

Applying Modeling and Simulation to Foreign Policy

Formulating strategy from Afghanistan to the Islamic State

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NDIA Human Systems Division (HSD)

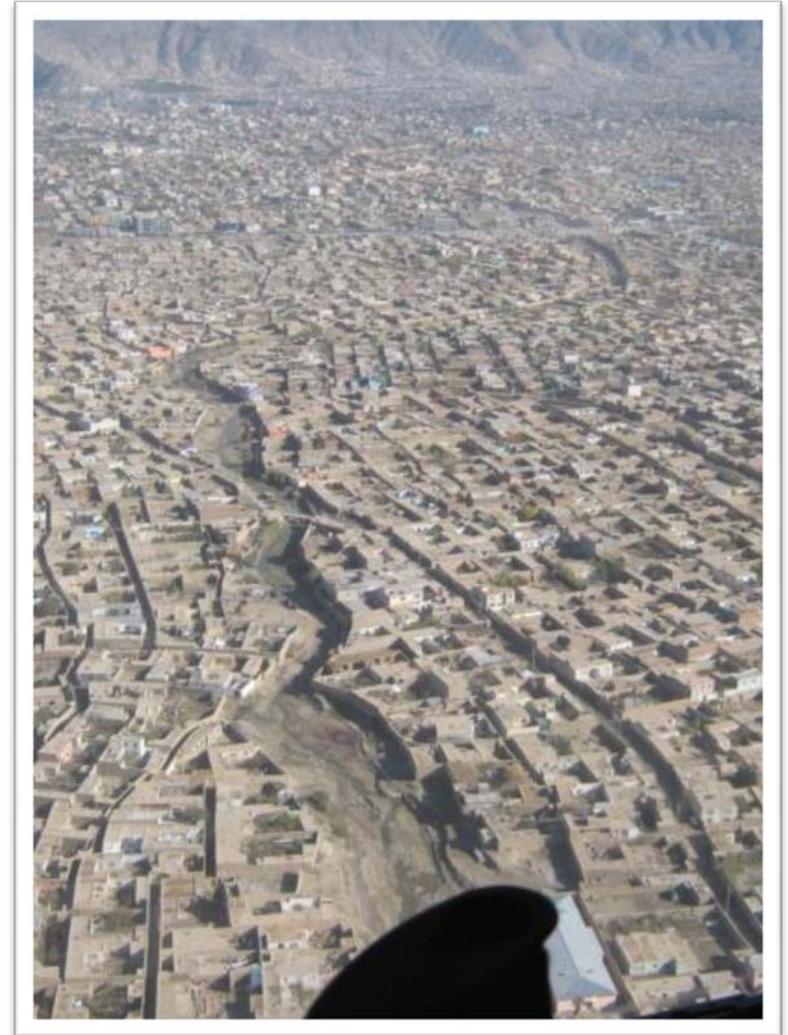
February 10, 2015

Alexandria, Virginia

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Outline

- System Dynamics (SD) simulation
 - Synthesizes information
 - Addresses social system complexity
- From Afghanistan to the Islamic State (ISIL/ISIS)
 - M&S-based strategy formulation
 - Governance competition model
 - Operational insights



Macro-level Information Synthesis

- We spend billions to collect information
 - Having spent money to sustain an information, collection, and analysis process, **we spend virtually nothing on the direct support to senior decision makers**
 - Few tools support the synthesis process
- This society pays dearly, every single day, in terms of policy, for its failure to teach **systems-oriented people to synthesize at the macro level.**
 - Many develop capabilities by virtue of experience, but we need people who are **trained** to synthesize information at the macro level



“Extreme Negotiations” Require Information Synthesis at the Macro Level

- Get the big picture
- Uncover and collaborate
- Elicit genuine buy-in
- Build trust first
- Focus on process

Jeff Weiss, Aram Donigian,
and Jonathan Hughes
Harvard Business Review 2010



System Dynamics (SD) for Strategy Formulation

- Social system simulation addresses dynamic complexity
 - People understand their present social system
 - People cannot predict how that social system will change
 - Human cognition is confused by **dynamic complexity**
- SD handles dynamic complexity through 3 types of causal relations
 - (1) Stock-flow, (2) nonlinearity, and (3) feedback – all are confusing
 - SD does what effects-based operations (EBO) attempted
- SD is not the same as Operations Research (OR)
 - Dr. Russell Ackoff, an OR pioneer, has expressed concern and criticism of OR as a discipline capable of analyzing policy in ever more complex times. He explains that systems thinking and SD offers the holistic perspective and flexibility needed to cope with dynamic complexity and to focus on the performance of “wholes rather than parts”.

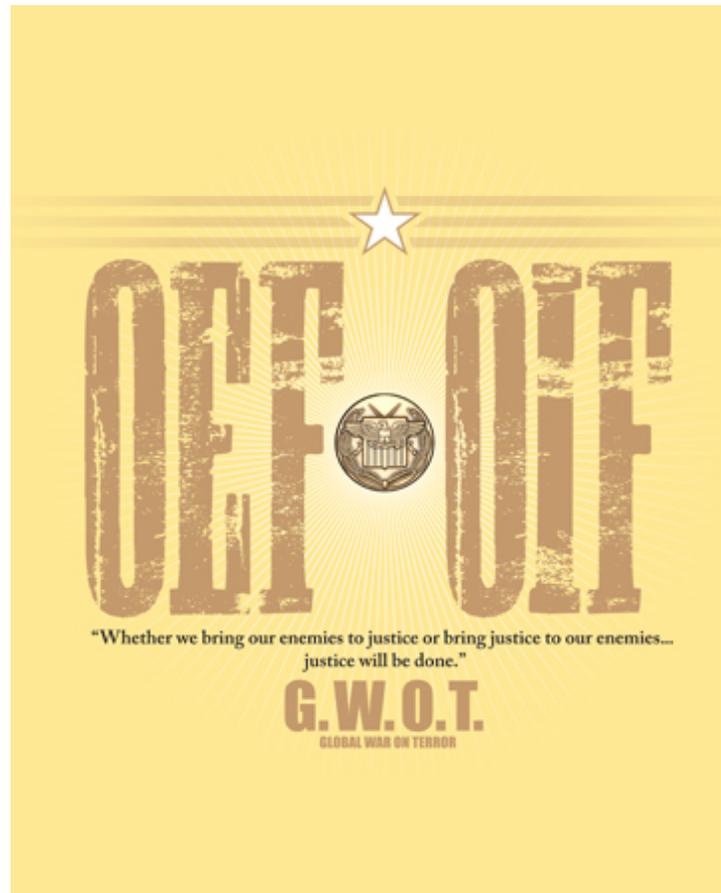
Current Strategy Modeling Opportunity: ISIL et al.

Address with long-term, shaping operations using small footprint Special Operations Forces (SOF)



ISIL Strategy: Overview

- Consider what strategies worked in Operation Enduring Freedom (OEF) in Afghanistan and Operation Iraqi Freedom (OIF), and what did not



ISIL Strategy: Background

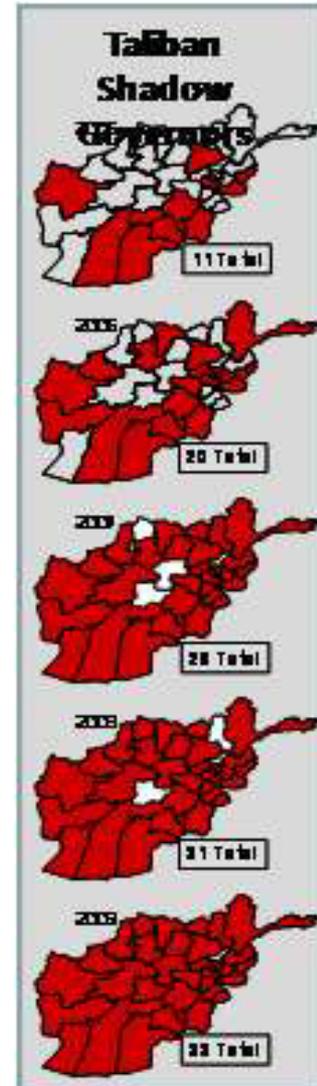
- Counterinsurgency (COIN) operations depend upon three complementary and integrated efforts: (1) security; (2) governance; and (3) development
- The US military is excellent short-term tactics, while there exist opportunities for improving long-term strategy



- Senior decision makers underestimate “cultural inertia” by overestimating their ability to change and reshape societies through strategy and policy
- Cultural inertia can be modeled through a “Polya” process that models the *path dependence* by which systems that are fluid and malleable can become frozen and unchangeable

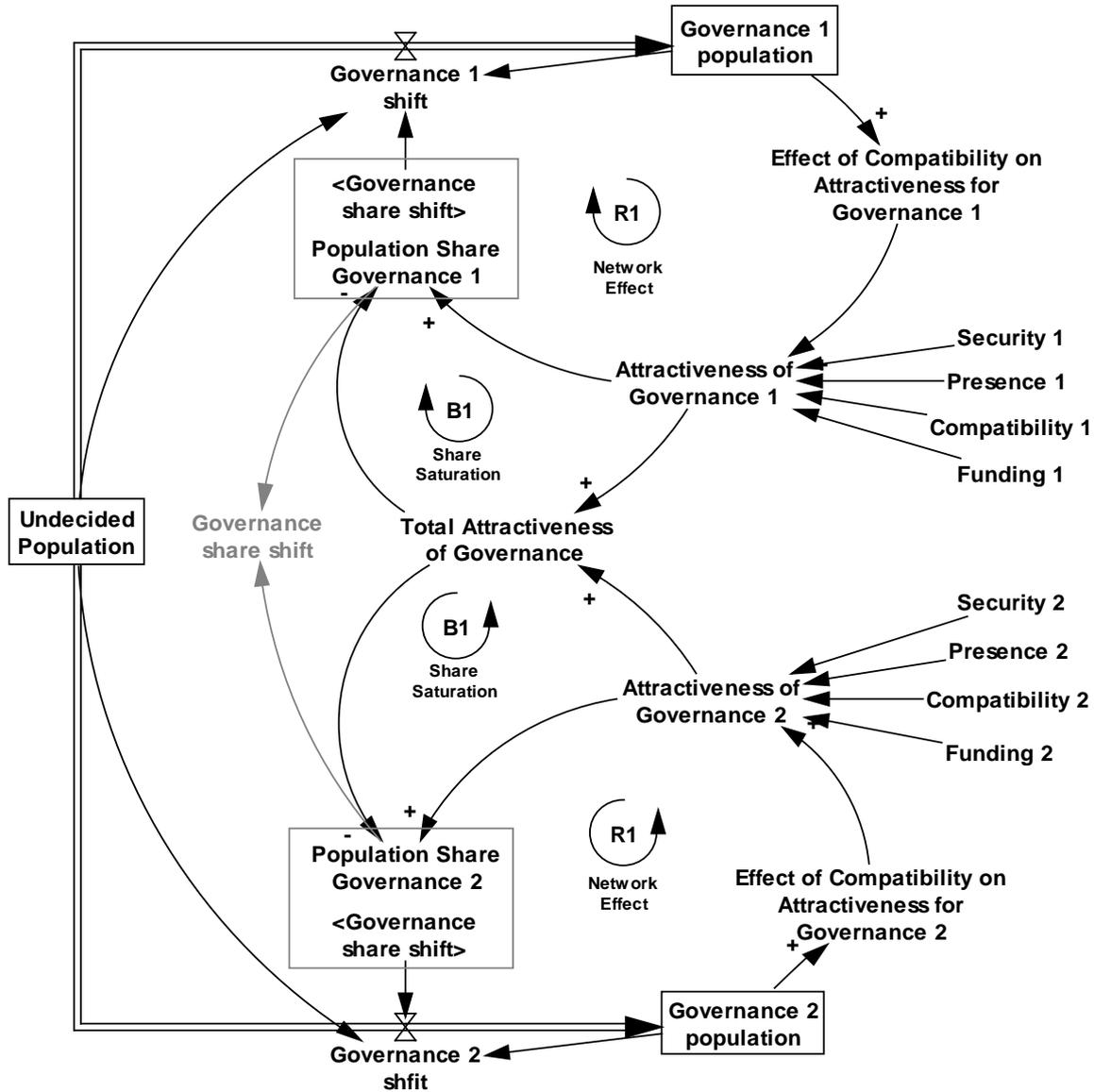
ISIL Strategy: Key Question and Proposed Answer

