



***A System Dynamics model of the FM 3-24  
COIN Manual***

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J8/WAD***

## ***Assess the full range of military operations***

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- **Warfighting analysis – assess proficiency**
  - Multiple scenarios
  - Wide range of variables within scenarios
  - Alternative CONOPs
  - Alternative campaign objectives
  - Force equivalencies/force substitution
  - Multiple analytical models
- **Other force structure requirements – assess sufficiency**
  - Day-to-day demands: Forward basing, forward presence, lesser contingencies, homeland defense, theater security cooperation
  - Peak demand of overlapping warfights
  - Sustained surge demand of post-hostilities operations
  - Force equivalencies/force substitution
- **Analysis of non-traditional challenges**

# *Analysis Framework*

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## Tools

- Svc/CCDR workgroups
- Mission Analysis
- Data
- Models
- Scenarios
- MOE's
- Wargaming
- Interagency partners
- Tank & GO/FO reviews
- Peer reviews
- Partner nations

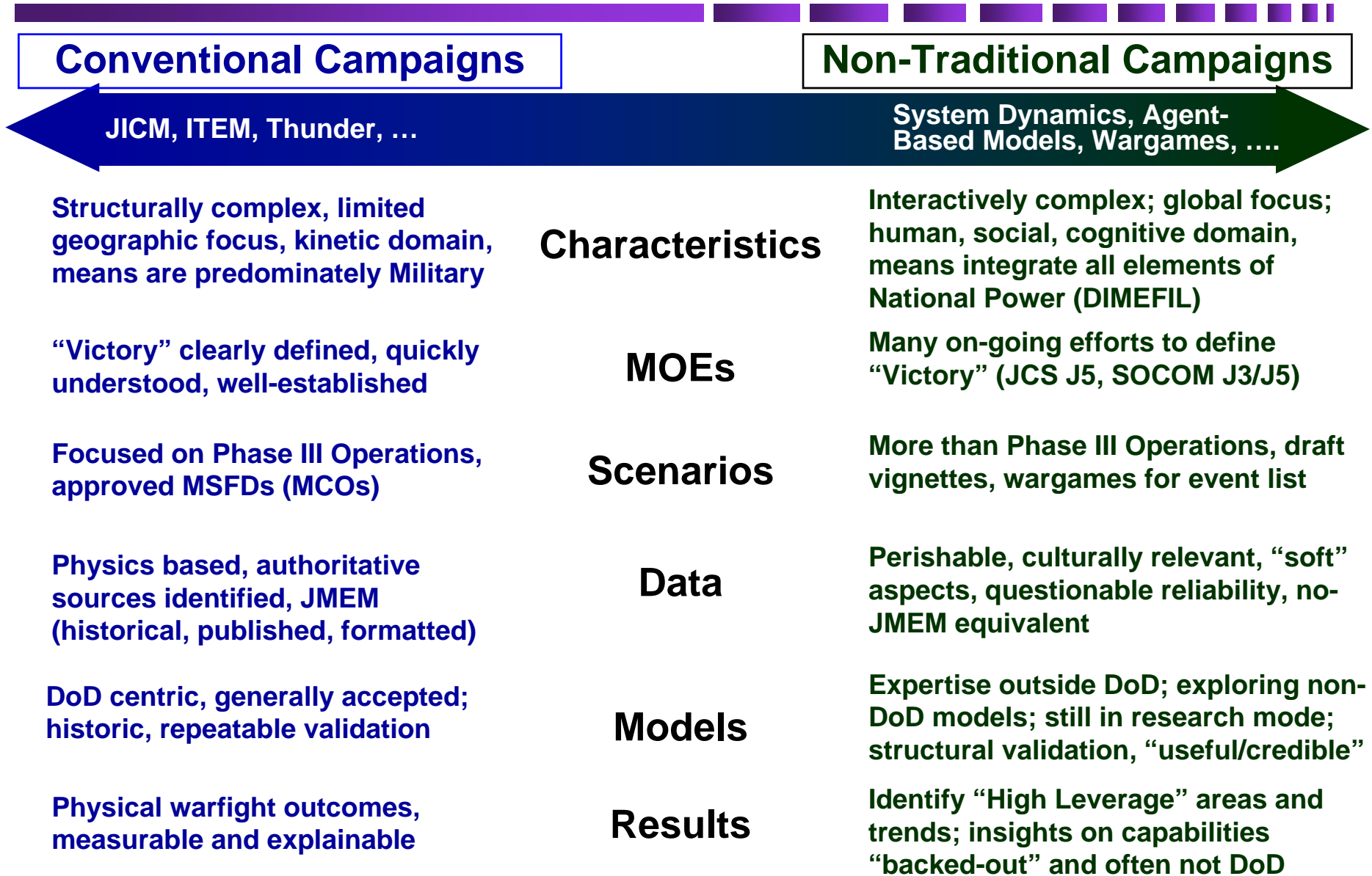
## Methodologies

- Intellectual approach
- Rationale
- Physical assumptions
- Philosophical assumptions
- Tank guidance
- SPG tasks

## Study Objective

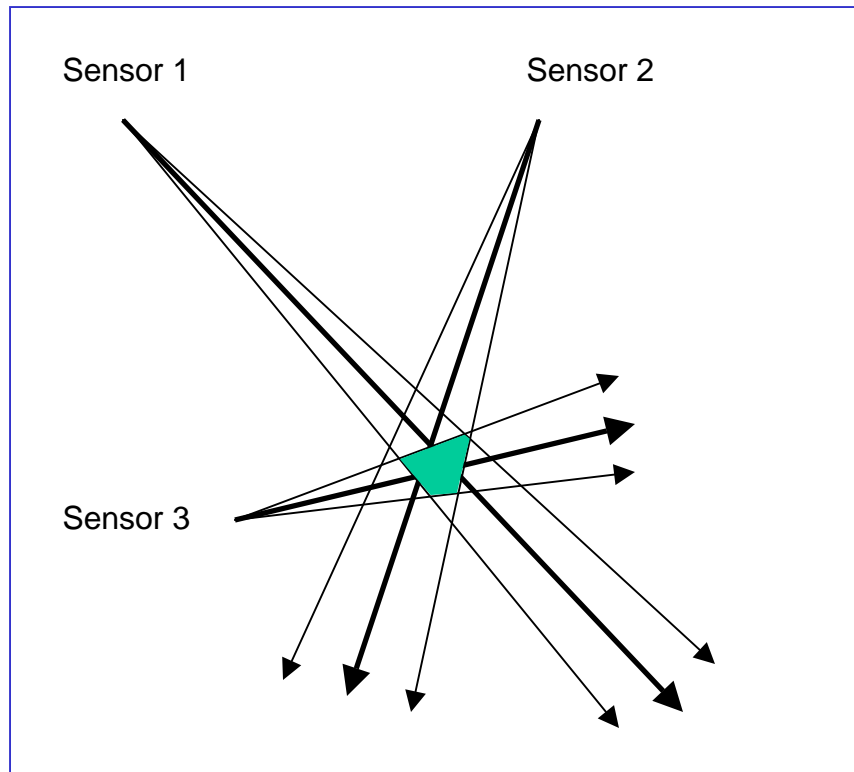
- Senior Leader insights

# Comparison of Traditional and Non-Traditional Analysis



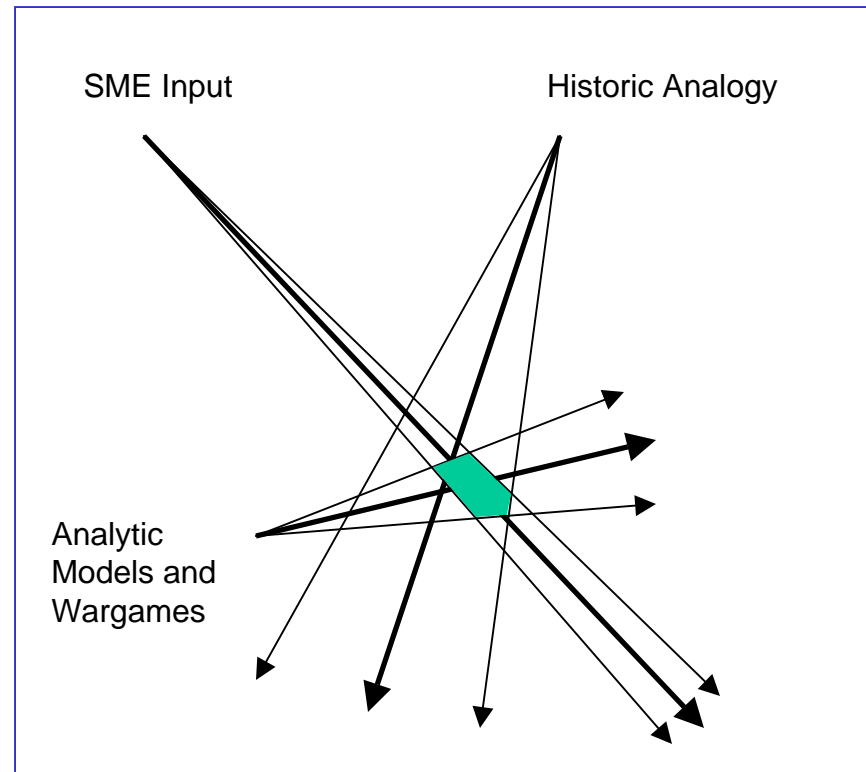
# Analysis in Irregular Warfare

## Triangulation Search in the Physical World



Uncertain distance with known error

## Uncertainty Space in the Analytic World




Uncertain error with known distance

Efforts to refine the solution risk missing a fleeting opportunity to attack


## Why System Dynamics Modeling?

- **Characteristics of systems problems include:**
  - Dynamic—changes over time and inherent system delays
  - Tendency to overshoot and crash or oscillate
  - Frequent over-reactions that drive exponential growth in costs
  - Multiple players, diverse interests
  - Interdependencies across borders and across disciplines
  - Proposed solutions that appear simple and are usually wrong
  - Very difficult to communicate!
- **System Dynamics Modeling can add value in several areas. It provides a platform for...**
  - Effectively *framing* issues and problems.
  - Representing the essence of the interdependencies that underlie system performance; minimize policy resistance
  - Reliably inferring the dynamics associated with a set of initiatives
  - Communicating—creating a single “sheet of music” to play

## *What is System Dynamics Modeling?*

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- **System Dynamics is a methodology for studying and managing complex feedback systems, such as ones found in business and social systems**
  - **The methodology**
    - Identifies a problem
    - Develops a dynamic hypothesis explaining the cause
    - Builds a computer simulation of the system
    - Tests the model to verify that it reproduces real world behavior
    - Devises and tests potential solutions to recommend alternative paths
  - **Developed initially from the work of Jay W. Forrester at MIT in the mid-1950s**
  - **Currently being examined by several DOD entities as a method to model non-traditional defense applications**

## Why System Dynamics Modeling?

- 
- **Problems/issues/challenges we are facing as a society appear to be increasingly difficult to understand/resolve using traditional tools, frameworks, techniques**
    - Polarization of political debate in US
    - Globalization
    - Global War on Terror
    - Environmental Issues
  - **Characteristics of systems problems include:**
    - Dynamic—changes over time and inherent system delays
    - Tendency to overshoot and crash or oscillate
    - Frequent over-reactions that drive exponential growth in costs
    - Multiple players, diverse interests
    - Interdependencies across borders and across disciplines
    - Proposed solutions that appear simple and are usually wrong
    - Very difficult to communicate!

