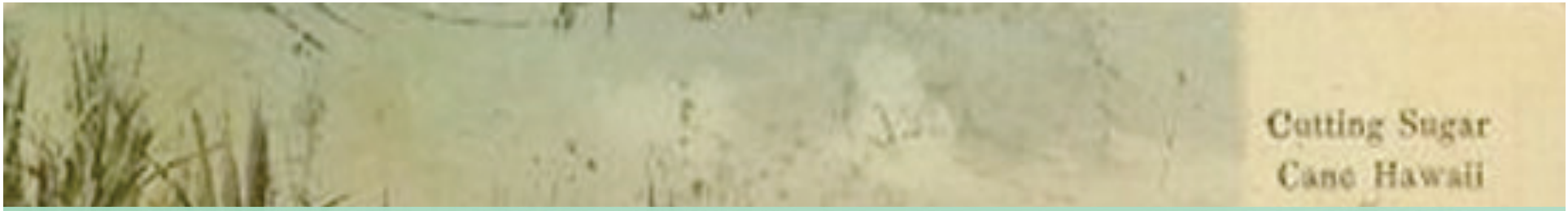


The Value of the Long View: A Long-Term Industrial Ecosystem Model of Hawai'i Island Part II

Professor Marian Chertow

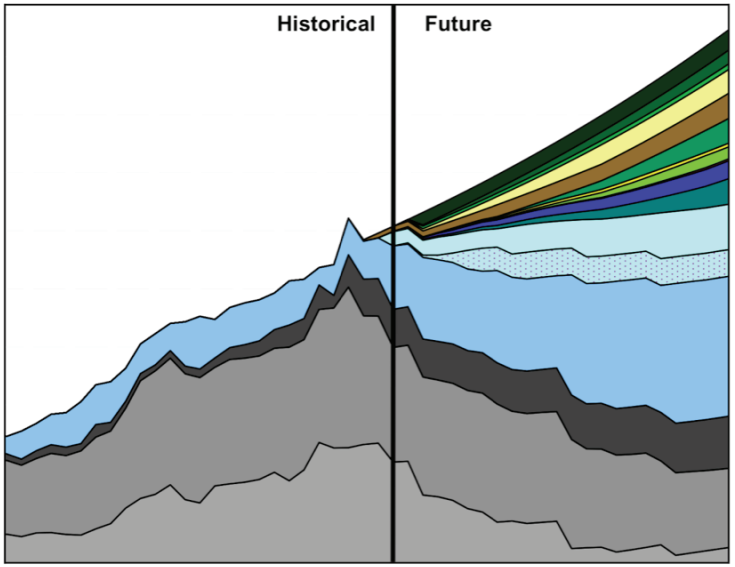
Yale School of Forestry and Environmental Studies

May 21, 2009

How we got here: Partnering with the Kohala Center and the County on Industrial Ecology

Analysis and Recommendations for the Hawai'i County Energy Sustainability Plan

October 3, 2007



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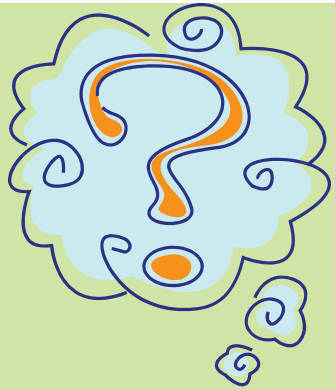
Research conducted for The Kohala Center, Kamuela, Hawai'i and the Hawai'i County Department of Research and Development
Prepared for and Funded by the Hawai'i County Council

Many Questions



- We looked at four historical transitions for Hawai'i Island: what might the next one look like?
- What "best management practices" can we observe in the "experiments" being done every day?
  - Can we find a suitable path in the biofuels quest?
  - Can we shift the metabolism of tourism?
  - What trends in construction?

The Program

To build on our strong relationships and engage Hawai'i Island:

- as a long-term research site (at least two decades);
- to study how human actions influence resource stocks, flows, use, and loss;
- historically, currently, and prospectively, as the…

***Long-term Industrial Ecosystem Model – Hawai'i Island* (LIEM – Hawai'i)**

How will this study differ from others?

Industrial Ecology …looks at human/industrial systems in the context of their natural surroundings

Industrial ecology provides ideas, methods, and tools that provide a strong foundation for this work…

Industrial ecology is the study of the flows of materials and energy in industrial and consumer activities, of the effects of these flows on the environment, and of the influences of economic, political, regulatory, and social factors on the flow, use, and transformation of resources.

Robert White

The Greening of Industrial Ecosystems 1994

Metabolism of the tourist industry:
Daily Resource Requirements/ Guest

Table 1: Summary of Infrastructure Demand, Residents and Visitors

	Water	Sewer	Electric	Utility Gas	Solid Waste	Hwy Gas & Diesel
Total Demand	(m gal)	(m gal)	(GWh)	(mmBtu)	(m lbs)	(m gal)
Residents	61,429	33,587	5,253	1,287,940	2,423.2	353.7
Visitors	11,856	8,022	1,944	1,521,257	421.3	52.1
Daily Per Capita Demand	(gal)	(gal)	(KWh)	mmBtu	(Lbs)	(gal)
Residents	138.9	75.9	11.9	0.003	5.5	0.8
Visitors	206.7	139.8	33.9	0.027	7.3	0.91

Planning for Sustainable Tourism, DBEDT 2005, Modeling Report Summary

US Long-term Ecological Research Network

- The National Science Foundation established the LTER program in 1980 to support research on long-term ecological phenomena in the United States.
- The 26 LTER Sites represent diverse ecosystems and research on
  - agricultural lands,
  - alpine tundra,
  - barrier islands,
  - coastal lagoons,
  - estuaries,
  - forests,
  - freshwater wetlands,
  - grasslands,
  - lakes,
  - open ocean, savannas,
  - streams, and
  - urban landscapes.

