



Decision Strategies



# **ORDER TO UNORDER – THE THIRD AXIS OF DA (AND HOW IT APPLIES TO SUSTAINABLE ENERGY)**

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DAAG 2011



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# The usual DA process

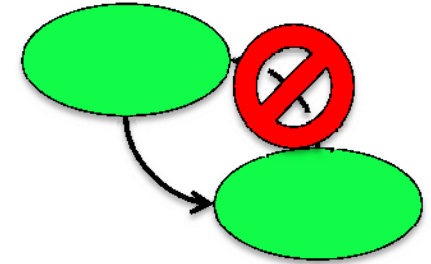


**This approach to decision-making assumes a fairly high degree of *order* in the problem at hand**

# Order versus Unorder

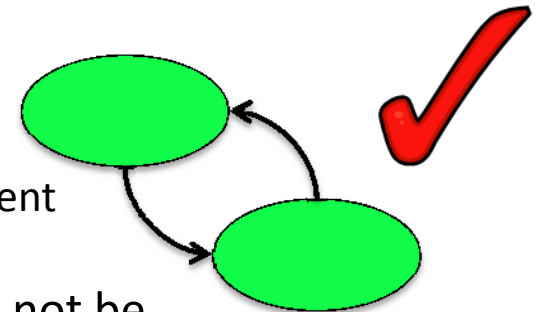
- Ordered systems

- The past is an indicator of the future
- Uncertainties are “well behaved”
- Modeling results are repeatable
  - Minor input differences => minor output differences
- Expected values are meaningful



- Unordered systems

- The future may not resemble the past at all
  - “Strange attractors”
- Uncertainties are strongly interdependent
  - Feedback loops and tipping points
  - Minor input differences may lead to extremely different outcomes
- The concept of the EV of a decision alternative may not be meaningful