## Why System Dynamics Modeling?



- **There are (at least) two theories to explain our difficulties in dealing with systems problems...**
  - **Theory 1:** People are idiots (maybe true, but not very useful!)
  - **Theory 2:** We don't have very good vehicles for dealing with these sorts of issues and problems. In particular, they don't do a good job of helping us to...
    - › Recognize systems issues and problems
    - › Get at the structure underlying the dynamics--understanding "how it works"
    - › Link together "how it works" and "how it performs"
    - › Communicate all of the above, clearly and compellingly
    - › "Bringing them along" with your thought process

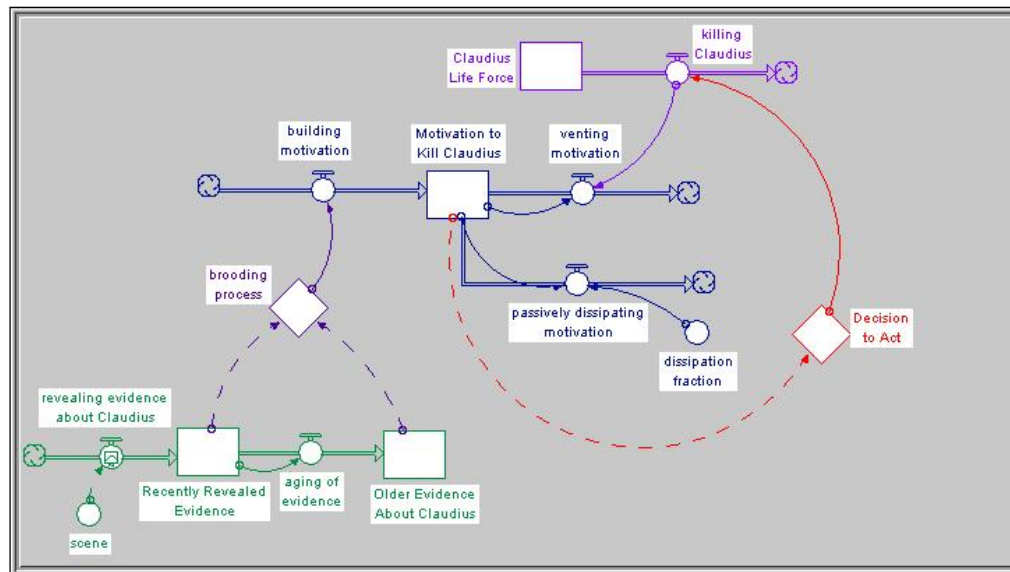
## Why System Dynamics Modeling?



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  - Effectively *framing* issues and problems.
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  - Reliably inferring the dynamics associated with a set of initiatives
  - Communicating—creating a single “sheet of music” to play
- **Various software and consultants being used within DOD**
  - STELLA / iTHINK – modeling software
  - VENSIM – modeling software
  - PA Consulting / VMASC / MIT – consultants using a mix of commercial and proprietary software to develop SD solutions

## System Dynamics Software

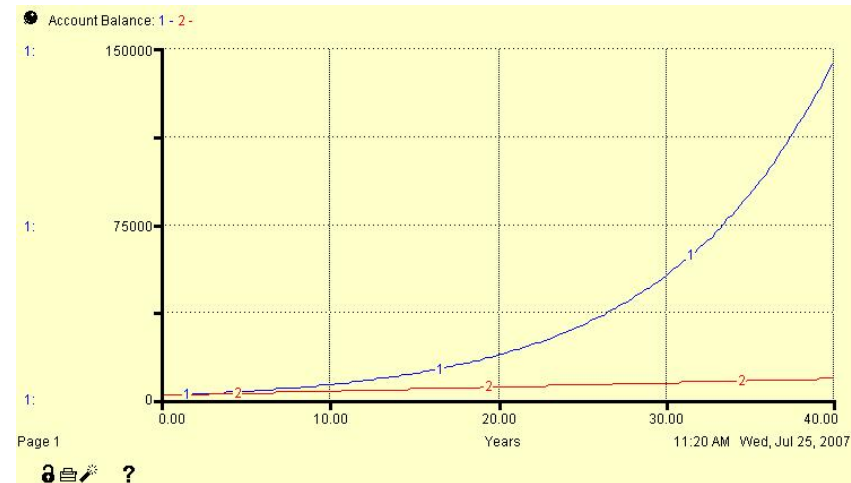
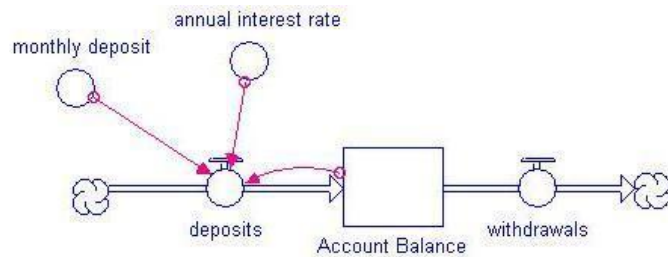
- STELLA / iTHINK – isee systems – Barry Richmond
- Language of stocks and flows, graphics user interface
- Innovator in application to social systems – “STELLA in the classroom” to study Hamlet in High School



## Building a simple STELLA Model

### Savings account

- Stock – savings
- Flows in – deposits and interest
- Flows out – withdrawals
- Simulation – what is the effect of various interest rates? How about deposits and withdrawals?

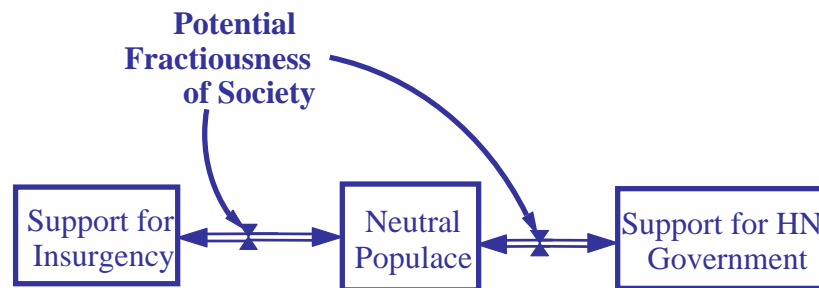


Most of the things that concern people are entities that accumulate or dissipate over time – and we are concerned with trends. Unlike the simple example above, most don't have a closed-form solution

## *Using a STELLA-based presentation*



- **Begin with a cause and effect relationship diagram**
- **Expand into a model structure that captures all elements and assigns assumptions about relationships**
- **“Troubleshoot” model structure and validate against some sort of truth data...historical data, research, or in this case doctrinal theory**



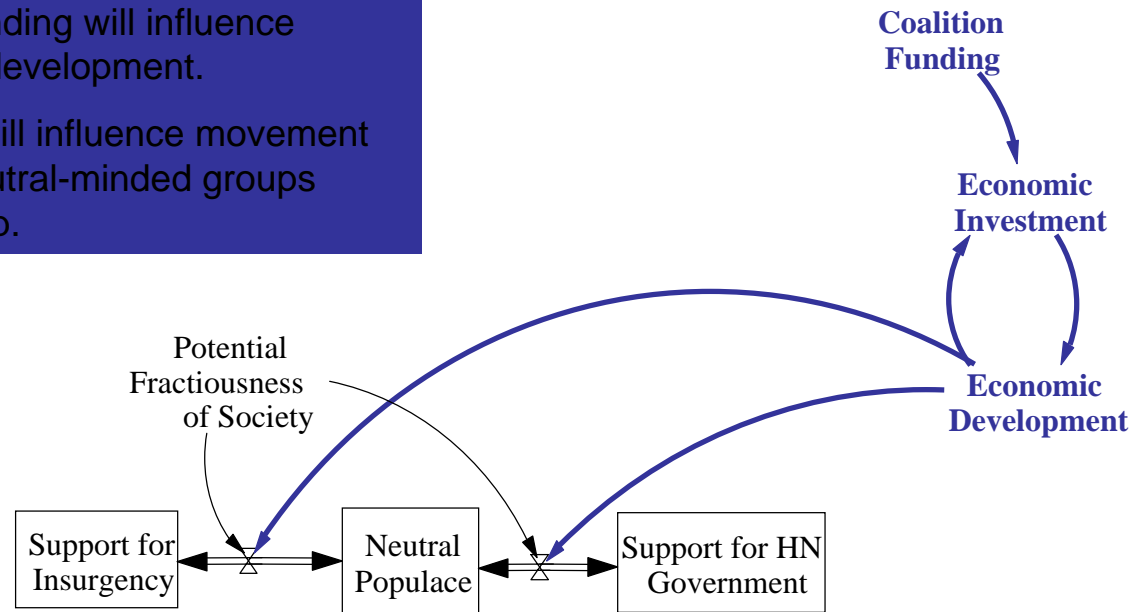
COIN operations must accomplish three tasks simultaneously:

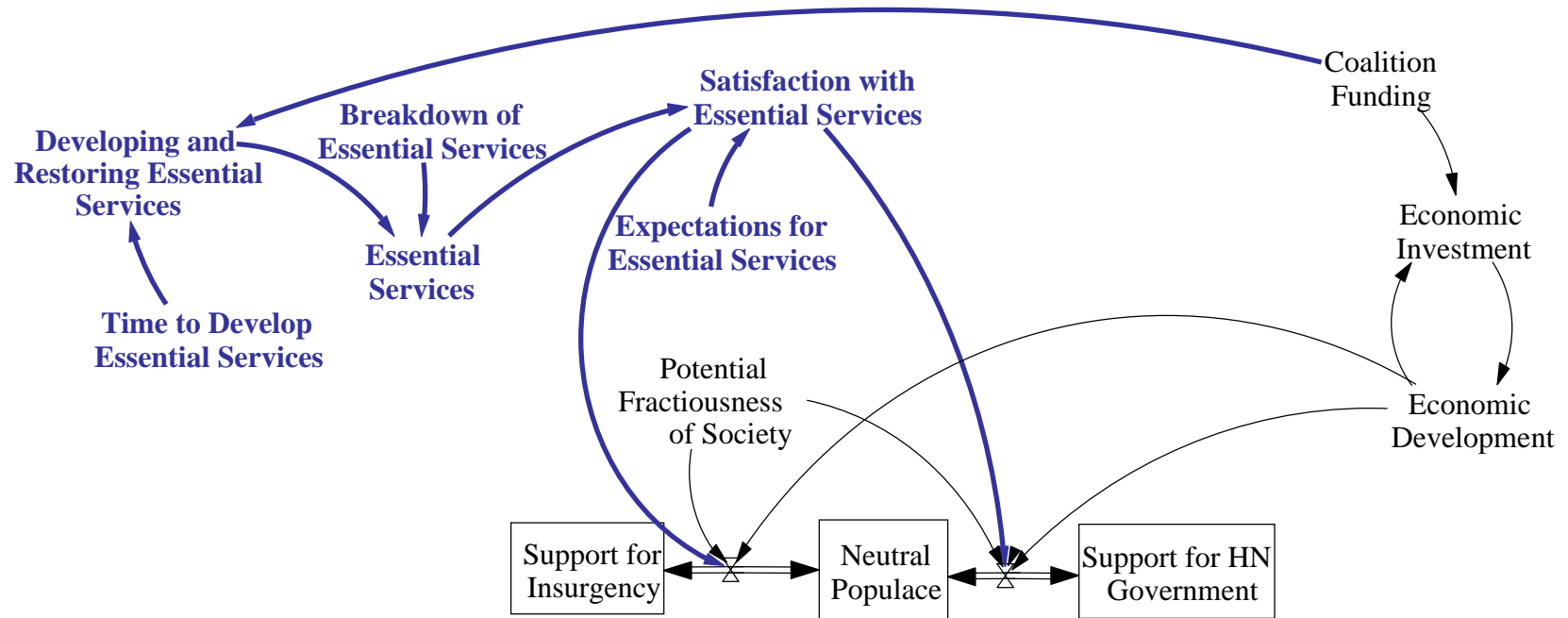
- Influence insurgent-minded individuals to adopt a neutral disposition.
- Influence neutral-minded individuals to adopt a supportive disposition.
- Retain supportive individuals.

