

Building Resilience in Haiti:

Equity, Information, Growth, and Sustainability

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September 30, 2010

- Cities, Complexity and Resilience
- Equity, Information, Growth and Sustainability

A Mathematical Metaphor

- Picture a dynamical system with multiple equilibria
- Earthquake propelled us outside the basin of attraction of the status quo
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- reconstruction **must** solve this mammoth optimal control problem

Outline

- 1 Introduction
- 2 Perspectives
- 3 Cities, Complexity, and Resilience
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Community Resilience

In 2009, the National Academies held a panel on the *Applications of Social Network Analysis for Building Community Disaster Resilience*.

Dr. Fran Norris of Dartmouth Medical School outlined:

- Social Capital
- Community Competence
- Economic Development
- and Robust Communication Infrastructures

as key ingredients for Community Resilience.

Community Resilience in Haiti



Community Resilience in Haiti

- A population on the edge of survival forced to exhaust the scarce resources of the environment without much regard to their renewal
- Urban concentrations exhausting the land and paralyzing local initiatives
 - Port-au-Prince hosted nearly 73,400 inhabitants per square mile (2007)
 - 843 per square mile in Haiti (2009)
 - GDP 733 dollars per year
 - counting the metropolitan area: 50 percent of the population living on 1.37 percent of the land
- Persistent social inequalities that drain the chances of fulfillment of most of the population

Vulnerable Communities: Hurricanes and Floods



Vulnerable Communities: Jan 12th Earthquake



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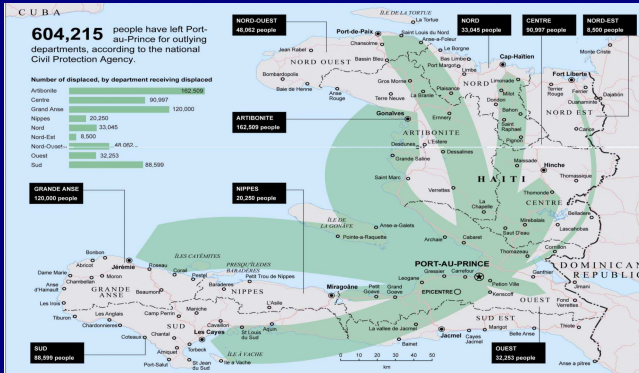
Perspectives on Reconstruction

- Cities are Complex Systems/Organisms
- There is an urgent need for a sophisticated understanding and implementation of urban and regional planning
- A resilient reconstruction must be animated by the same principles that guide preparedness and mitigation of risk
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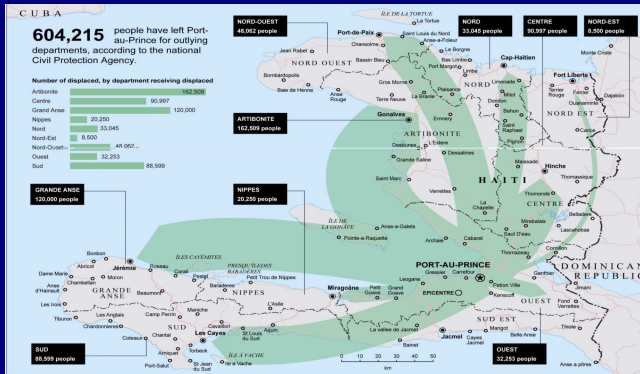
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Port-au-Prince, Complexity and Resilience



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Port-au-Prince, Complexity and Resilience



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- **Interaction:** the network of this movement is not only based on geographical distance

Port-au-Prince

in Haiti's social, economic, political landscape

- assembly manufacturing as the single industry growth plan
- uncontrolled urbanization and rural flight
- increase in food imports undermining the agricultural production

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- Adaptive, Complex and Chaotic . . .



Lessons from American Cities

In 1961, Jane Jacobs published *The Death and Life of Great American Cities*, one of the most influential volumes on urban planning. A critique of modernist planning, Jacobs:

- argues against artificial separation of land use as residential, commercial, and industrial
- favors a mixed, redundant and local approach to land/resource allocation

Vibrant cities are made of interacting neighborhoods and communities that are multifaceted, multipurpose, and whose functionalities are redundant.

In *The Architecture of Complexity* (1962), Herbert Simon wrote that:

Roughly, by a complex system I mean one made up of a large number of parts that interact in a nonsimple way. In such systems, the whole is more than the sum of the parts, [...] , given the properties of the parts and the laws of their interaction, it is not a trivial matter to infer the properties of the whole."

- The study of complex systems originated in non-equilibrium statistical physics
- Recently social scientists have become increasingly interested in complex systems

Cities and Complexity

Michael Batty, in *Cities and Complexity* (2005), advocates a generative understanding of cities via computational models. Considering cities as complex systems, he brings to urban planning:

- **tools:** Agent-based Modeling, Cellular Automata
- **concepts:** self-organization, criticality, complex networks, spatial epidemics, emergence
- **methods:** mean-field approximation, simulation

of complexity science.

The processes that animate a city are the macroscopic outcomes of the micromotives and microbehaviors of the city's inhabitants.