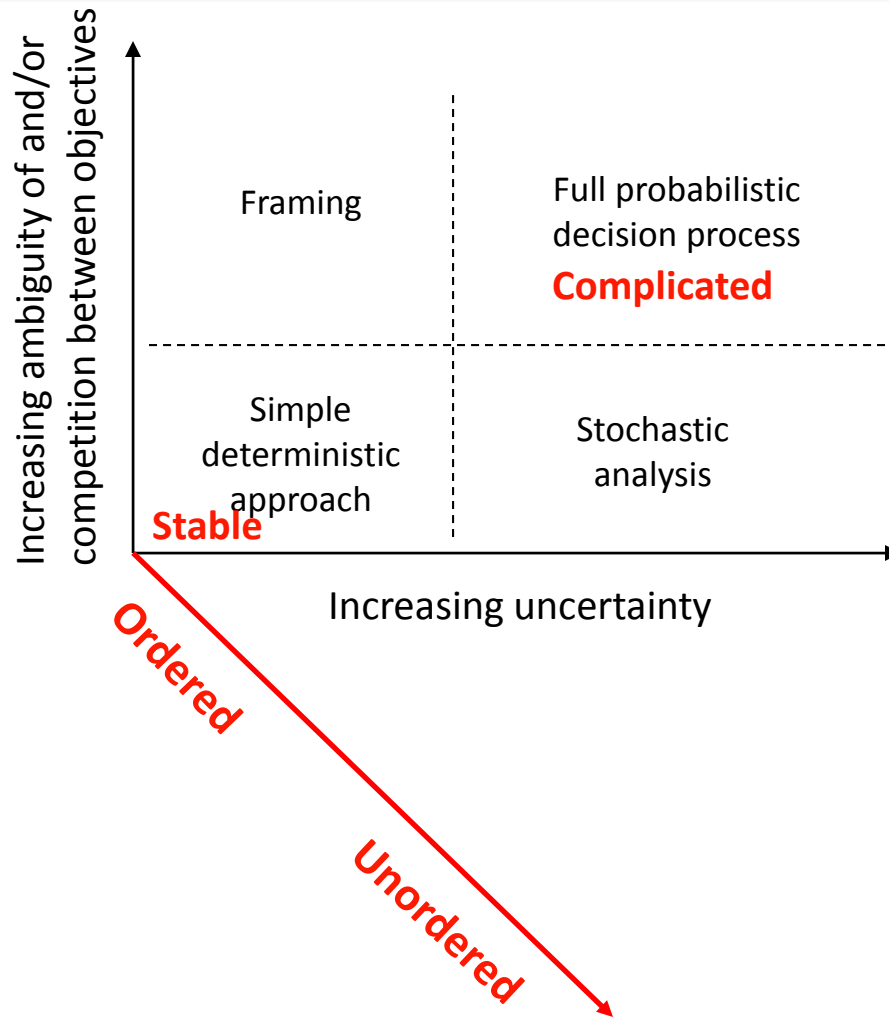


# Decision-making amidst varying degrees of order

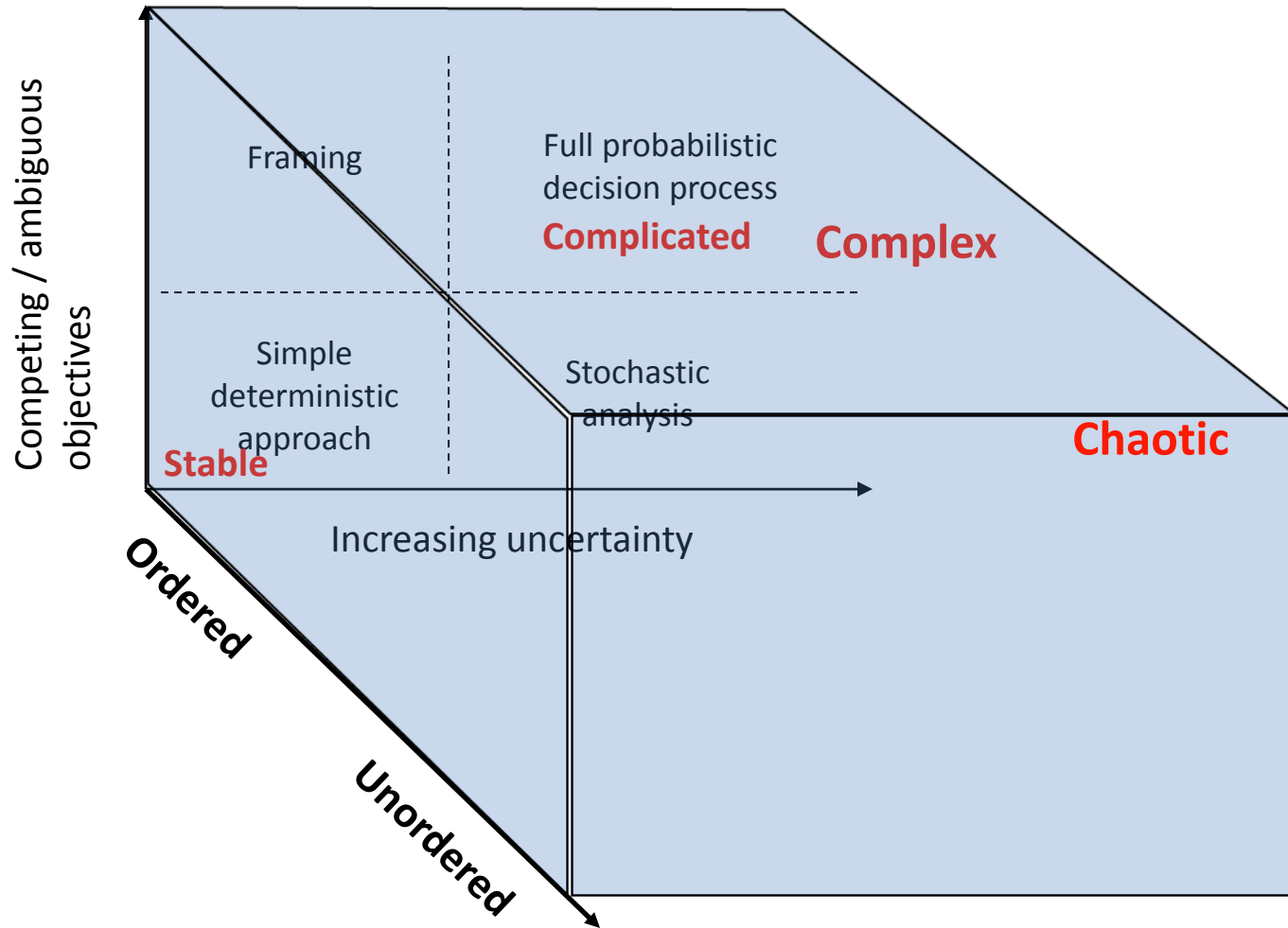
Situation	Buzz phrase	Key inputs, tools	Decision process
Stable Sense Categorize Respond	“The past is key to the future”	Benchmarking, six-sigma	Determine best practices and adopt them; delegate
Complicated Sense Analyze Respond	“Known unknowns”	Expert inputs; stochastic modeling	Think creatively; push boundaries; use analysis to gain insight; weigh competing objectives
Complex Probe Sense Respond	“Tipping points; butterfly effects”	Parallel efforts by multiple teams	Set boundaries, then experiment; multiple creative approaches; solutions emerge
Chaotic Act Sense Respond	“What the h*** is going on?”	None. Cope with situation and impose as much order as possible until chaos passes	Autocratic; take charge and give commands