These operations are conducted in an environment where tensions and hostilities between groups may destabilize a society and provide opportunities for insurgents

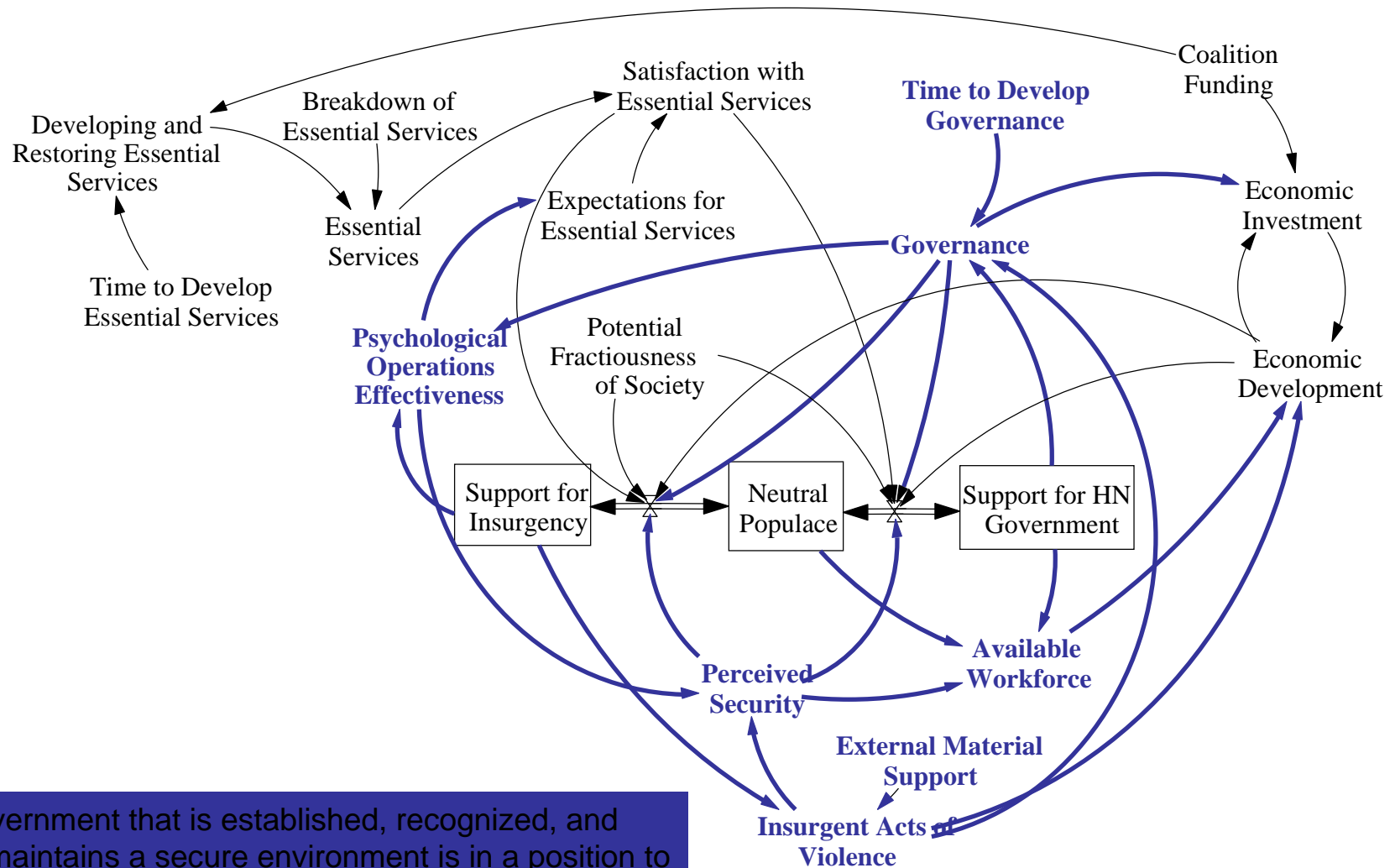
- This environment may suggest courses of action aimed at reinforcing or widening seams

- An increase in Coalition funding will influence economic investment and development.
- A strengthened economy will influence movement from the insurgent- and neutral-minded groups toward the supportive group.





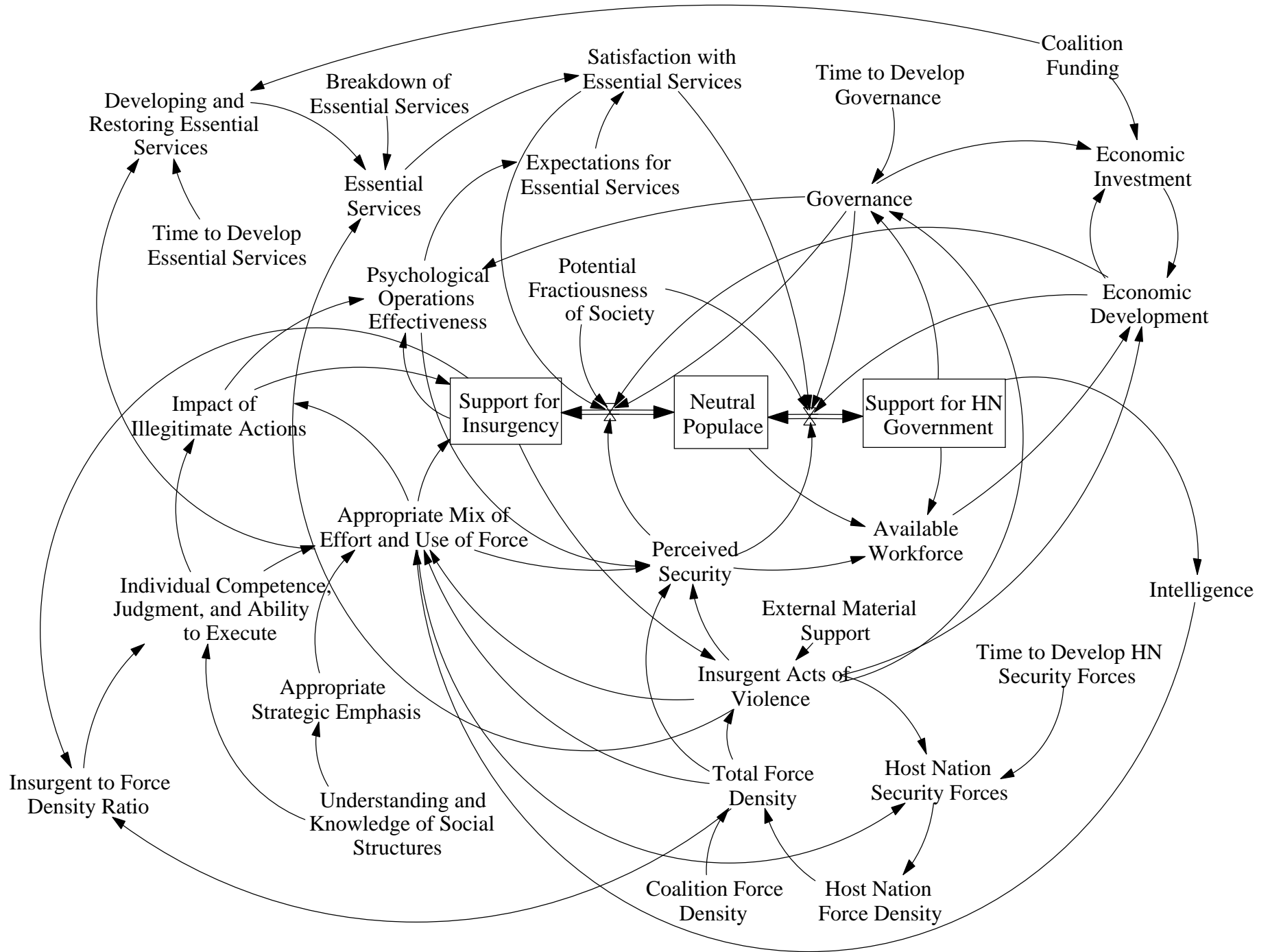
- An increase in Coalition funding will significantly impact the restoration of essential services.
- Improvements in the provision of essential services will influence movement from the insurgent- and neutral-minded groups toward the supportive group.

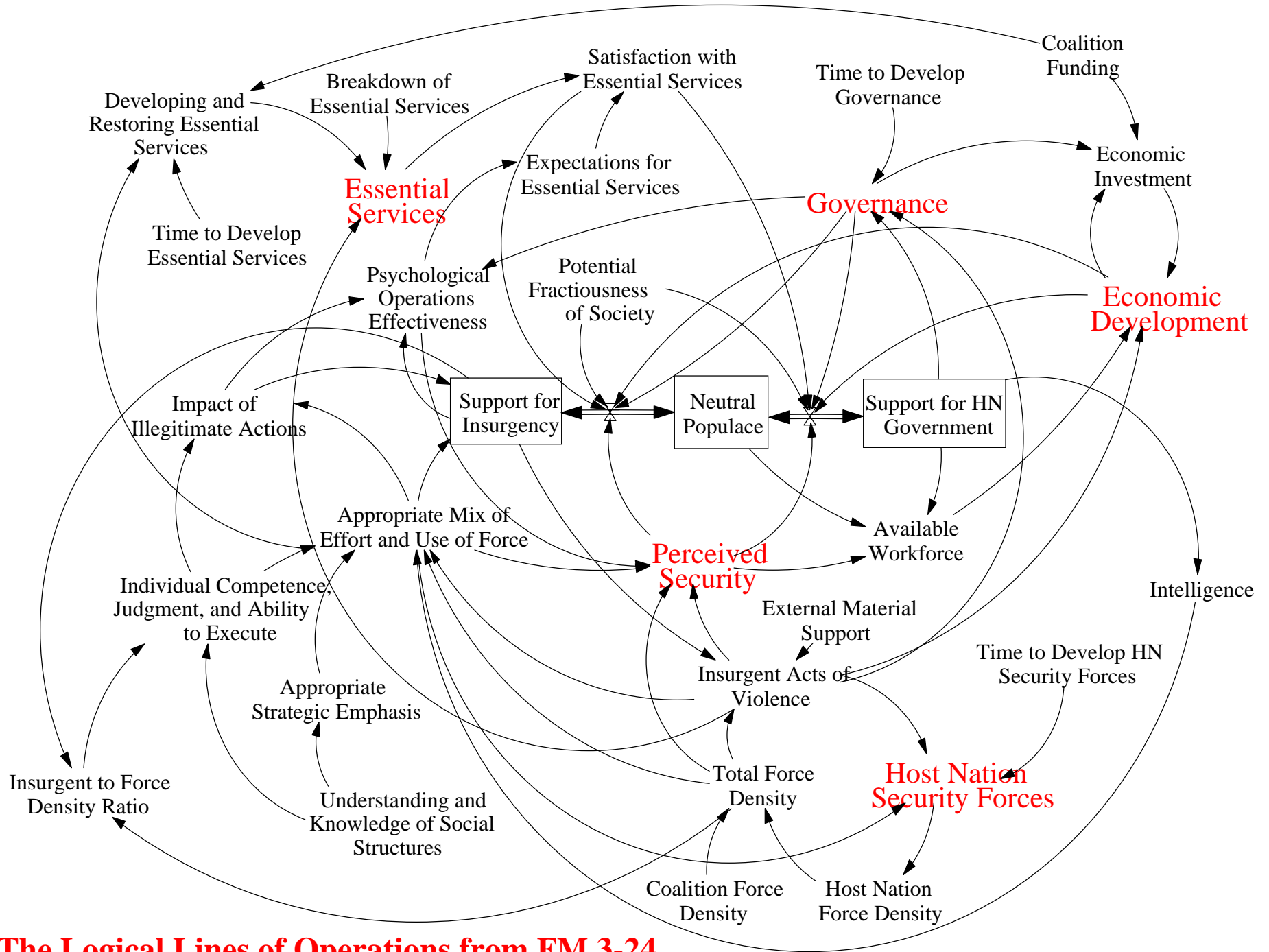


A government that is established, recognized, and that maintains a secure environment is in a position to

- Send a positive, credible message of success to the populace.
- Provide an environment that enhances stable employment of the workforce.
- Persuade insurgents and neutrals to consider becoming supporters.