- Q: The US military is excellent at security operations, but in Afghanistan they critically lost the support of the population—why?
- Ans: Populations decide which form of governance to support based on **network effects** based:
 - Their **presence** among the population
 - Are there sufficient forces?
 - Their **compatibility** with the culture
 - Will forces, their strategy, and their policies be accepted?
 - For example, the **democracy** offered by Government of the Islamic Republic of Afghanistan (GIROA) may be better than Taliban rule but is far more foreign
 - An alternative, the Taliban's authoritarian shadow governance, expanded from 11 Afghan provinces in 2005 to 33 (of 34) in 2009
 - The Taliban imposes taxes for a sustainable revenue stream, while GIROA depends on international donations



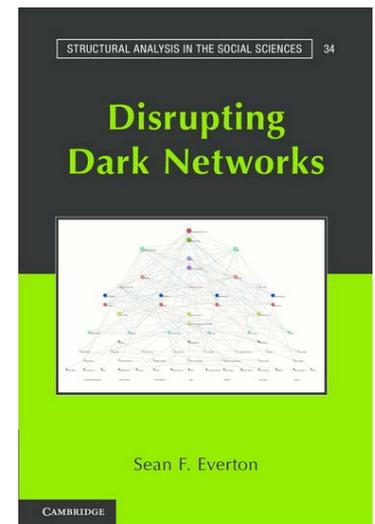
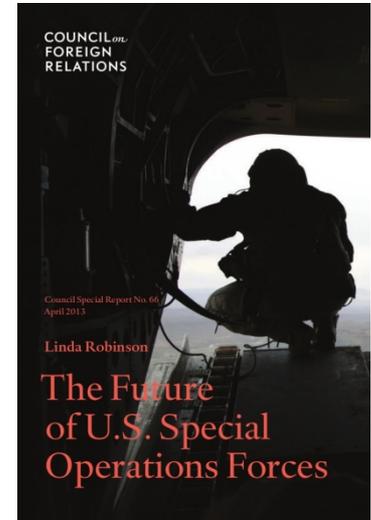
Governance Competition Model

(featuring network effects of presence and compatibility)



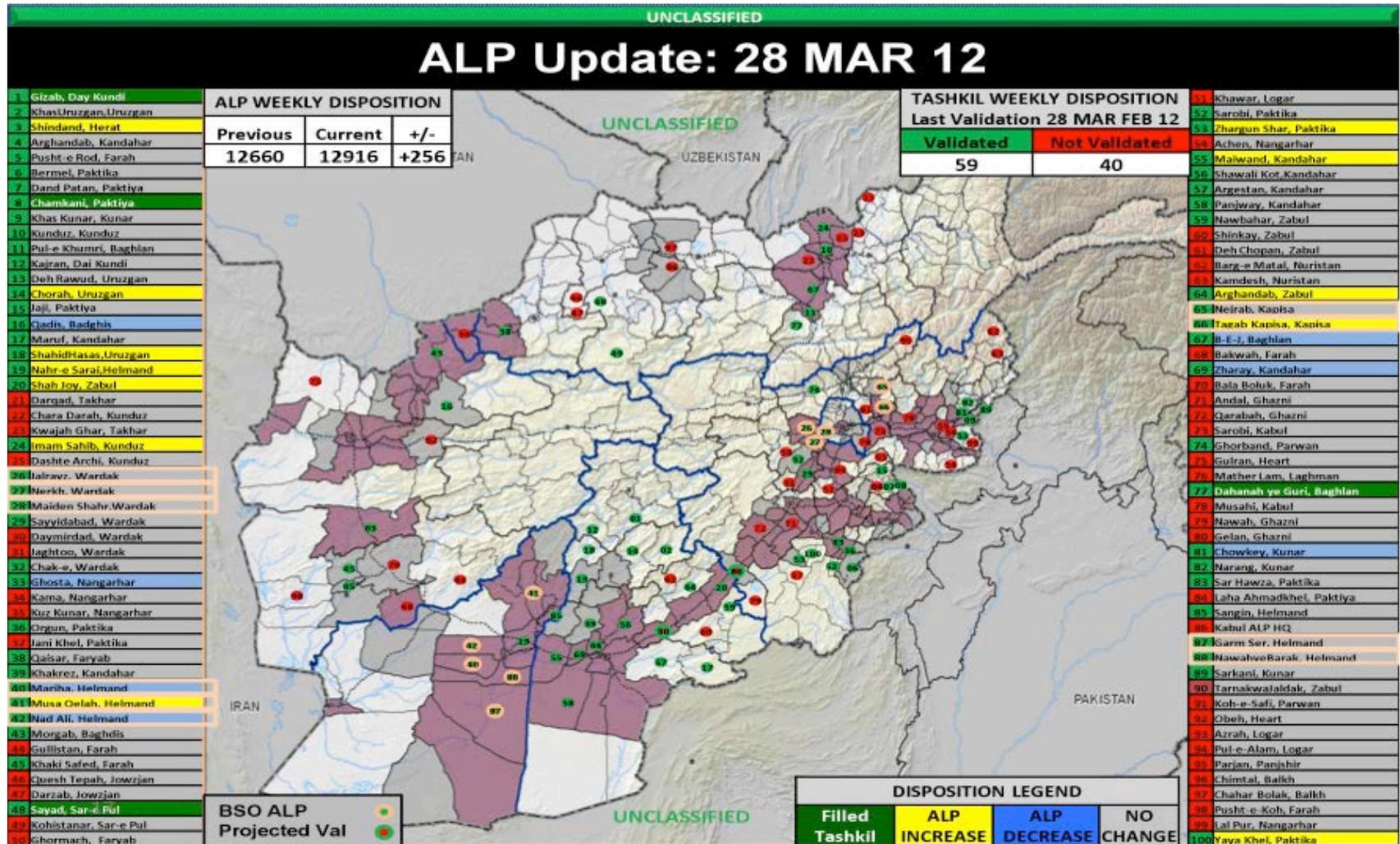
Strategic Special Operations Require Space and Time

- Employing Special Operations Forces (SOF) to achieve strategic effects remains an opportunity
 - Over the timeframe of months and years rather than hours and days
- System Dynamics (SD) simulation supports the analysis and management of strategic effects over time but not space
 - Network models characterize space but not time
- Agent-Based (AB) simulations that incorporate social network (AB+SN) representations can characterize system change over space and time
 - Using dark network disruption as a behavioral theory source



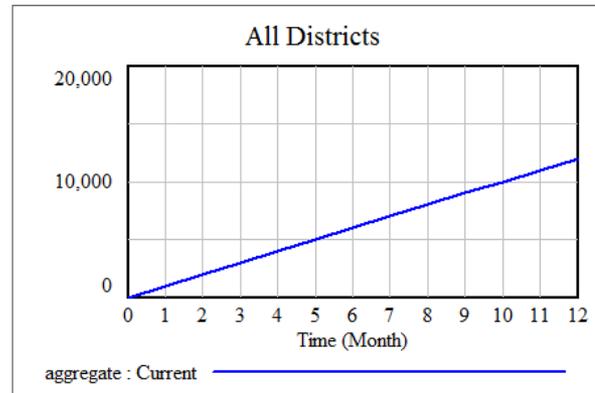
Command Forces Special Operation Combatant Command – Afghanistan (CFSOCC-A)

Afghan Local Police (ALP) acknowledges network effects

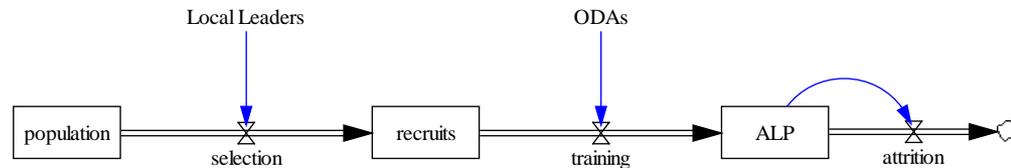


ALP acceleration, dynamics, and disaggregation

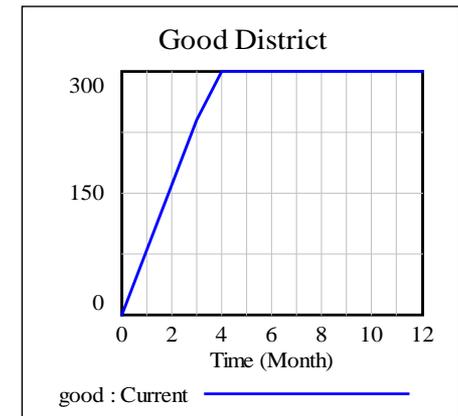
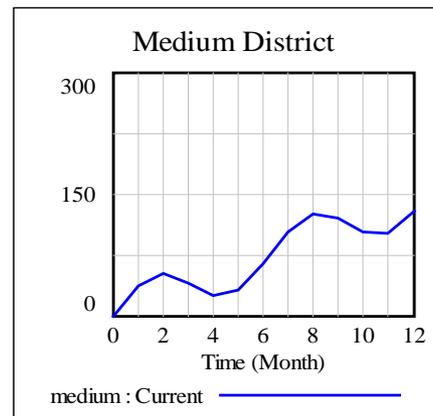
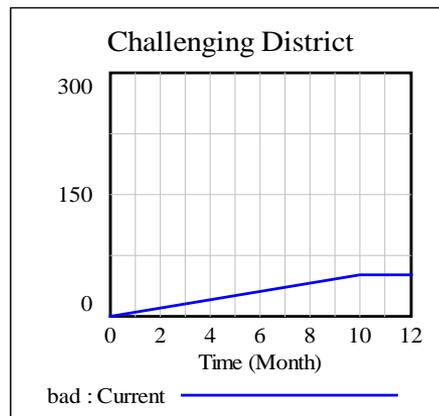
- All districts



