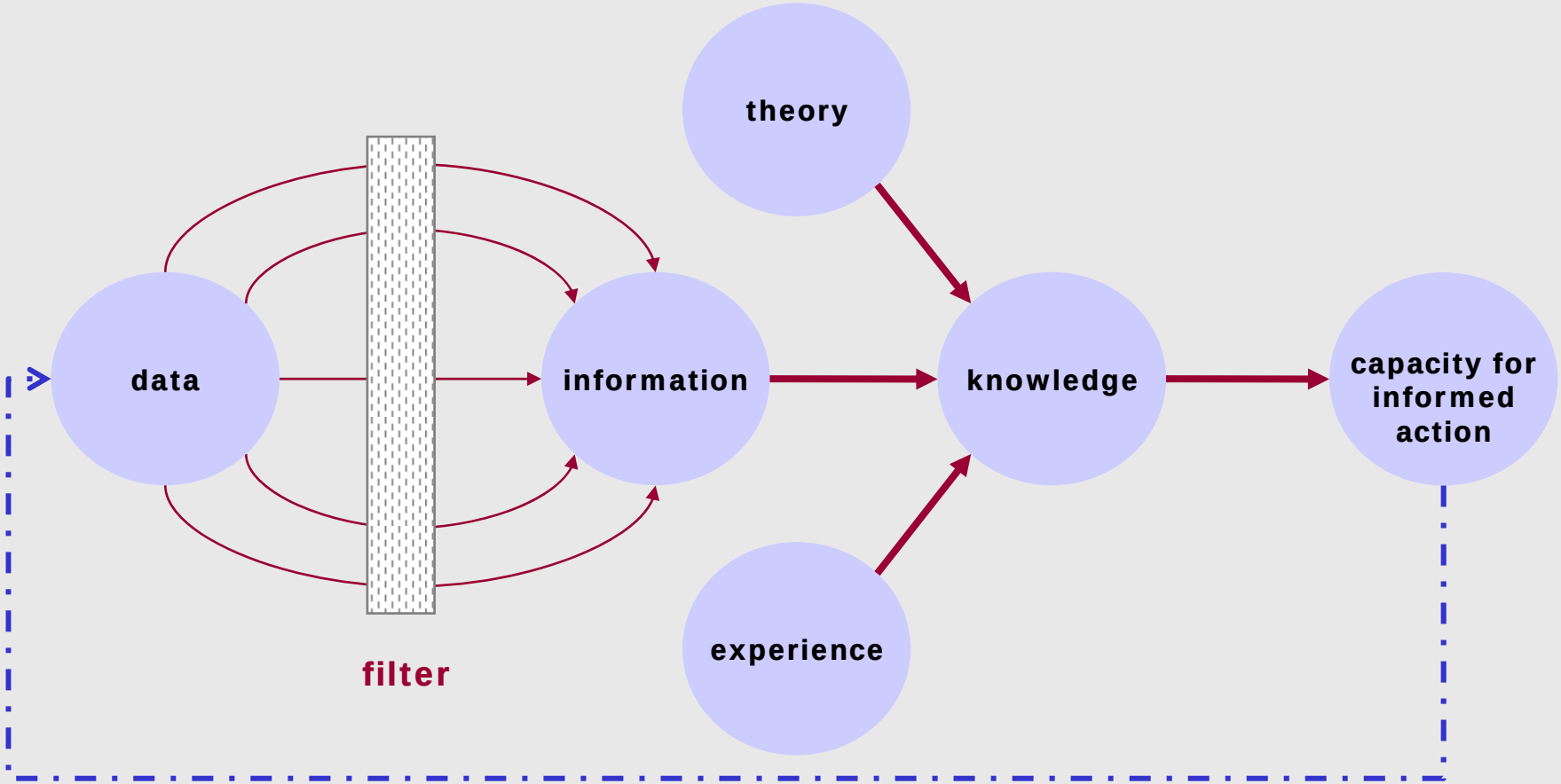
Brock and Selerno 1998

4. LEARNING -> KNOWLEDGE

Knowledge emerges through learning which is the integration of:

- Information derived from data, &
- Theory that gives information its proper context, &
- Experience of how things work in the real world

LEARNING PROCESS (whether individual, organizational, science-management)



CHALLENGES

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1. predicting state change;
2. separating desirable (natural) and undesirable (unnatural) change
3. knowing when management intervention is necessary to avoid an unnatural state change;
4. identifying the mechanisms responsible for this unnatural state change;
5. identifying the absent or damaged ecosystem process;
6. deciding what management intervention will simulate this specific ecosystem process;
7. and knowing how to adapt management practices appropriately

Acknowledgements

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Useful references:

Du Toit, Rogers & Biggs (2003) The Kruger Experience: Ecology and Management of Savanna Heterogeneity. Island Press

Planned 2011:

Special issue of *Koedoe* - A decade of adaptive management in SANParks

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