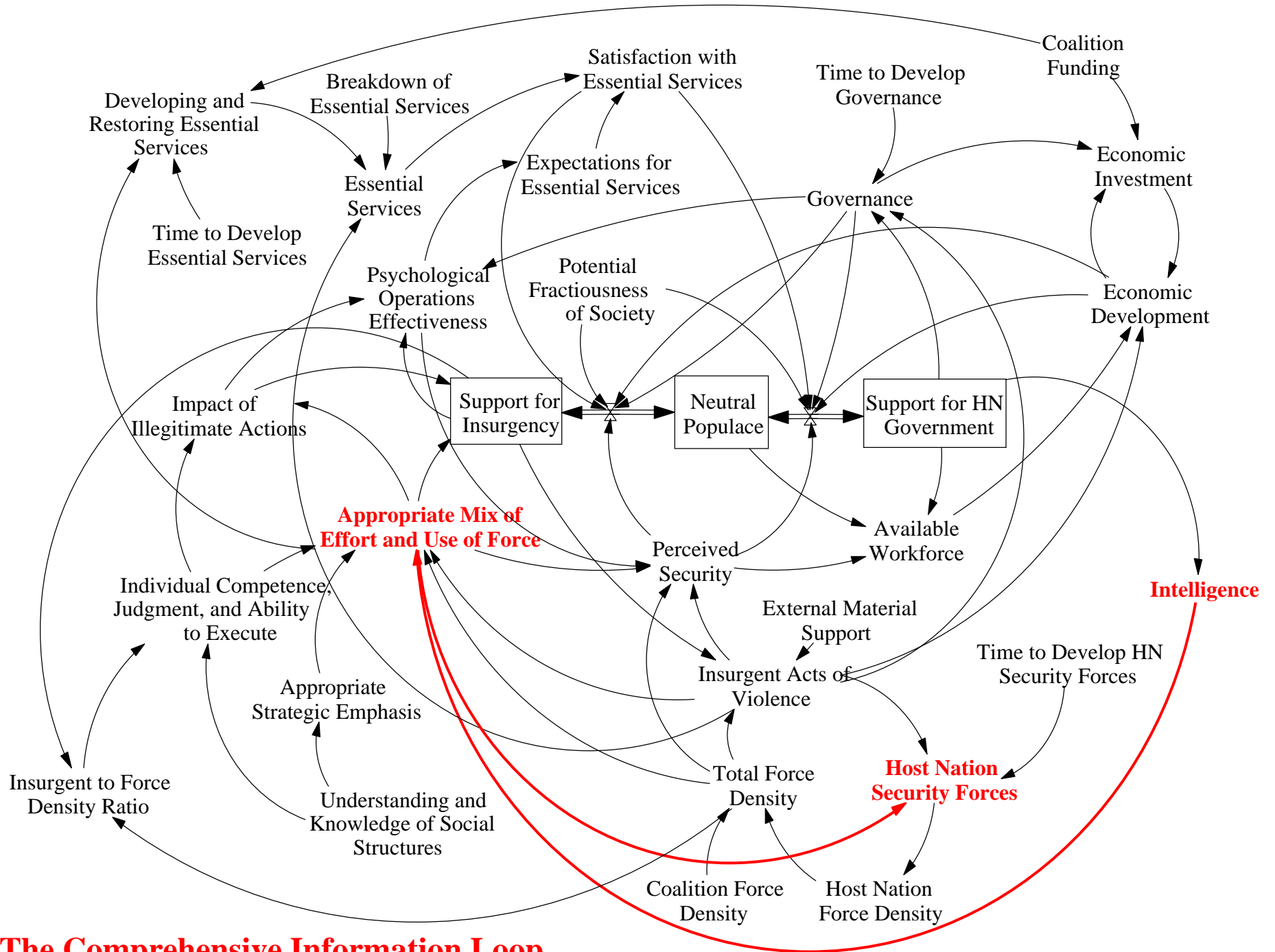




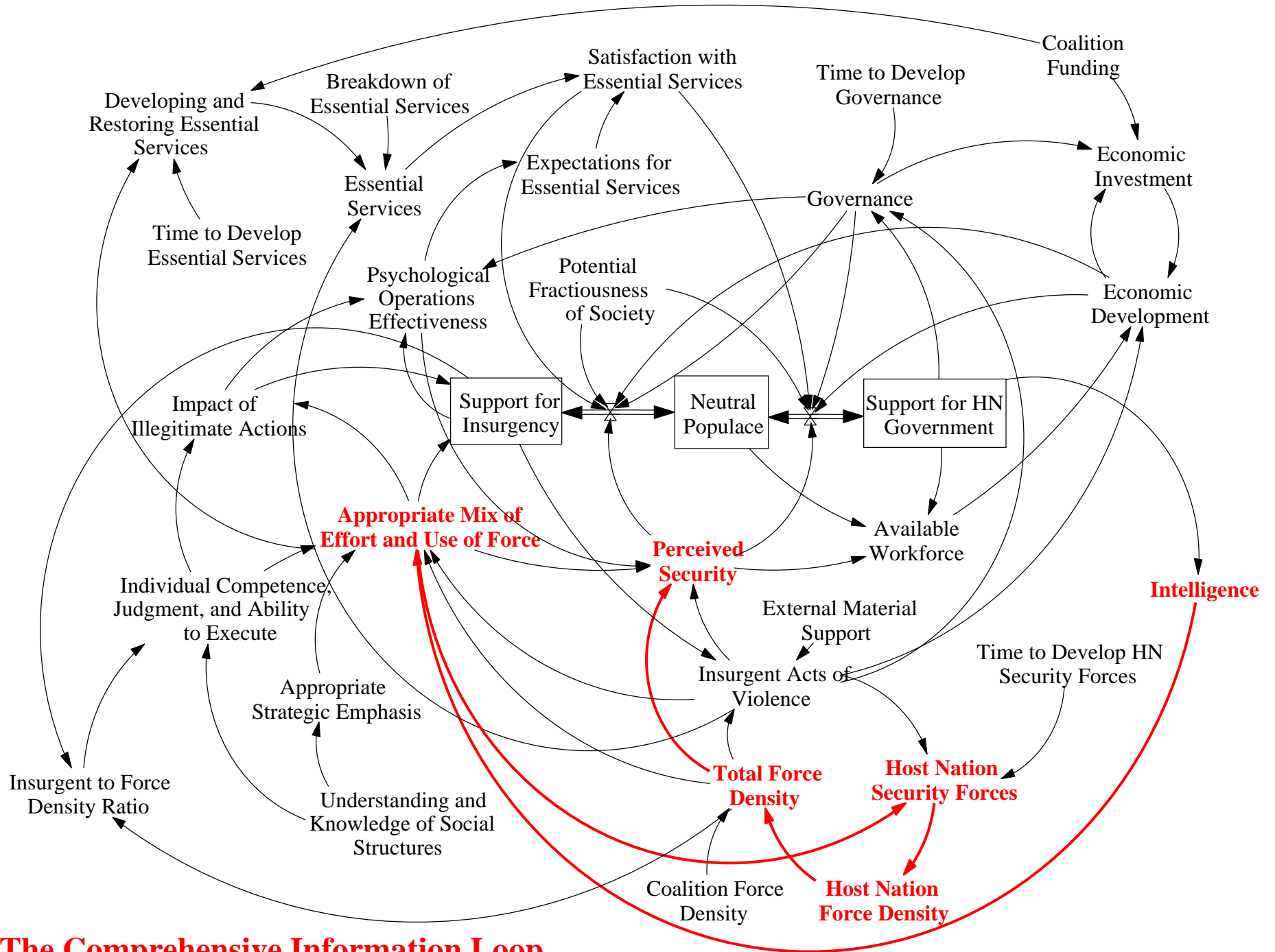


**The Logical Lines of Operations from FM 3-24**

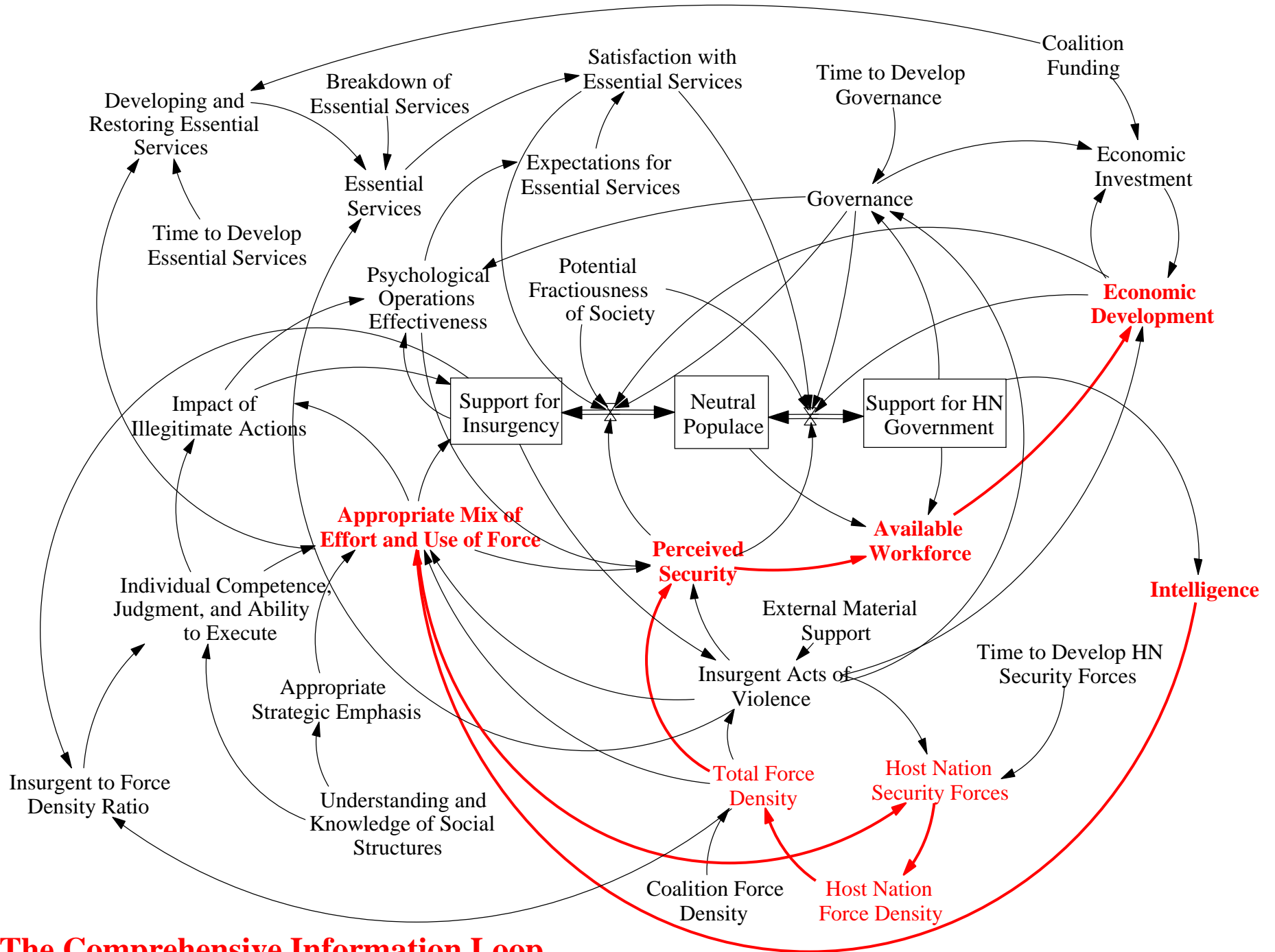




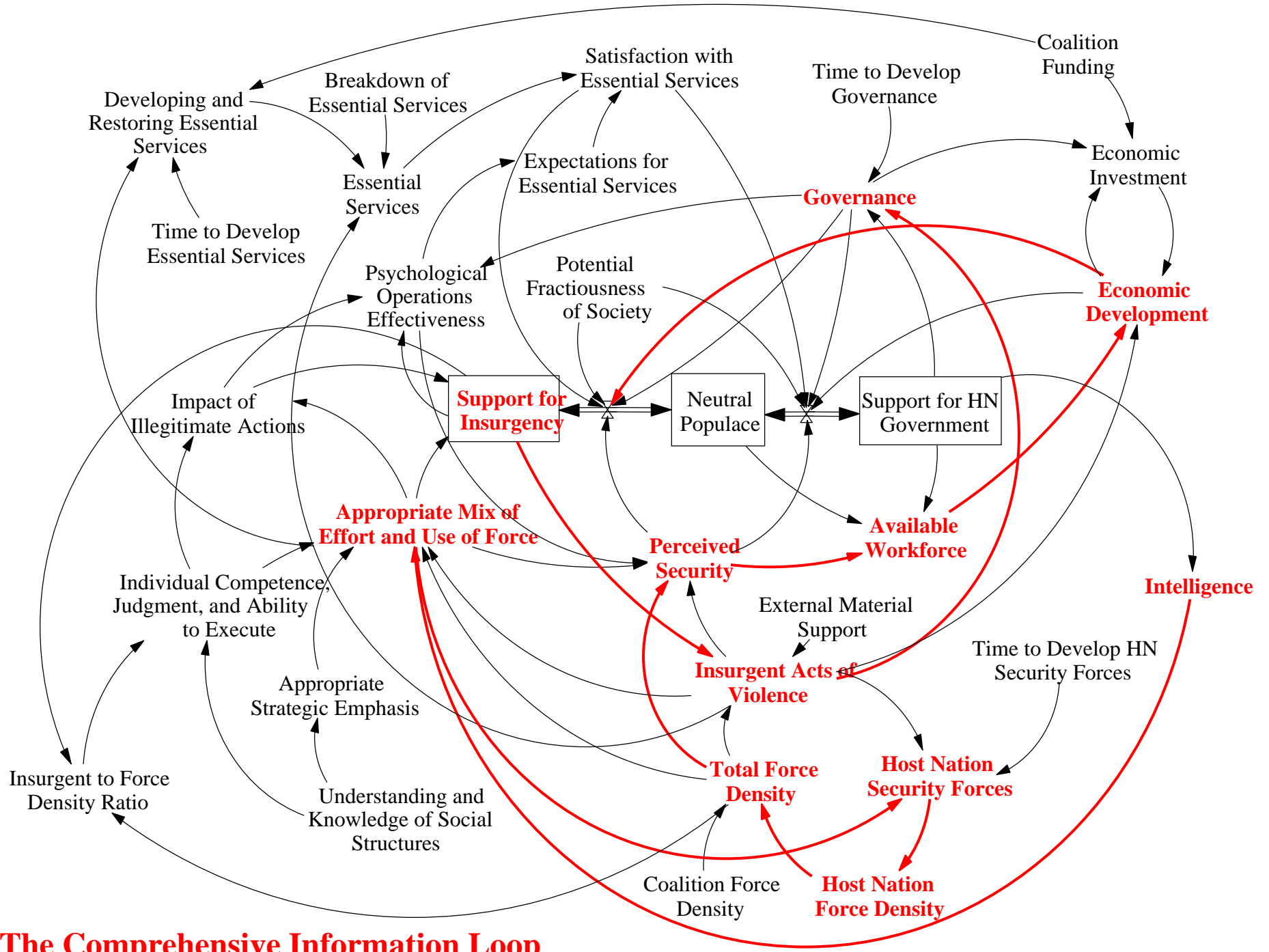