Resilience

- Resilience is property of a material that absorbs energy when deformed elastically; and releases this energy when it regains its shape.
- In *The Resilient City* (2005), Vale and Campanella, suggest that major modern cities are resilient as they are routinely able to rebound from disaster.

Three Noteworthy Axiom of Resilience

- Resilience Benefits from the Inertia of Prior Investment
- Disasters Reveal the Resilience of Governments
- Resilience Entails More than Rebuilding

Tangshan, China

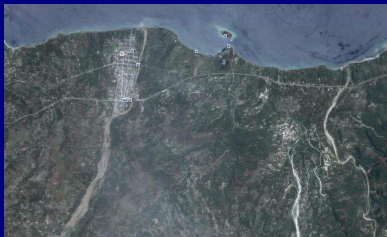
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- over 250 thousand people killed, in a city of about one million.
- The city was rebuilt within a decade, by Chinese officials.
- In 2008, Tangshan's population was over seven million,
- with a GDP per capita of 6,817 dollars.

Grand Goâve and Ravine du Sud

Unmitigated Risk to Natural Disaster

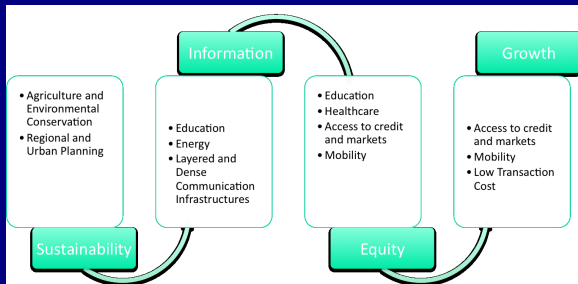


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Elements of a Course of Action

- Regional and Urban Planning
- Agriculture and Environmental Conservation
- Decentralized and Robust Economic Growth

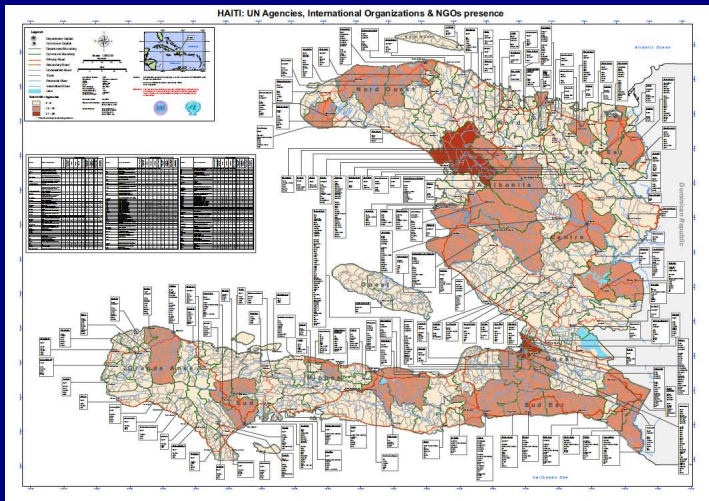


Equity

- Education
- Health Care
- Access to Credit
- Access to Markets
- Mobility

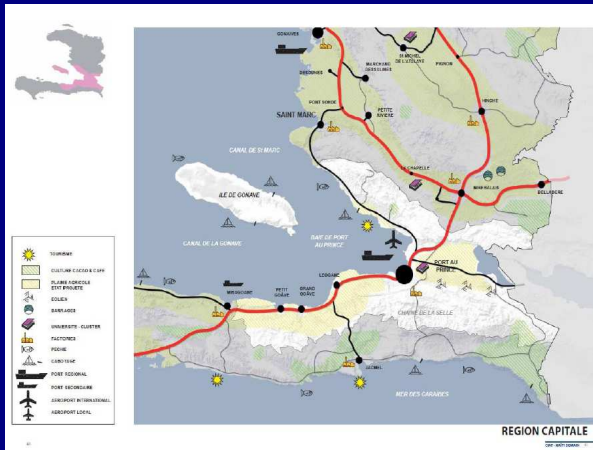
- Education
- Energy
- Layered and Dense Communication Infrastructures

The NGO Network

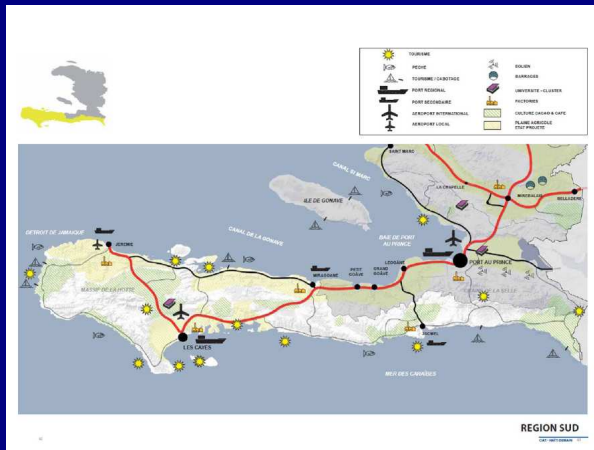


- Access to Credit and Markets
- Mobility
- Low Transaction Cost

Growth \implies Decentralization



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- Agriculture and Environmental Conservation
- Regional and Urban Planning

Sustainable Agriculture





Ecological Tourism



Closing Remark

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