Reference: Snowden and Boone

# A third axis to the traditional DA 2x2



# A third axis to the traditional DA 2x2



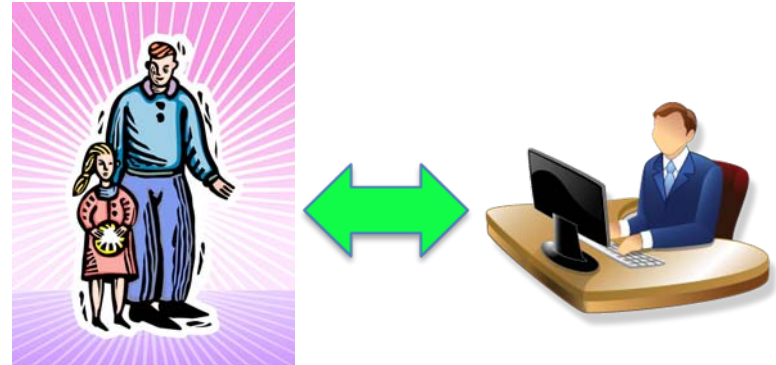
# Characteristics of complex systems:

- Large number of interacting elements (or agents)
- The agents and the system constrain each other
  - Contrast with ordered systems (system constrains agents)
- Interactions are non-linear
  - Minor changes can have major consequences
- The past is not the key to the future
  - Deterministic prediction is impossible
- System evolves
  - Elements evolve with one another and with environment
  - Evolution is irreversible

Reference: Snowden and Boone

# But *human* complex systems may be different

- Humans play multiple roles and fluidly switch between them
- We make decisions based on:
  - Past patterns of success or failure and/or emotion
  - NOT on logical, definable rules
- Humans can consciously change systems