**The Comprehensive Information Loop**



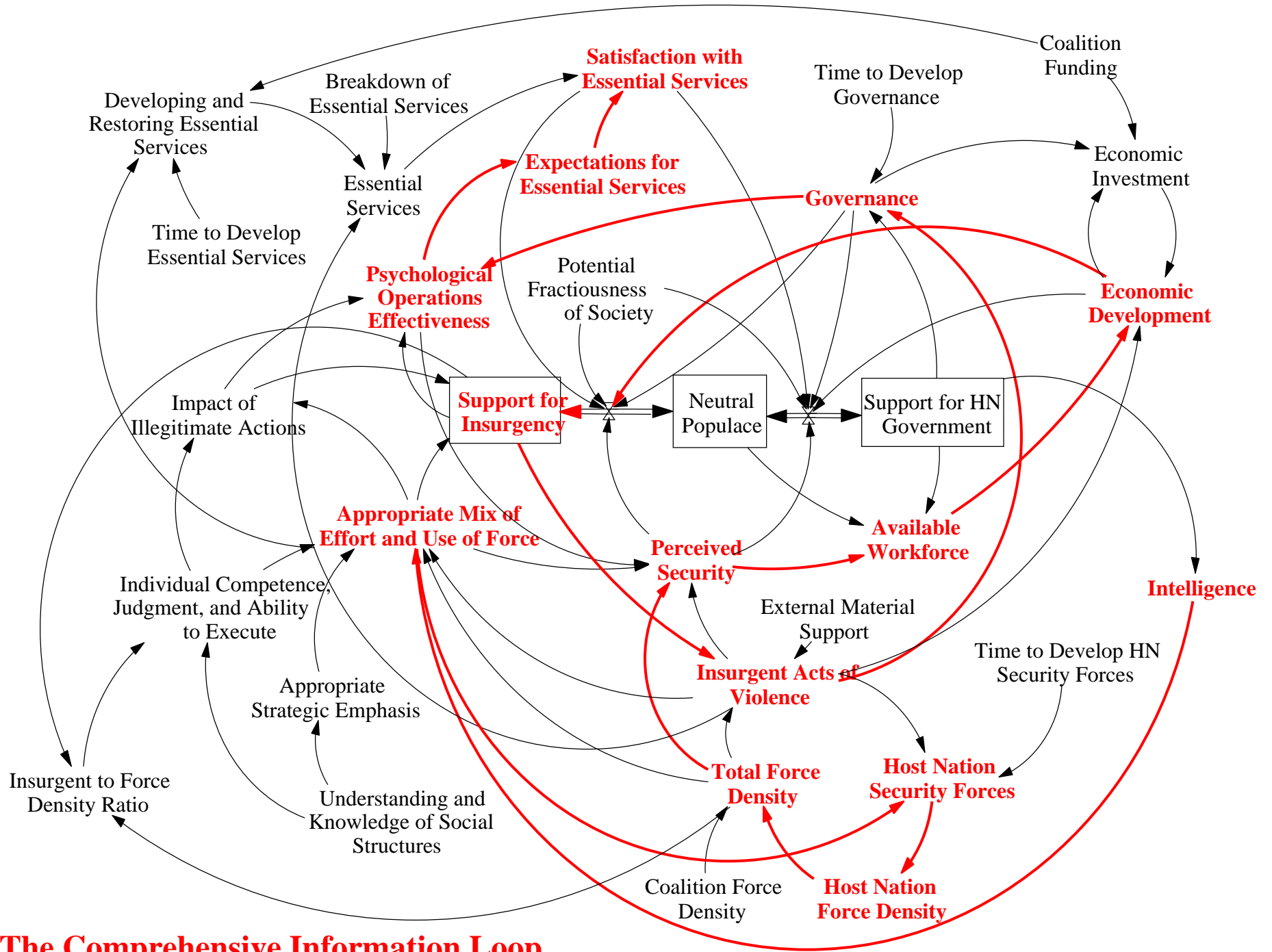
**The Comprehensive Information Loop**



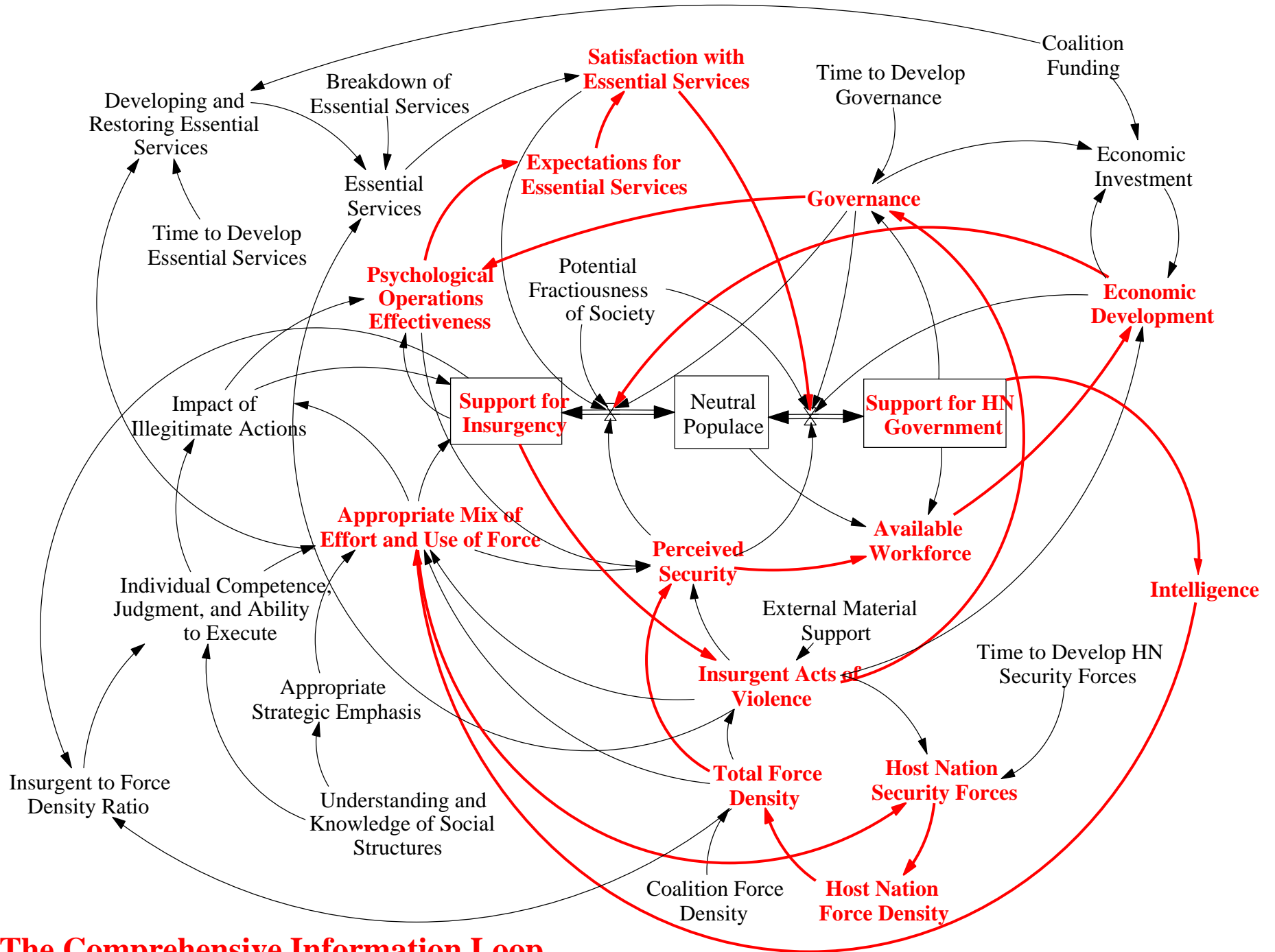
**The Comprehensive Information Loop**



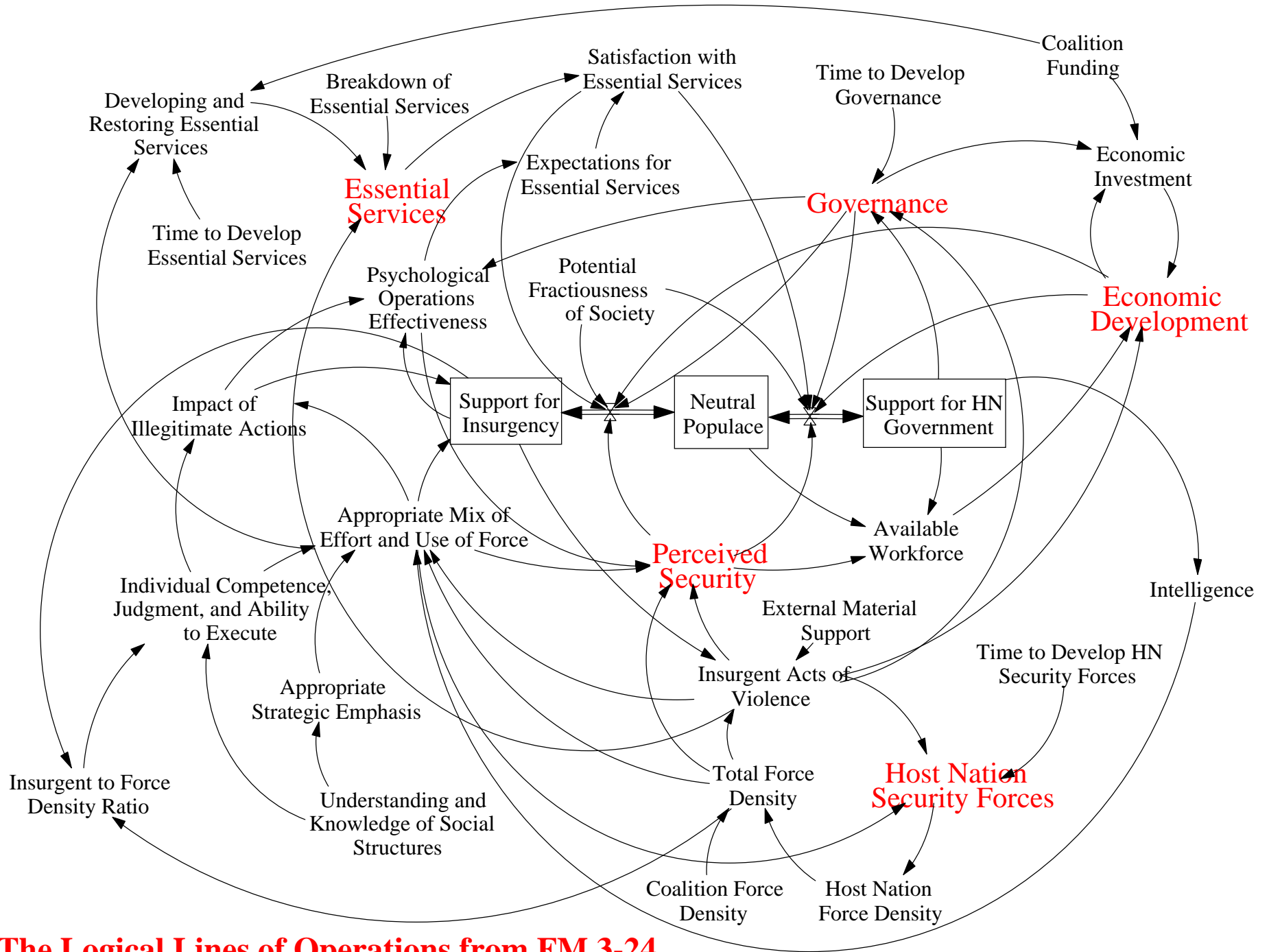