- Simple system



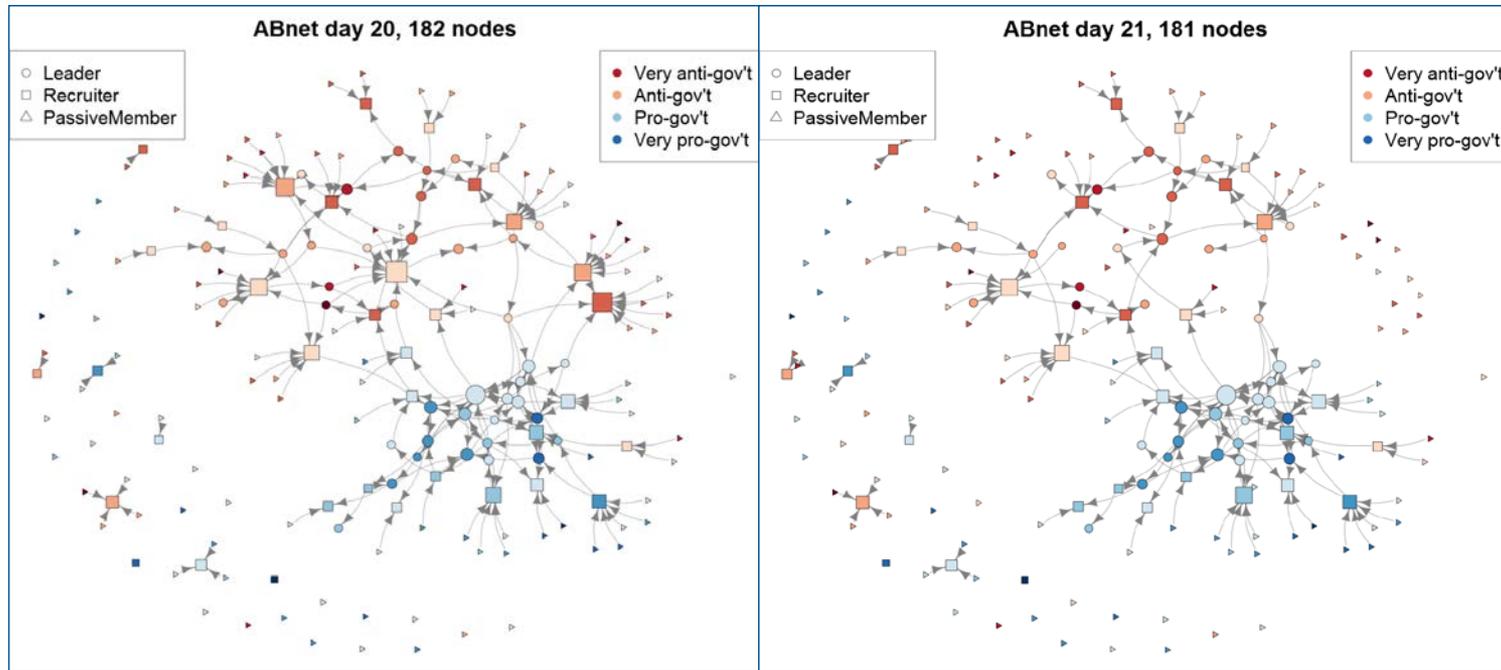
- By district





State-of-the-Art Social Network Analysis (SNA)

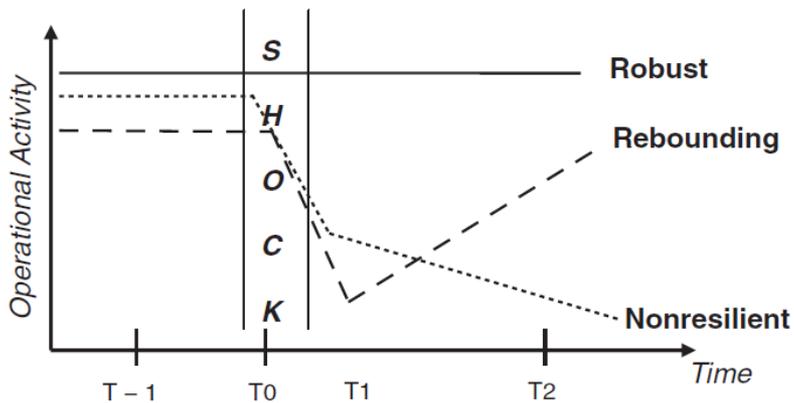
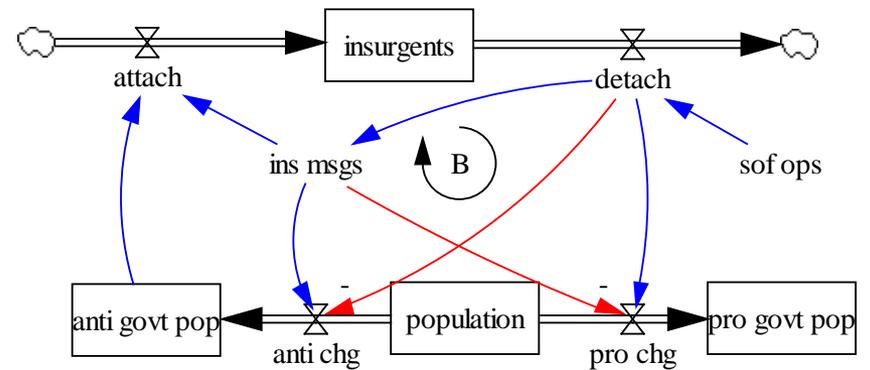
- Short-term
- Kinetic
- Removal of highly centralized nodes



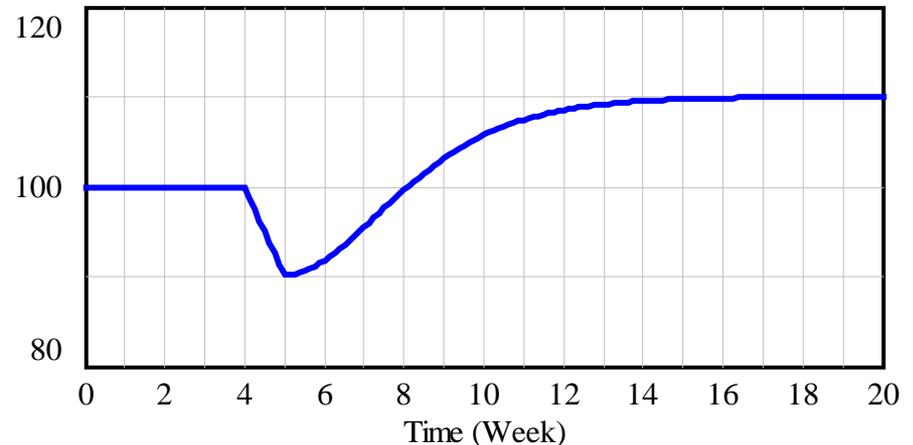
Short-term Kinetic Operations and Long-term Non-kinetic Consequences

- Node removal may seem intuitively obvious but can have negative long-term consequences
 - Specifying complex causal relationships in agent-based simulation is challenging