Reference: Snowden and Boone



**So we have to model human behavior in  
a way that captures human attributes**

**=> Game Theory**

# The Order-to-Unorder spectrum bifurcated

**Stable**

**Complicated**

**Complex**

**Deterministic  
Modeling**

**Basic  
Stochastic  
Modeling**

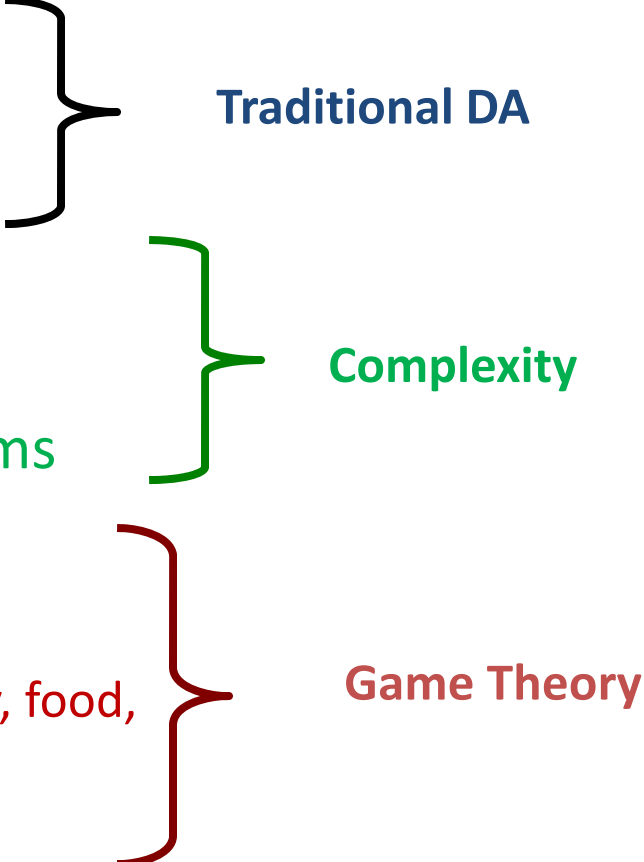
**Small number of  
unique players**

**Game  
Theory**

**Complex  
Systems  
Analysis**

**Large number of  
similar players**

# Consider the issue of Sustainable Resources

- Competing objectives
  - Uncertainties
    - Known
    - Unknown
    - Interdependencies
  - Non-linear complex systems
  - Multiple decision-makers
    - Governments, regulators
    - Resource providers (energy, food, water,...)
    - Resource consumers
- Traditional DA**
- Complexity**
- Game Theory**
- 

***A triple-integrated approach is needed***

# A modified DA process\*

- Discovery
  - Understand the opportunity
  - Understand the system;  
learn the rules
  - Understand all players  
objectives, preferences and  
decisions
- Framing
  - Clarify our objectives
  - Raise issues
  - Determine focus
  - Create strategic themes
  - Understand influences  
between uncertainties
  - Establish reasonable  
boundaries for evaluation
  - Understand objectives,  
strengths, and influences of  
all players

\*Acknowledgement to James Mitchell

# A modified DA process\*

- Evaluation (1)
  - Where known unknowns dominate:
    - Build stochastic model
    - Gather probabilistic inputs
    - Evaluate strategic themes
    - Gain insight
    - Create hybrid strategies
    - Optimize hybrid
- Evaluation (2)
  - Where “agent interactions” dominate:
    - Probe the situation; experiment within the bounds established during framing
    - Pilot several different potential solutions?
    - Observe changes and trends in the other players and in the system itself; *learn what works*
    - Plan for flexibility
- Evaluation (3)
  - To account for other major players and gain insight into likely outcomes:
    - Model the players’ interactions through a “sufficient” number of time periods
    - Include appropriate uncertainties
    - Run multiple simulations
    - Discover likely stable solutions

\*Acknowledgement to James Mitchell

# What this means for Sustainable Resources

- Research and/or analysis alone will not generate an answer
- Bounded experimentation is needed
- Game theory modeling of the behavior of the major players should be used
- Solutions will emerge

## The biggest obstacle to action:

**“...the values to which people cling most stubbornly under inappropriate conditions are those values that were previously the source of their greatest triumphs over adversity.”**

Jared Diamond in *Collapse – How Societies Choose to Fail or Succeed*



# TRADITION

JUST BECAUSE YOU'VE ALWAYS DONE IT THAT WAY  
DOESN'T MEAN IT'S NOT INCREDIBLY STUPID.

[www.despair.com](http://www.despair.com)



**So there's an element of Change Management needed, too.**

**(... but then again, there always is)**

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# Questions?