**The Comprehensive Information Loop**



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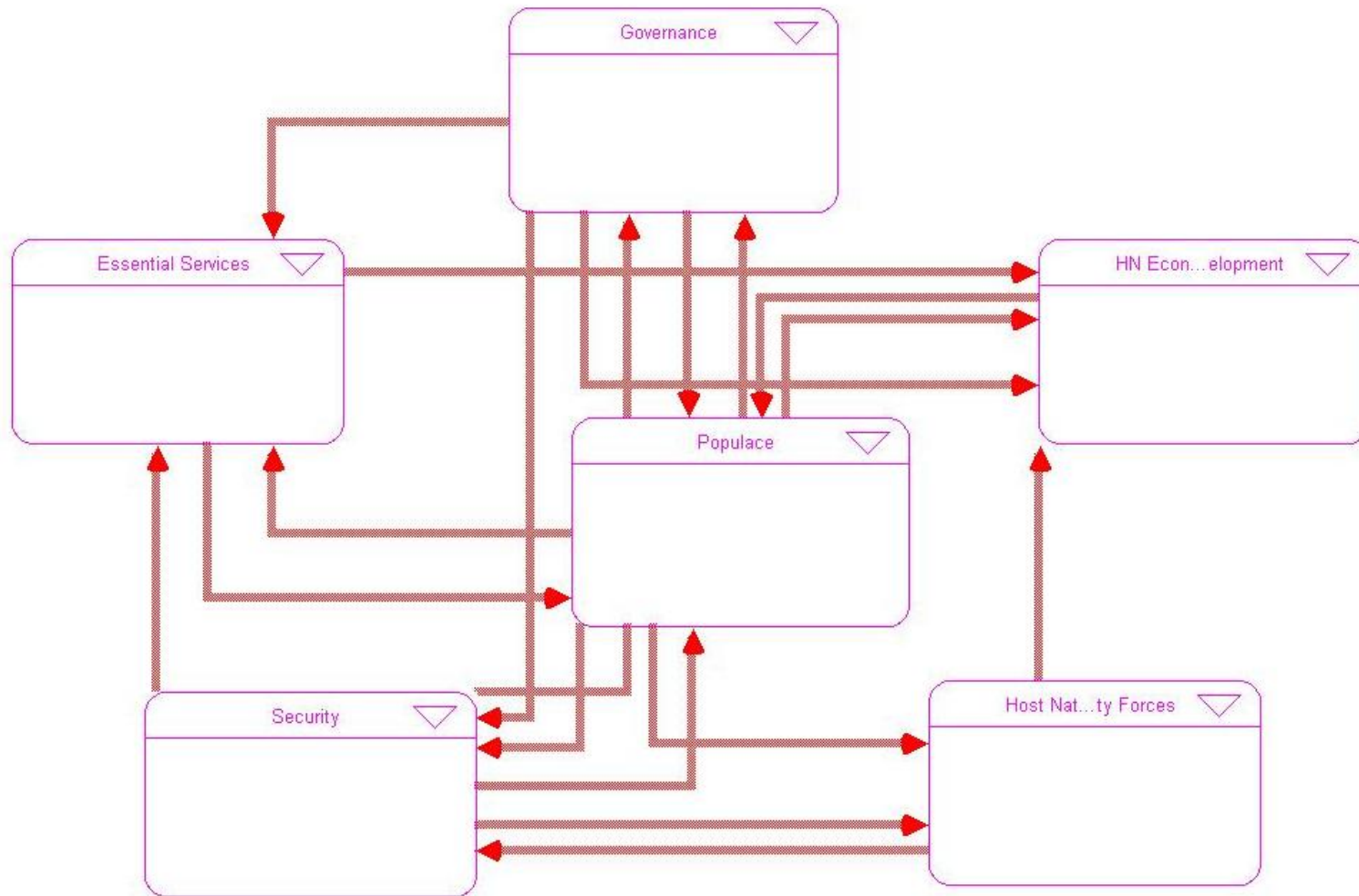


**The Comprehensive Information Loop**



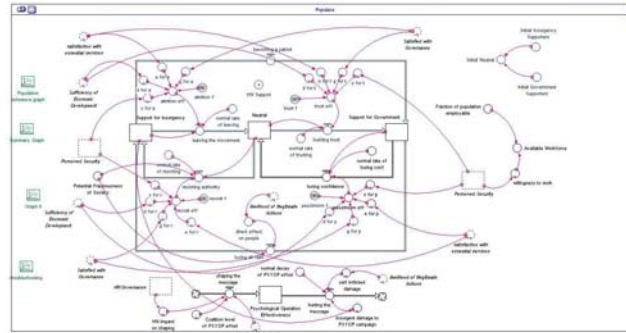
**The Logical Lines of Operations from FM 3-24**