McCrystal "Insurgent Math" Model



Insurgent Subtraction Dynamics

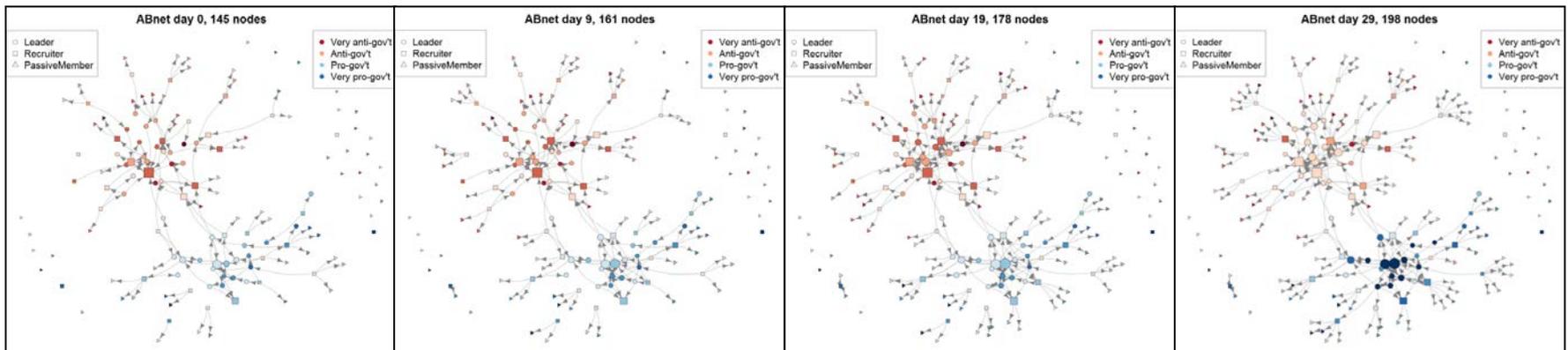


Insurgents : Current

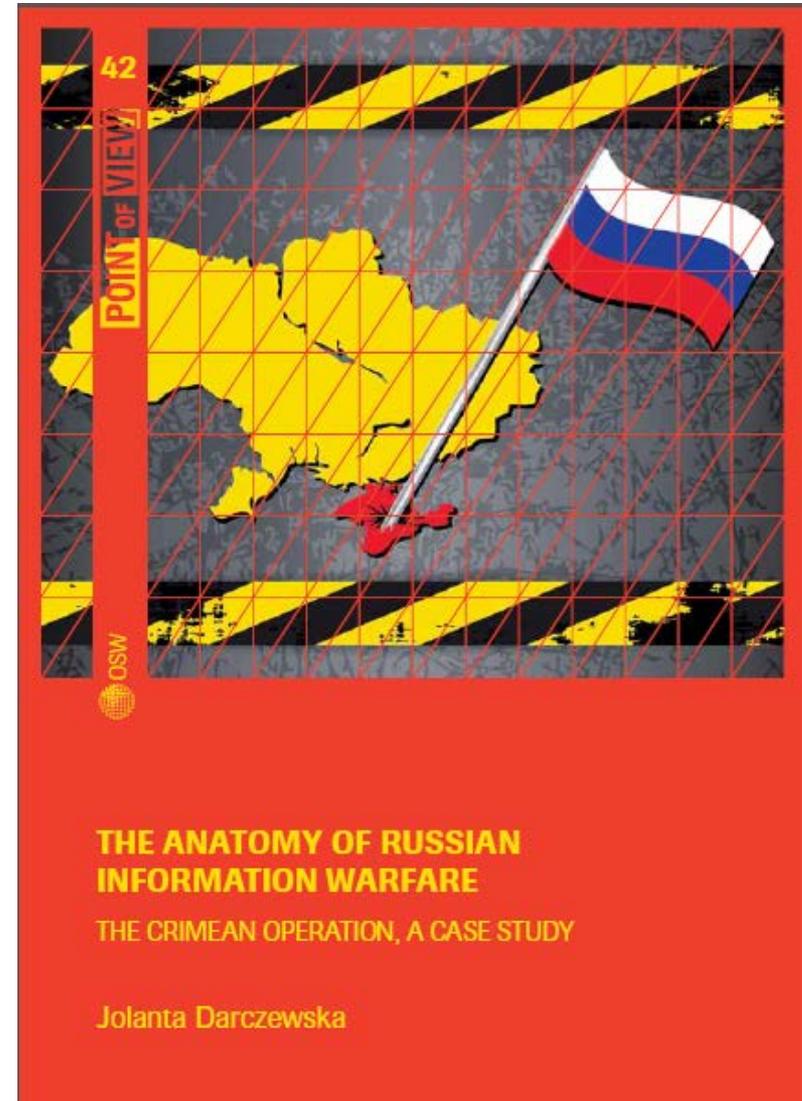
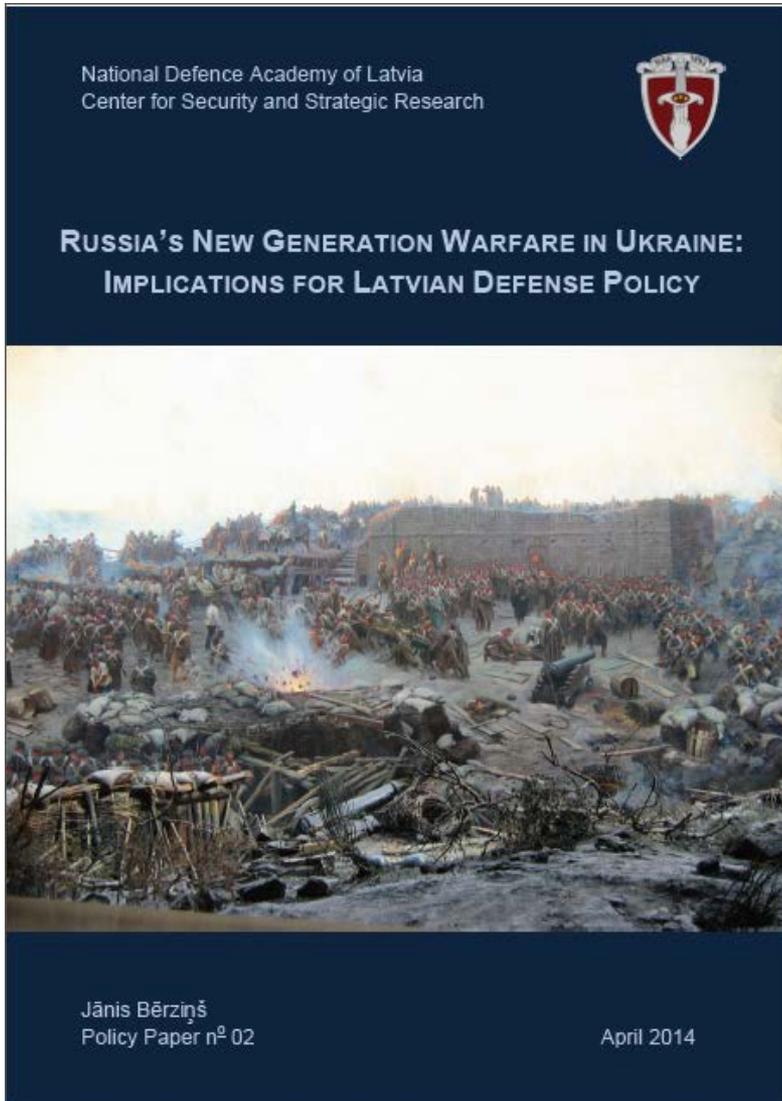


Desired SNA for Long-term System Engagement

- Long-term
- Non-kinetic
- Influence of the larger network (i.e., social system)



State-of-the-Art Warfare: SOF and Information Ops



Conclusion



- System Dynamics (SD) simulation
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Point of contact

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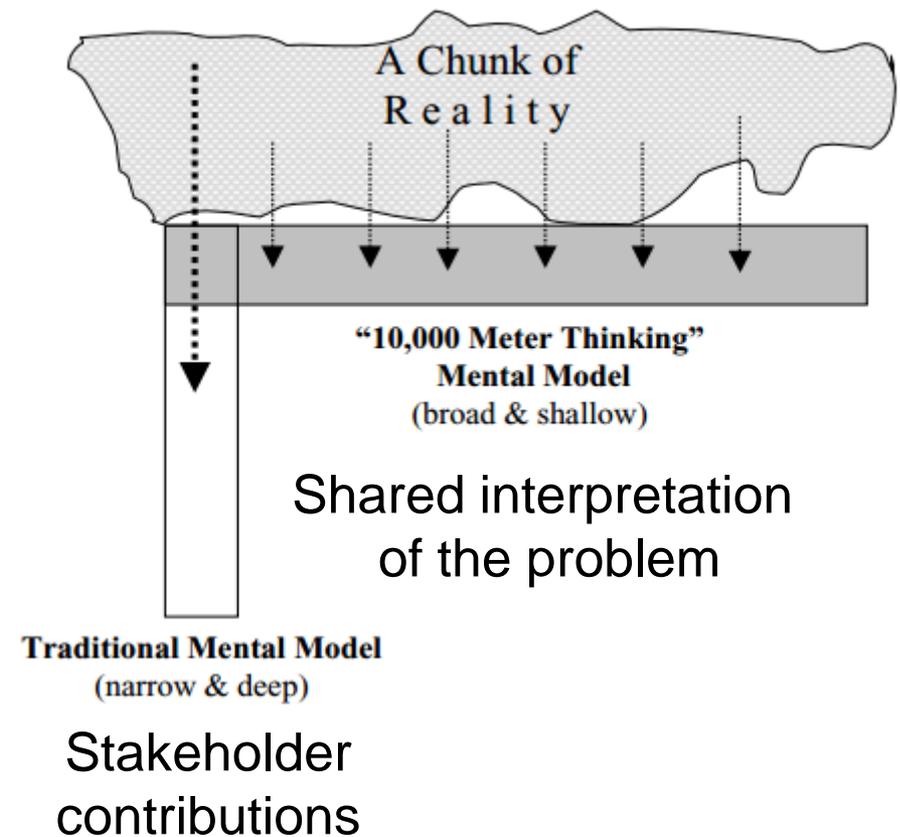
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Multi-stakeholder collaboration (MSC)

- Broad and abstract system dynamics policy modeling allows stakeholders to
 - define and
 - understand how their individual efforts contribute to the larger effort
- SD properly employed drives stakeholder collaboration
 - Purpose
 - People
 - Place
 - Process
 - Planning and Preparation
 - Practice



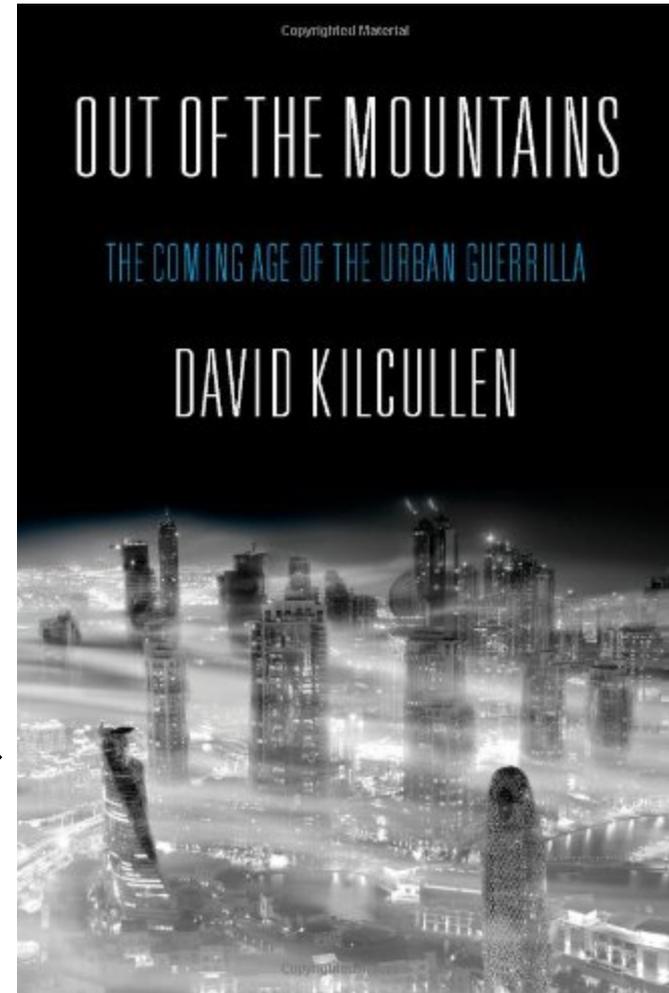
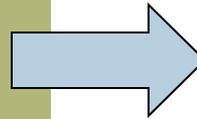
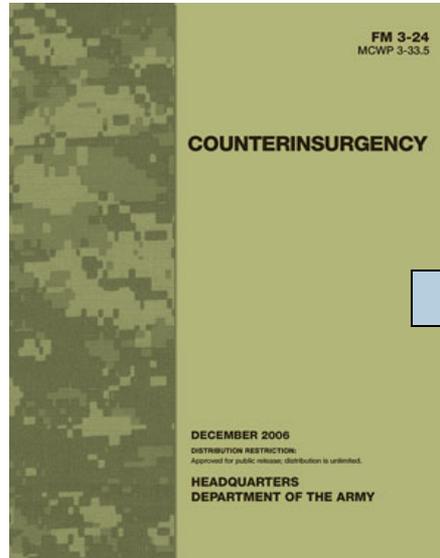
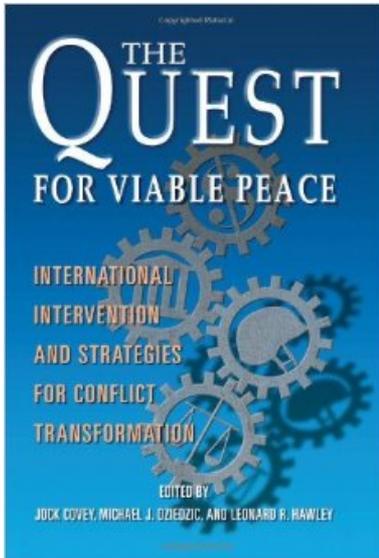
MSC observations