# The STELLA Model - Interfaces

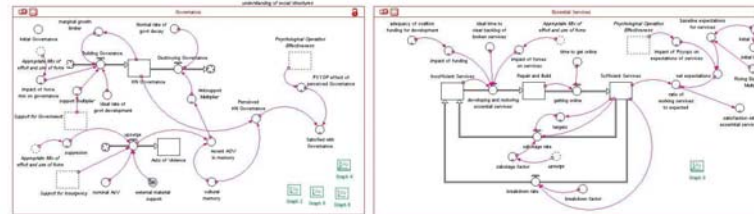


# The STELLA Model - Structure

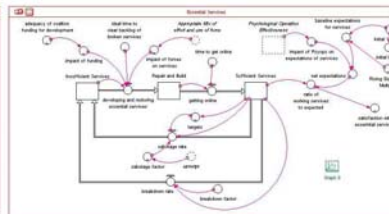
Population



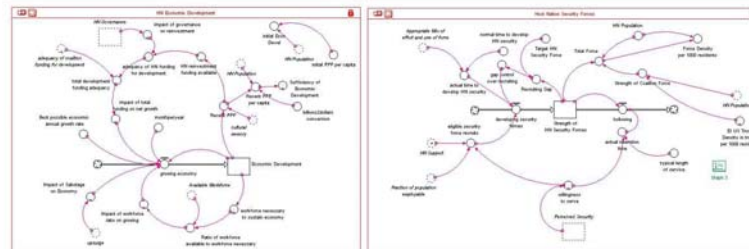
Governance



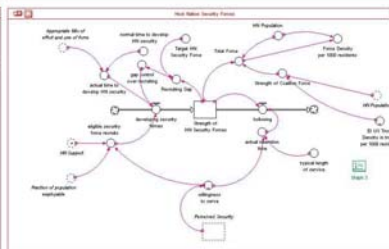
Essential Services



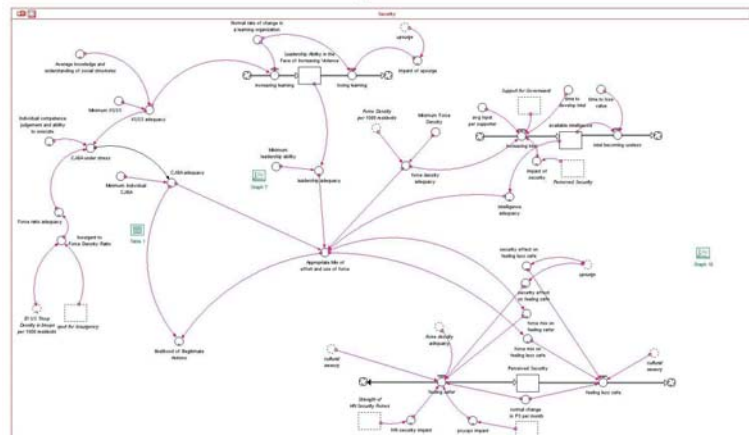
Economic Development



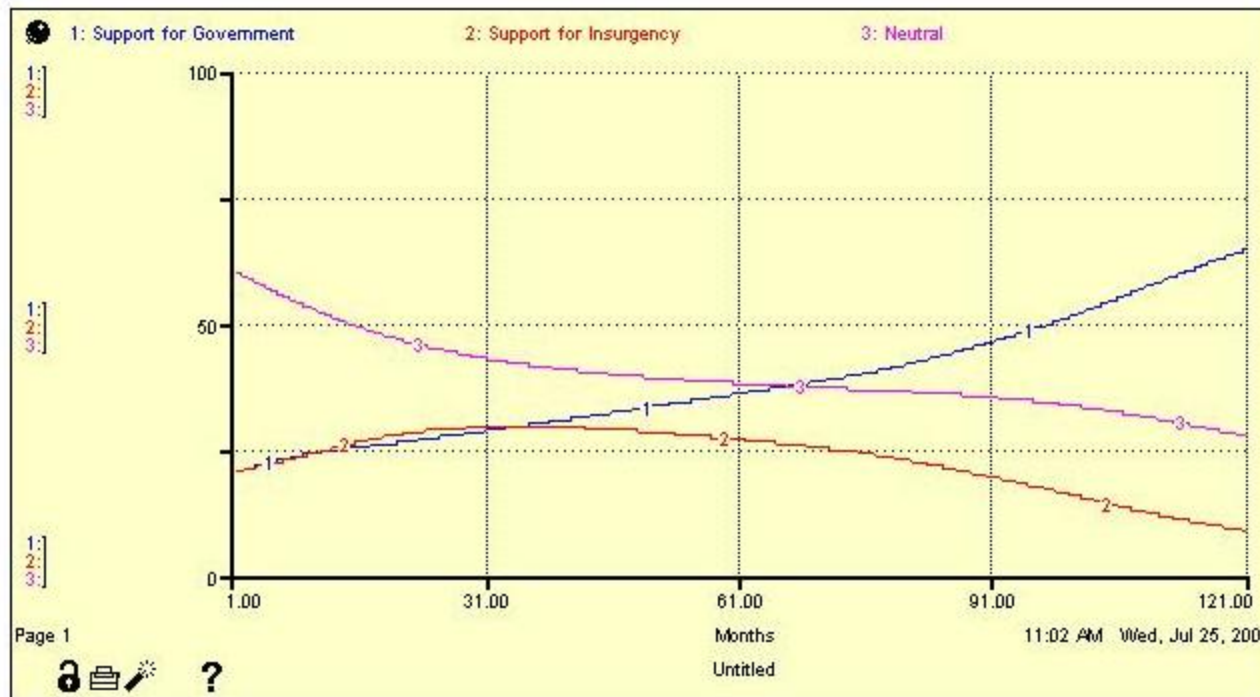
Host Nation Security Forces



Security



# The STELLA Model

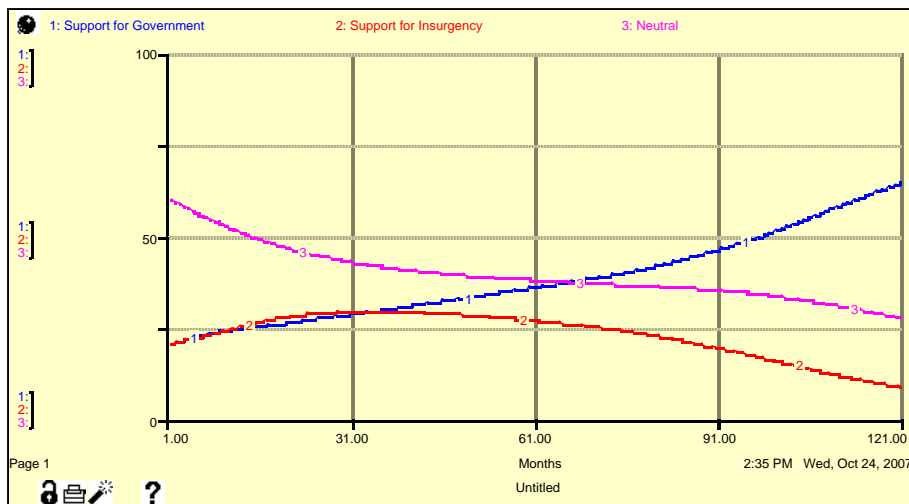


Run      Clear

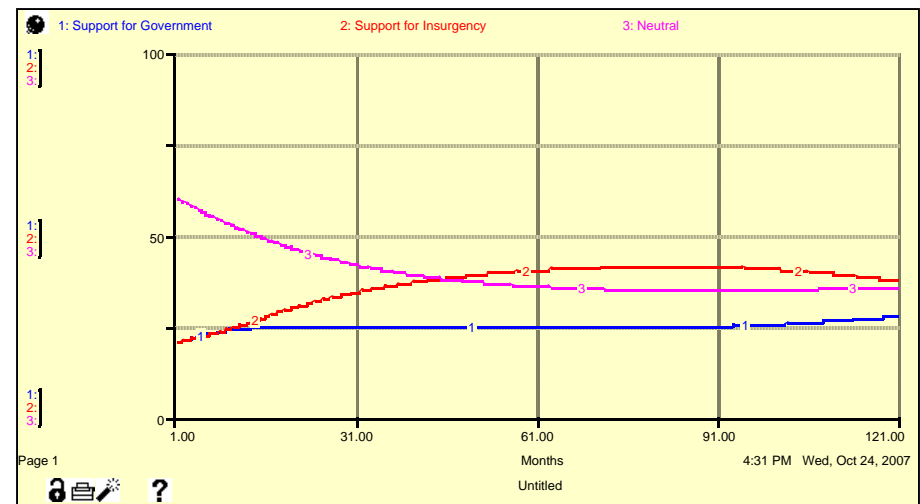


### Option – Adjust Mix of Effort and use of Force to focus totally on suppression

- Technology-driven and reactive cost imposing strategy
- Ignores FM 3-24 recommended effort on non-security LLOs



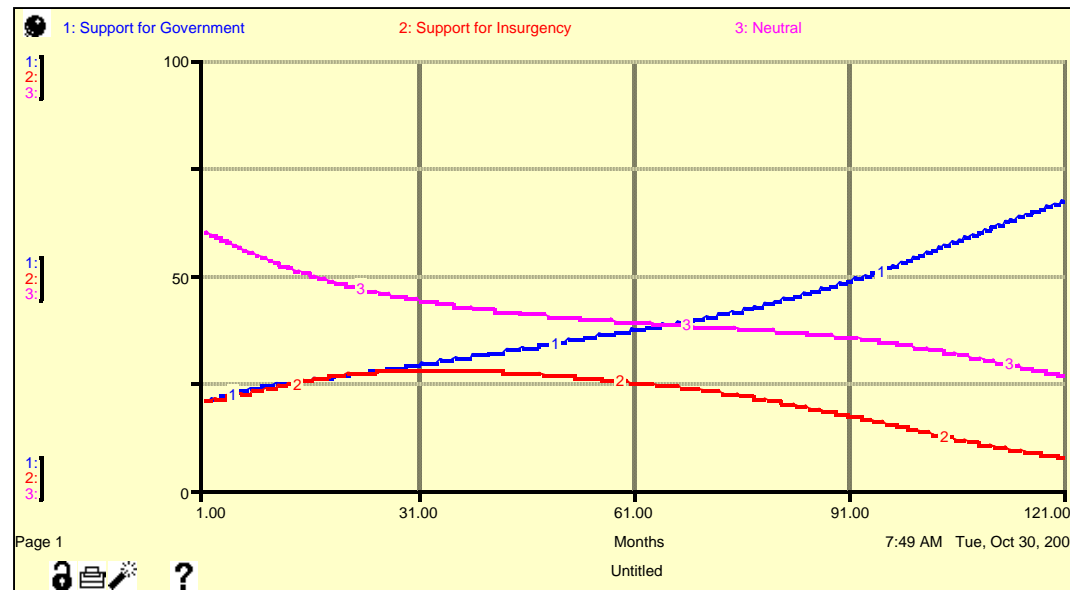
Appropriate mix of effort set to a balanced focus on all Logical Lines of Operation



All effort focused on Perceived Security and Host Nation Security Forces, others zero

**Waiting to start on the Non-Security LLOs until Security is established is an inherently flawed and self defeating strategy. The LLOs are too interdependent.**

# Optimizing a Solution



Results with balanced mix of effort on LLOs combined with slight reduction in External Material Support and slight reduction in Potential Fractiousness of Society

## • Optimum Solution

- Mix effort on LLOs to reduce support as per FM 3-24
- Reduce External Material Support where sanctuaries exist
- Reduce Potential Fractiousness of Society wherever possible

# Is it working?

“...spotting a land dispute...”  
*(Governance)*

“The Strategy has become the new mantra of the military”  
*(FM 3-24)*

“...and halt a string of suicide attacks...”  
*(Insurgent Acts of Violence)*

“Five new teams have been deployed, bringing the total to 6”  
*(Troop Density)*

“...wanted to reduce to use of heavy-handed military operations...”  
*(Appropriate Strategic Emphasis)*

“Who else is going to do it?”  
*(FM 3-24)*

“... about where to build a school...”  
*(Essential Services)*

“...protect villagers from the Taliban and criminals.”  
*(Perceived Security)*

“...a potentially strong economy...”  
*(Economic Development)*

“If Afghan and American officials could unite the Zadran...”  
*(Potential Fractiousness)*

“...local councils to resolve Tribal disputes...”  
*(Governance)*

“...alienated the population and created more insurgents...”  
*(Impact of Illegitimate Actions)*

**New York Times – October 5<sup>th</sup> 2007: Combat operations reduced by 60% since the arrival of Anthropologists; “it works to help you define the problem, not the symptoms”**

New York Times  
October 5, 2007  
Page 1

E.B. Nr 5  
ANALYSIS BY S.W.J.  
AK: XIF/ANALYSIS

**Army Enlists Anthropology In War Zones**  
By David Rubin

SHARAK VALLEY, Afghanistan — In this isolated Taliban stronghold in eastern Afghanistan, American paratroopers are fielding a crucial new weapon in counterinsurgency operations here: a sophisticated anthropological manual. They

They, who said that last summer but he used for several months as a member of the first Human Terrain Team, an experimental Pentagon program that uses anthropologists and other social scientists to American combat units in Afghanistan and Iraq. The goal is to understand subtle points of tribal relations — in one case spotting a land dispute that allowed the Taliban to bury parts of a major tribe — has won the praise of officers who say they are seeing concrete results.

“I’ve seen the value of this program, and I’ve seen the value of the first Human Terrain Team,” said Martin Schweitzer, commander of the 42nd Airborne Division unit working with the anthropologists here, said that the unit’s combat operations had been reduced by 60 percent since the unit arrived in February, and that the soldiers were now able to “find recovery” improving medical health care and education for the population.

“We’re not looking at this from a narrow perspective, from a social scientific perspective,” he said. “We’re not focused on the military. We’re focused on bringing the war down to the people.”

In September, Defense Secretary Robert M. Gates authorized a \$40 million expansion of the program, which will assign teams of anthropologists and social scientists to each of the 26 American combat brigades in Iraq and Afghanistan. Since early September, five new teams have been deployed in the Baghdad area, bringing the total to 26.