- No one organization has all of the requisite knowledge, power, relationships, or resources to comprehensively address a complex issue that affects multiple stakeholders
- Interestingly enough, often people are not aware of their intentions or go about their business without consciously connecting to what they value
- An inclusive approach to diverse perspectives helps bring together the right mix of stakeholders to listen to each other's concerns and discover what can unfold out of creative friction
- An appreciation for how complex systems interact and how to incorporate the needs of a variety of different stakeholders contributes to success of the enterprise
- Collaboration is not a spectator sport

From Afghanistan to elsewhere

From COIN to megacities

- Population growth-ization
- Urban-ization
- Littoral-ization
- Network-ization



Example efforts: MIT's State Stability Model (SSM)

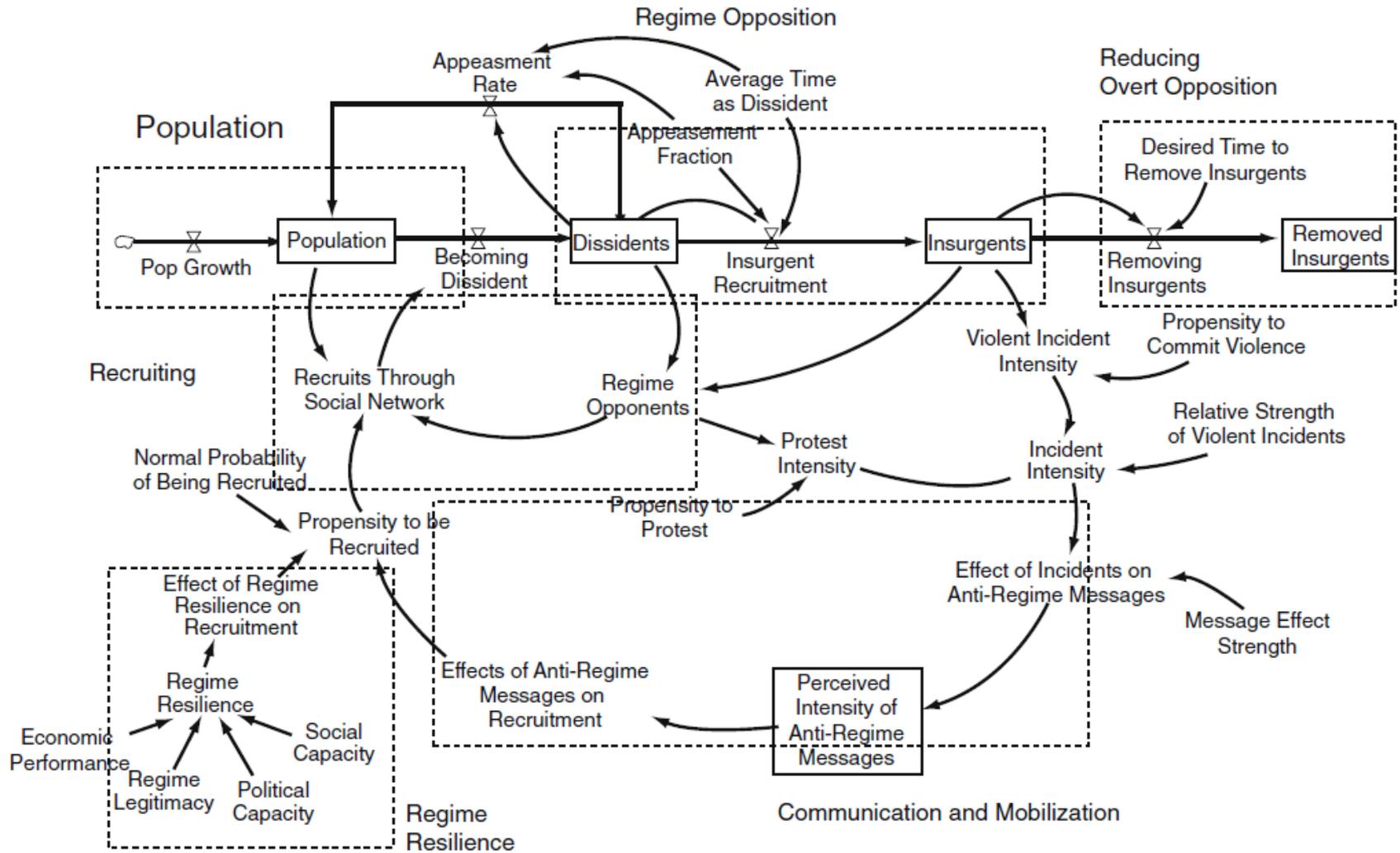
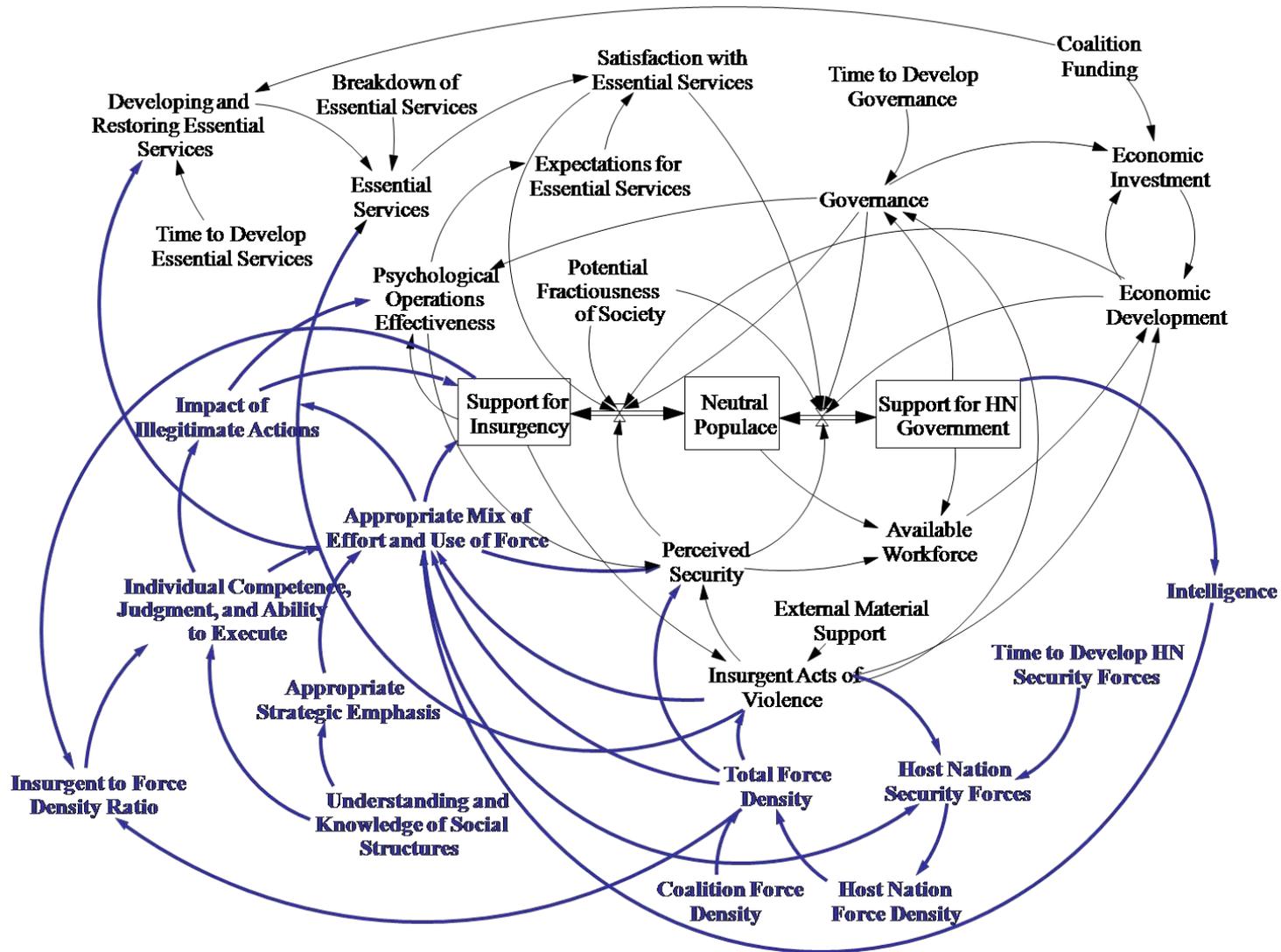


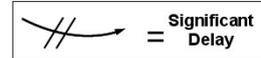
Fig. 5 SSM conceptual model of insurgent activity and recruitment (Choucri et al. 2007)