Yet critics are emerging in academia. Citing the past misuse of social sciences in counterinsurgency campaigns, including in Vietnam and Latin America, some denounce the program as “instrumental anthropology” that exploits social science for political gain. Opponents fear that, wherever their interests, the soldiers who work with the military could inadvertently cause all anthropologists to be viewed as intelligence gatherers for the American military.

Hugh Osterman, an anthropology professor at George Mason University, and 10 other anthropologists are co-authoring an online pledge calling for anthropologists to boycott the teams, particularly in Iraq.

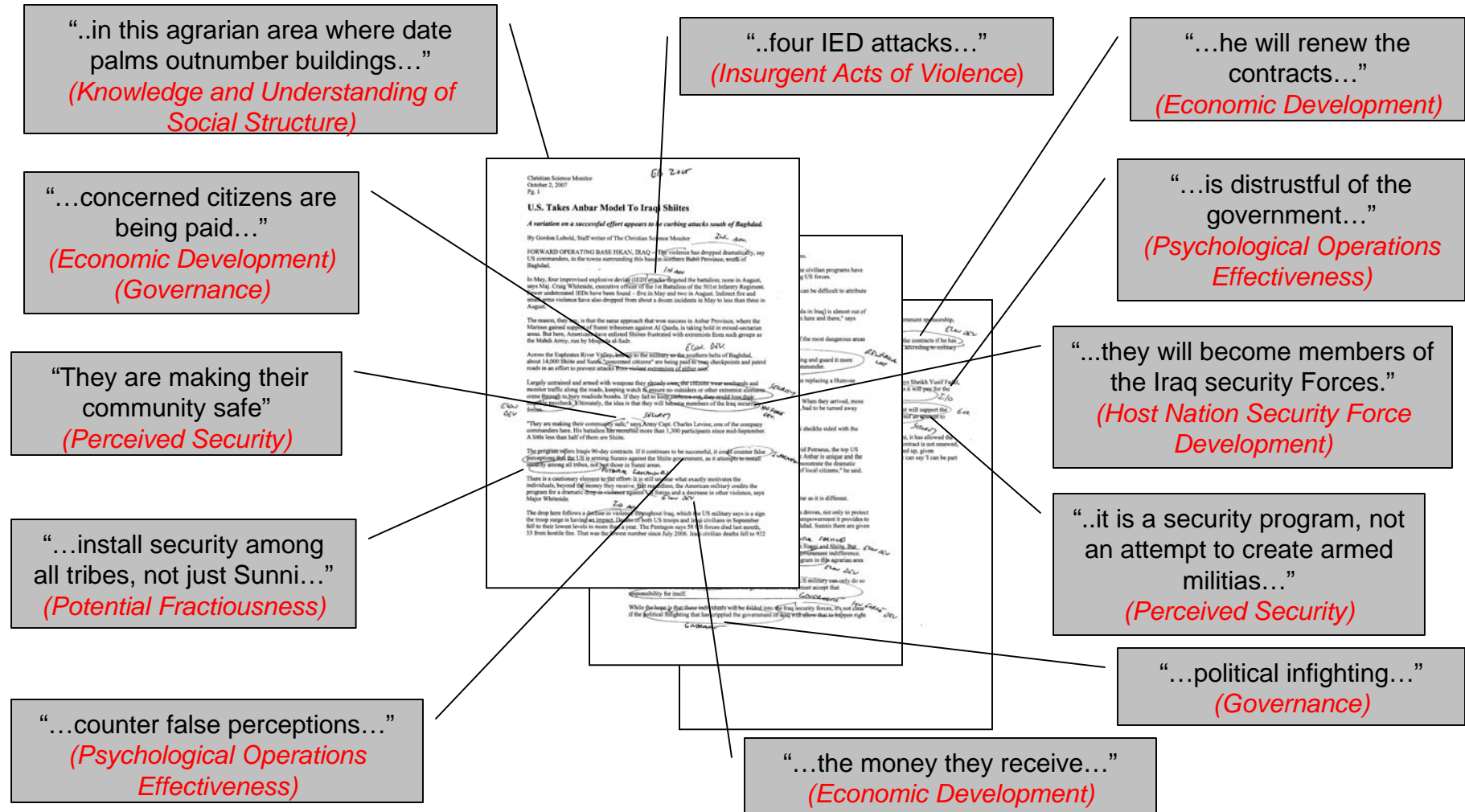
“While often presented by its proponents as work that builds a more secure world,” the pledge says, “at best, it contributes instead to a brutal war of occupation which has entailed massive casualties.”

In Afghanistan, the anthropologists arrived along with 6,000 troops, which doubled the American military’s strength in the area it patrols, the country’s east.

A smaller version of the Bush administration’s troop increase in Iraq, the buildup in Afghanistan has allowed American units to carry out the counterinsurgency strategy here, where American forces generally face less resistance and are better able to take risks.

“It’s what you do, it works,” said Colonel Woods, a native of Colorado. “It works in helping you define the problem, and not just the symptoms.”

# Is it working?

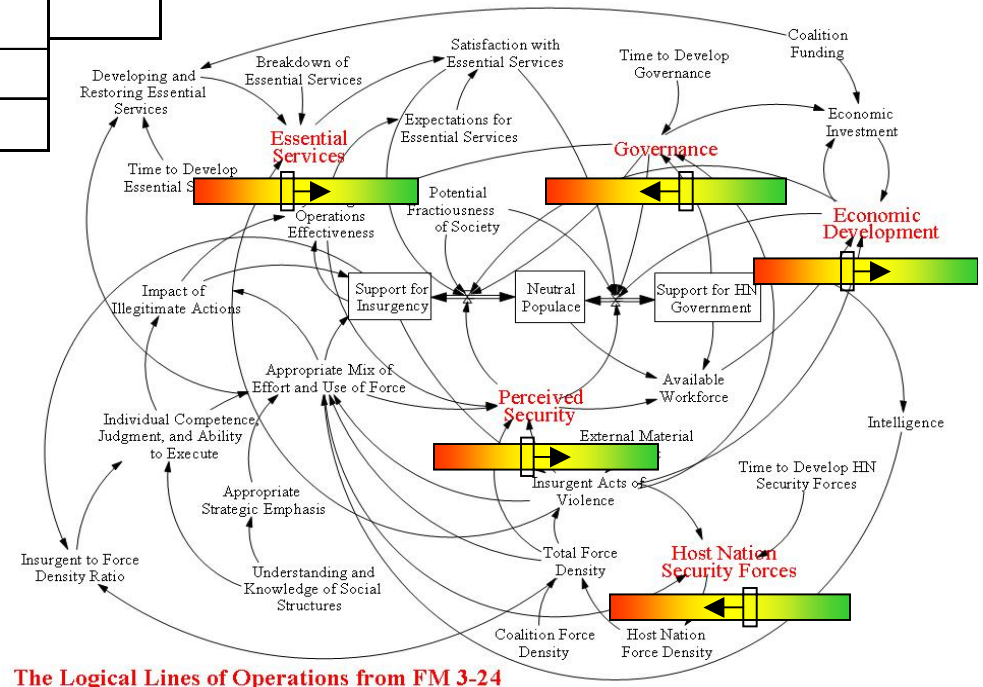


Christian Science Monitor – October 2<sup>nd</sup> 2007: Violence dropped dramatically; “The more successful this is, the more the locals will embrace it and guard it more closely”

# Contextual Mapping

Perceived Security		
Desired Outcome 3: xxx.xxxx		Overall Status
Metric(s)	Significant Activities	Status/Trend
Governance		
Desired Outcome 3: xxx.xxxx		Overall Status
Metric(s)	Significant Activities	Status/Trend
Essential Services		
Desired Outcome 3: xxx.xxxx		Overall Status
Metric(s)	Significant Activities	Status/Trend
Host Nation Security Forces		
Desired Outcome 3: xxx.xxxx		Overall Status
Metric(s)	Significant Activities	Status/Trend
Economic Development		
Desired Outcome 3: xxx.xxxx		Overall Status
Metric(s)	Significant Activities	Status/Trend
Βελλα	Λαργε γραψ ΣΥς ωιτη α γρεατ νυμβερ οφ αμενετιεσ	
Αννα	Βρανδ νεω Λυχατι τηατ γοεσ περψ φαστ	
Ολδ Ωηιτε Δογ	Ολδ 1974 Χαμαρο τηατ ηασ βειν αρουνδ φορ α νυμβερ οφ ψεαρσ	
Ολδ Βλυε	Α περψ νιχε Χαρλεψ Δαπιδσον τηατ Ι βουγητ φορμ μψ Δαδ	

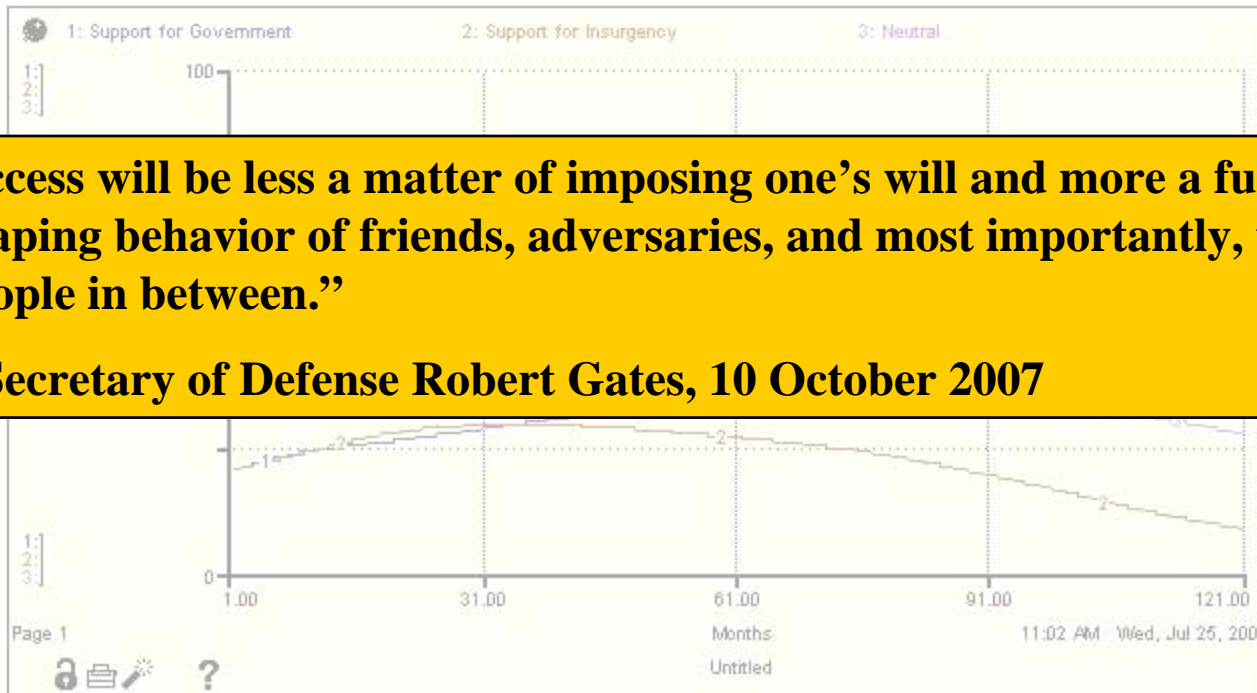
Contextual Mapping helps metrics point towards the appropriate LLOs



What can you say about these except "I hope they start getting greener"

To be useful, metrics need a contextual mapping, which infers a framework

# The STELLA Model – Demo/Questions



**“Success will be less a matter of imposing one’s will and more a function of shaping behavior of friends, adversaries, and most importantly, the people in between.”**

**Secretary of Defense Robert Gates, 10 October 2007**