Example efforts: Joint Staff FM3-24 model

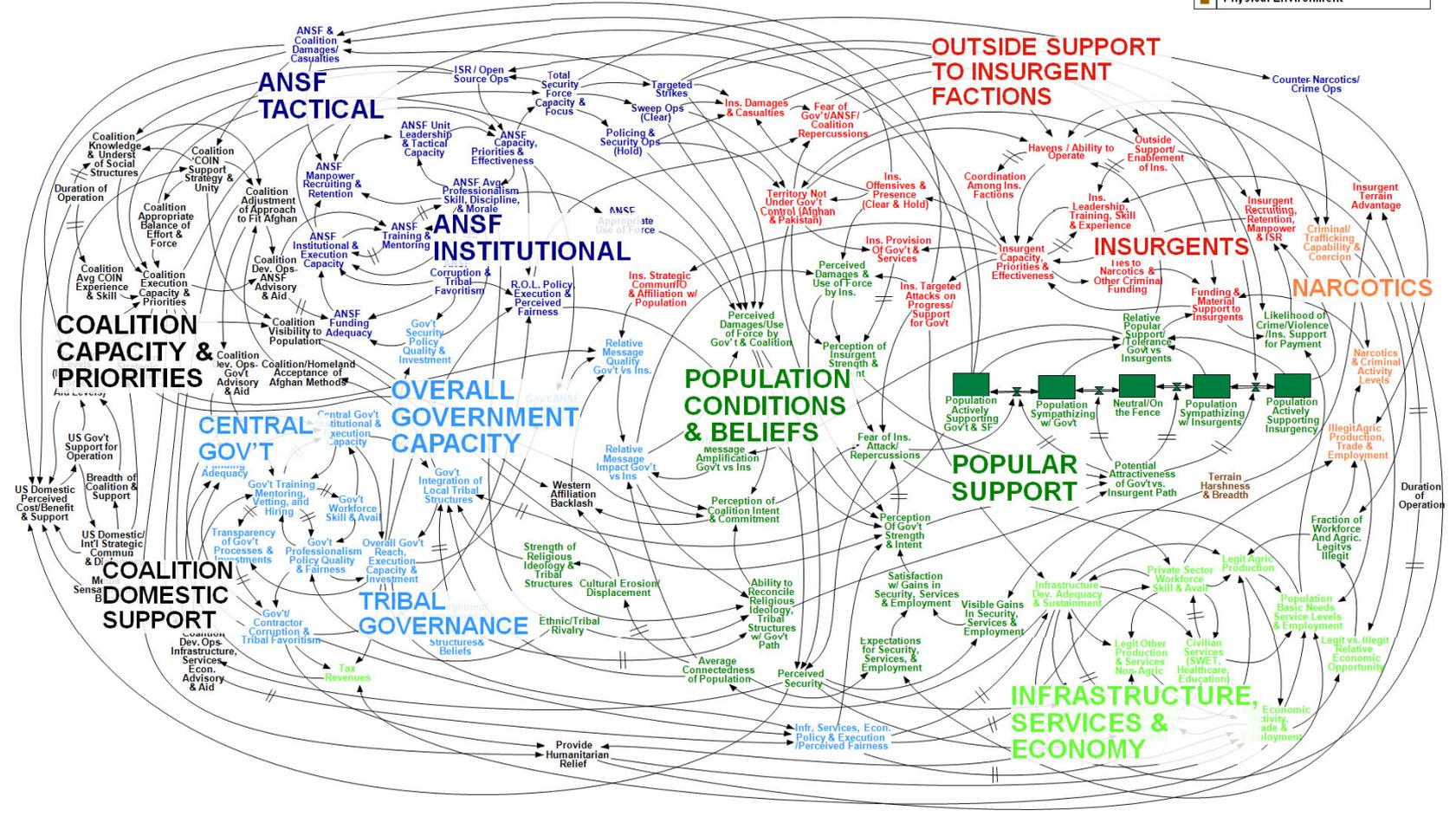


Example efforts: PA Consulting model

Afghanistan Stability / COIN Dynamics



- Population/Popular Support
- Infrastructure, Economy, & Services Government
- Afghanistan Security Forces
- Insurgents
- Crime and Narcotics
- Coalition Forces & Actions
- Physical Environment



System dynamics complex system study methodology

Reference mode:

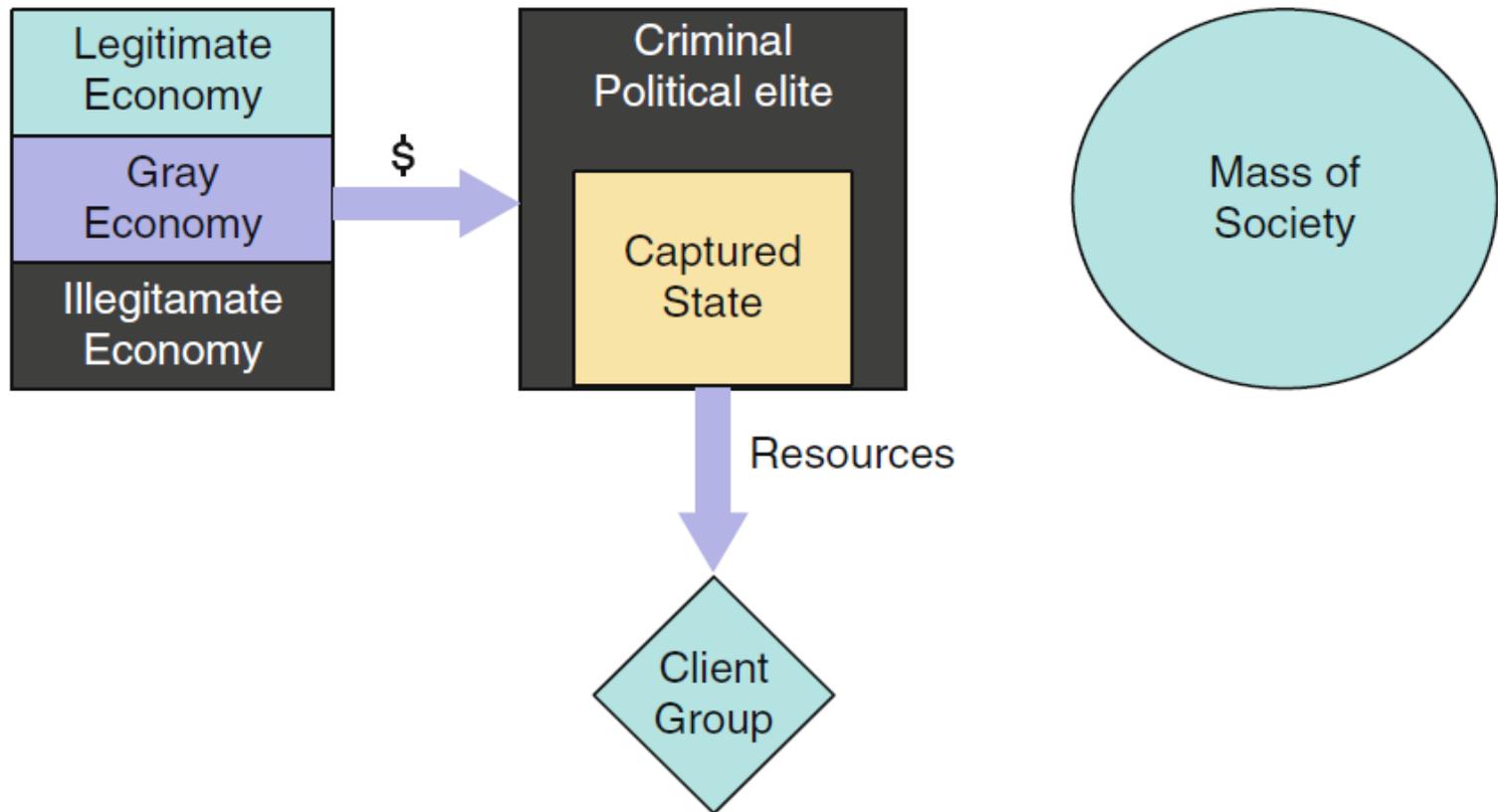
- Articulate theory
 - What is to be explained?
- Articulate ancillary theory
 - What additional concepts need to be incorporated?
- State the analysis time-frame
 - Hours, days, weeks, years, decades, etc.
- Identify 7 ± 2 key variables
- Graph them over the time-frame
- Postulate causality
- Create model
 - Each variable and causal relationship can range from purely conceptual to empirically grounded
- Test and modify model
- Present results

System dynamics model testing (VV&A) strategy

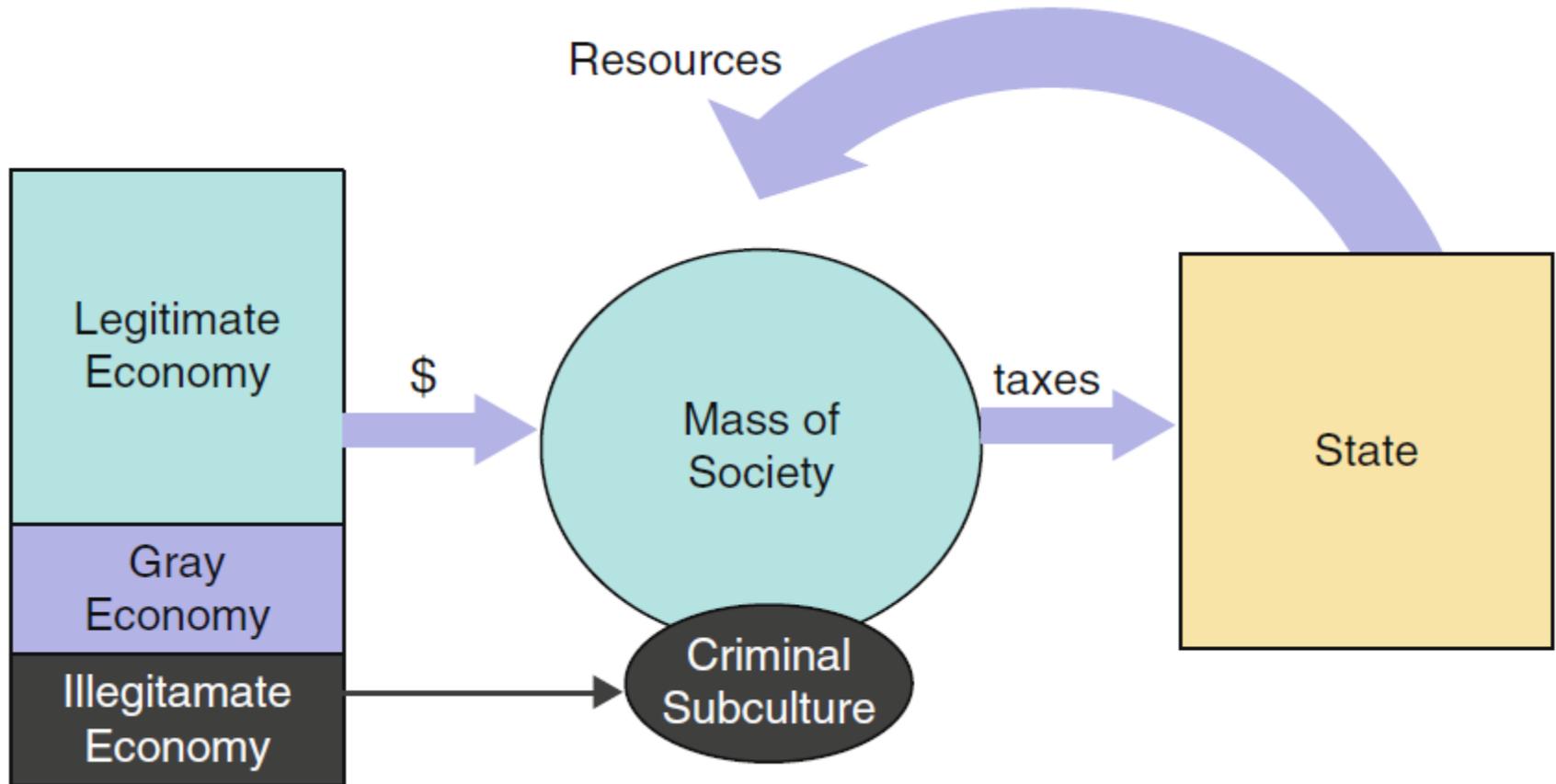
The more the system dynamics model is tested, the more robust and resilient it will be, and the more its insights and results can be trusted

- Boundary adequacy
- Structure assessment
- Dimensional consistency
- Parameter assessment
- Extreme conditions
- Integration error
- Behavior reproduction
- Behavior anomaly
- Family member
- Surprise behavior
- Sensitivity analysis
- System improvement

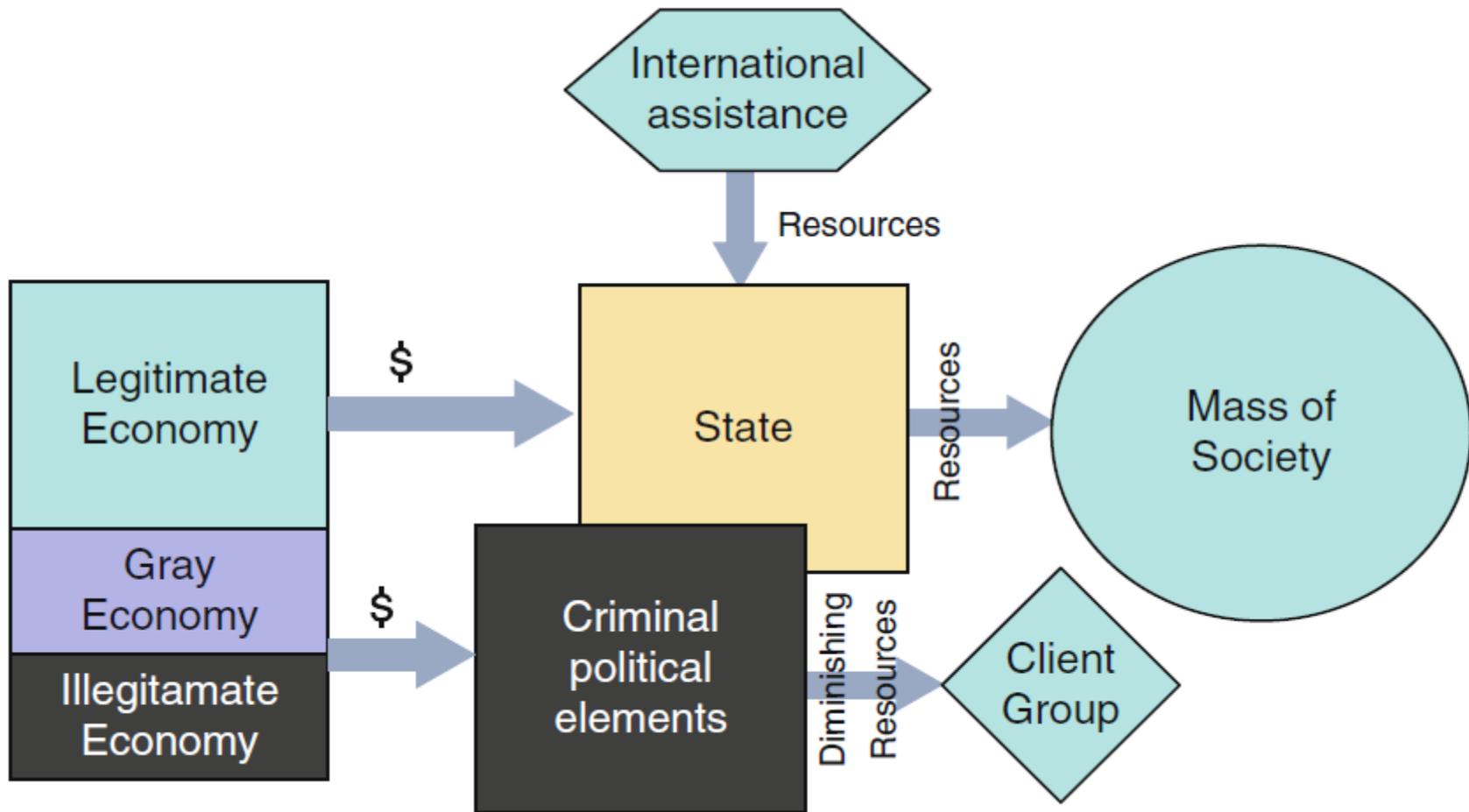
Example theory – the start state: Ineffective governance results in failed states



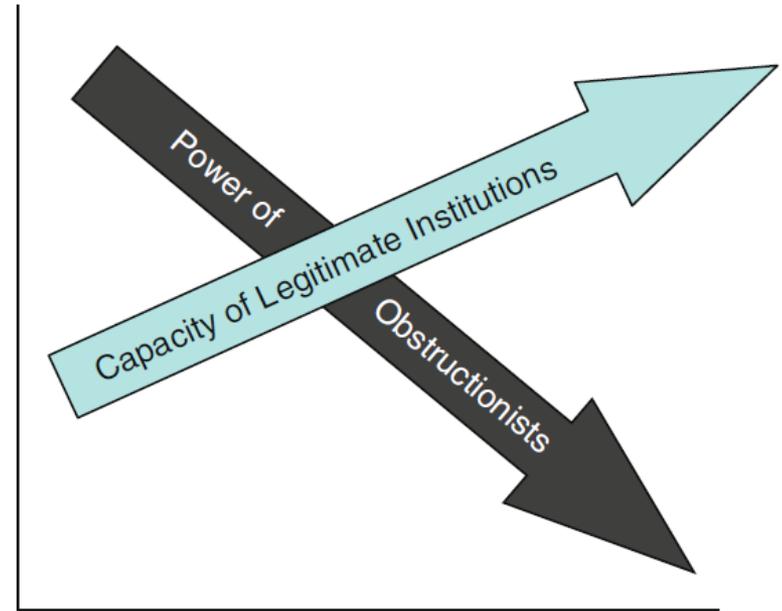
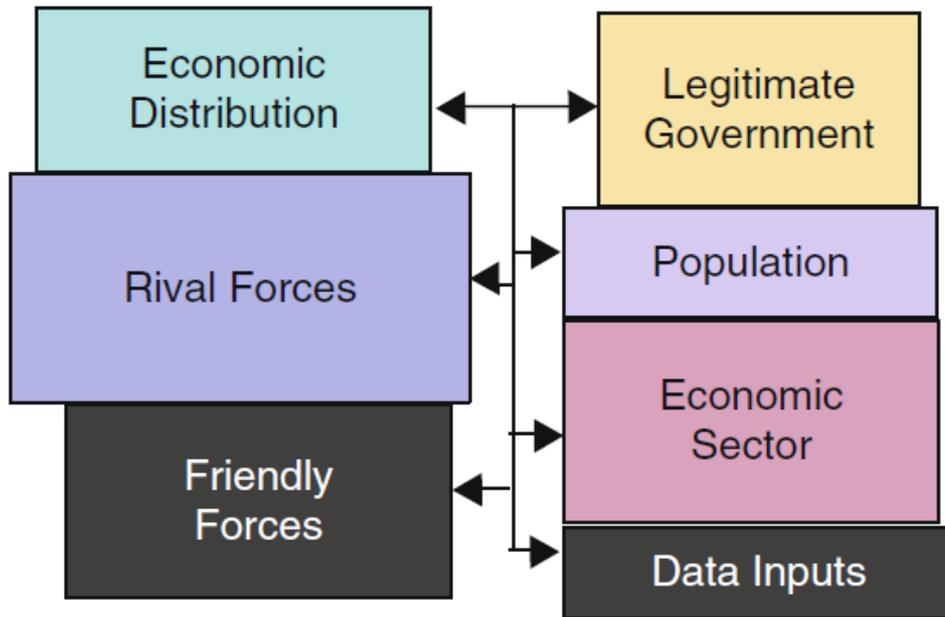
Example theory – the desired end state: Effective governance leads to state stability



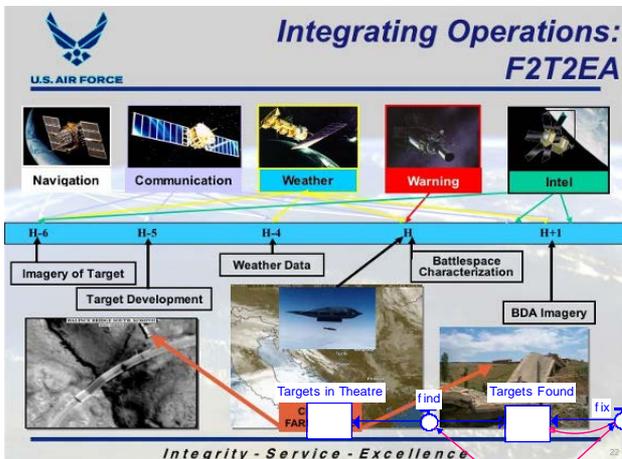
Example theory – the “missing middle”: International assistance transforms failed states?



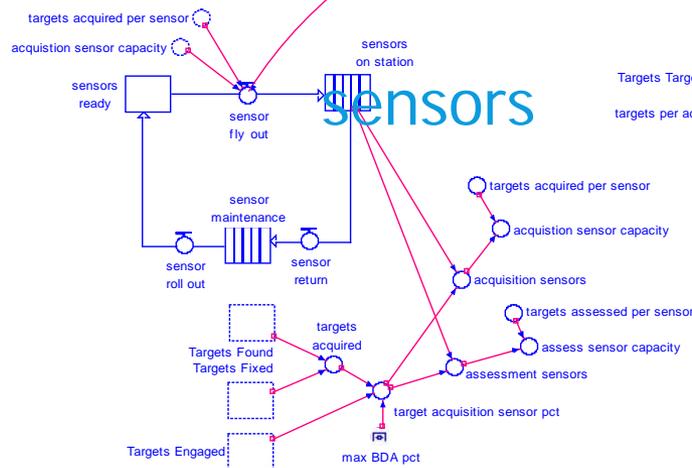
QVP model detail



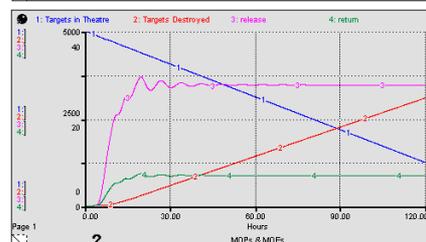
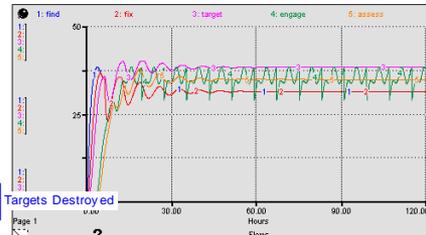
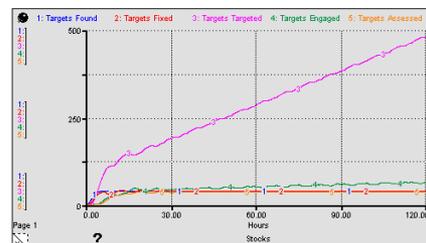
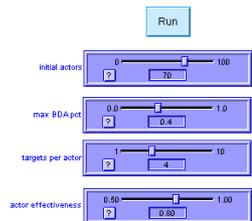
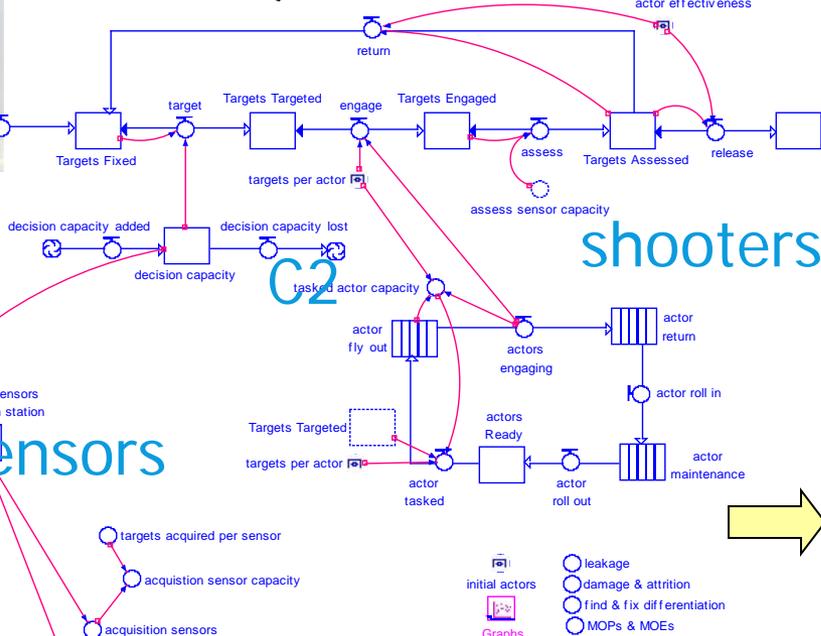
Example simulation: Using SD to rack, stack, track, and apply resources to tasks



1) vision



2) SD sim



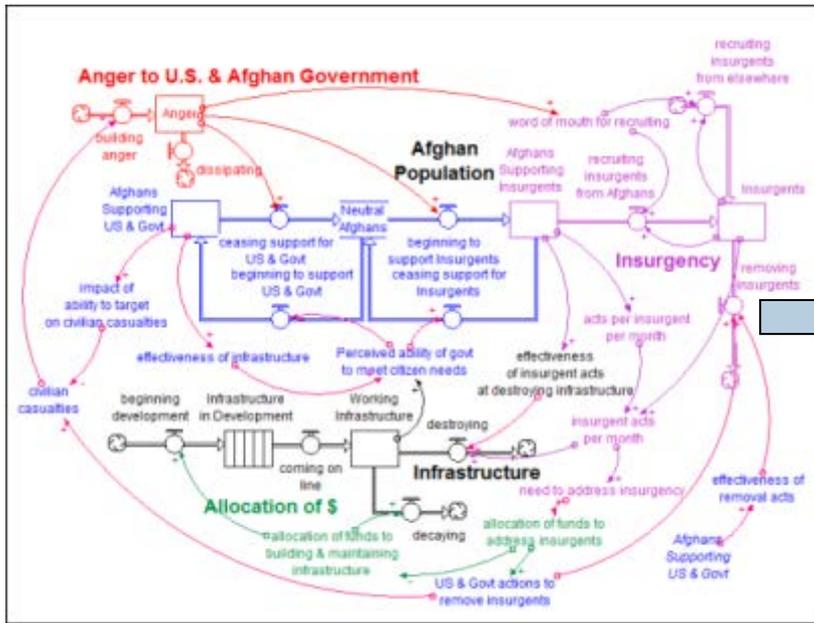
3) metrics

Afghan operational experience

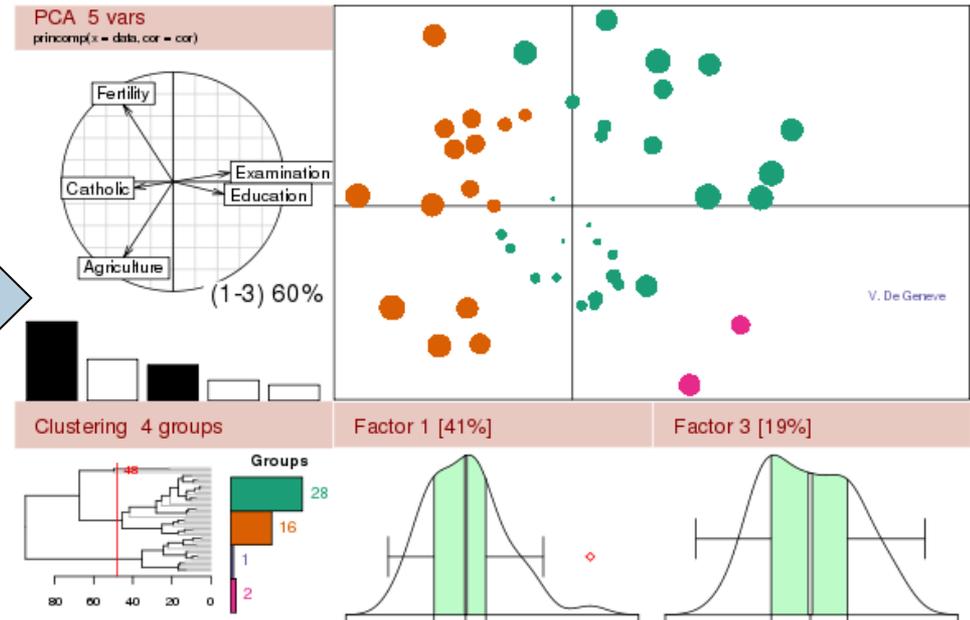
- Combined Force Special Operations Combatant Command – Afghanistan (CFSOCC-A), Kabul
 - Counterinsurgency (COIN, good cop, SF)
 - As opposed to Counter Terror (CT, bad cop, SEALs)
 - Village Stability Operations (VSO)
 - Afghan Local Police (ALP)
- Commander Issues Group (CIG)
 - Long-term studies on hard problems
 - My work
 - ALP acceleration
 - 2014 elections



The opposite of "DARPA hard" is "operationally simple"



System Dynamics (SD)



R Computational Statistics

Lots of data available:
Needs to be structured, integrated, and interpreted



"Shape, Clear, Hold, Build, and Transfer:" The Metrics of the Afghan War

Anthony H. Cordesman
Arleigh A. Burke Chair in Strategy
With the Assistance of Nicholas B. Greenough

CSIS

CENTER FOR STRATEGIC &
INTERNATIONAL STUDIES

Burke Chair
in Strategy

January 12, 2010

www.csis.org |

Wicked policy problems (Rittel and Webber 1973)

- There is no definitive formulation of a wicked problem
- Wicked problems have no stopping rule
- Solutions to wicked problems are not true-or-false, but good or bad
- There is no immediate and no ultimate test of a solution to a wicked problem
- Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial and error, every attempt counts significantly
- Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan
- Every wicked problem is essentially unique
- Every wicked problem can be considered to be a symptom of another problem

Wicked policy problems (Conklin 2006)

- The problem is not understood until after the formulation of a solution
- Wicked problems have no stopping rule
- Solutions to wicked problems are not right or wrong
- Every wicked problem is essentially novel and unique
- Every solution to a wicked problem is a 'one shot operation'
- Wicked problems have no given alternative solutions

Multi-Stakeholder Collaboration (MSC) pitfalls

- Not developing a shared interpretation of the problem
- Falling into authoritarian or competitive approaches
- Trying to do it alone
- Technology-only solutions that do not address the social issues
- Being unprepared for resistance from groups outside the process
- Demonizing other stakeholder groups
- Inadequate follow-up
- Other versions of internal conflict
- Tensions between top-down and bottom-up perspectives

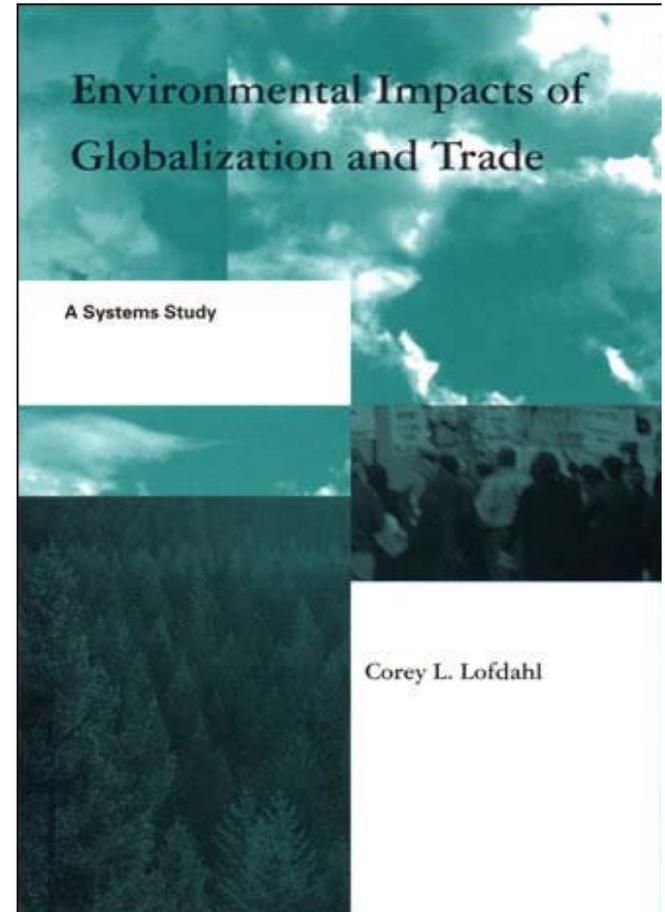
Trade and the Environment (Lofdahl 2002)

- Combines

- System Dynamics (SD)
- Geographic Information Systems (GIS)
- Spatial (network-based) statistics
- To show that international trade hurts the global environment rather than helps it

- Based on *lateral pressure* theory

- Population
- Technology (GNP)
- Resources (forestation)
 - Cross-border flows
- To synthesize and order information at the macro-level
- To achieve a cross-national, holistic, and analytic (i.e., metric-based) perspective



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