Reflecting on the past - four historic transitions and four historic icons

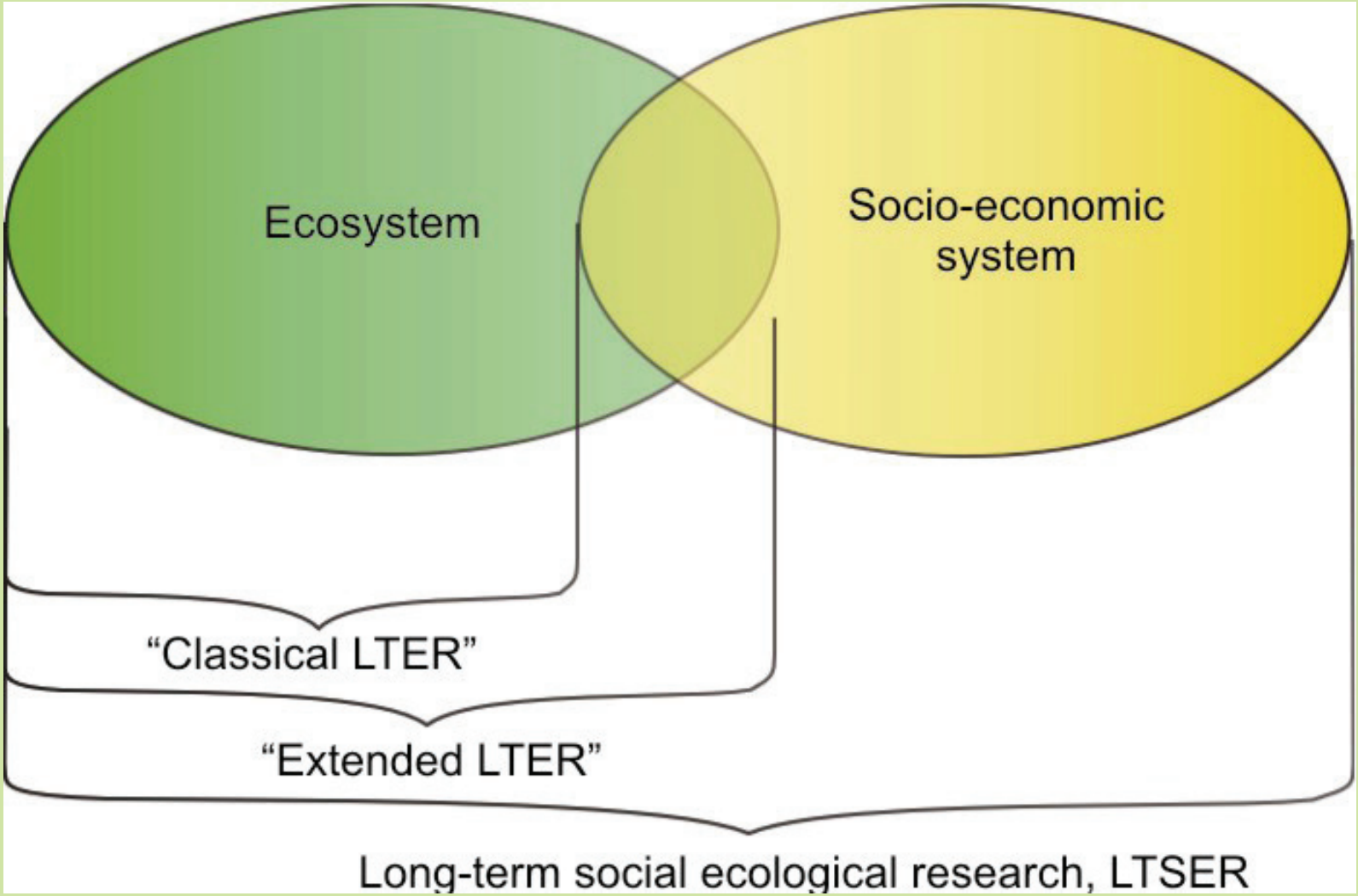
Ahupua'a to 1840s traditional land ownership

Māhele to 1898, privatization of land

U.S. ceded territory 1898-1959 land divided between federal and private landowners

Hawai'i joined the union in 1959

From LTER to LTSER – Prof. H. Haberl



Challenges I – Complex adaptive systems

- *Dynamic network of multiple agents interacting (acting and reacting) with decentralized control*
- *System adapts to both external forces (climate change, rising oil prices) and internal forces (abundance of prey, legislation banning plastic bags)*
- Examples – Ant colony, transportation network, governments, food production/distribution system
- The case of the food system (http://www.trojanmice.com/index.htm)

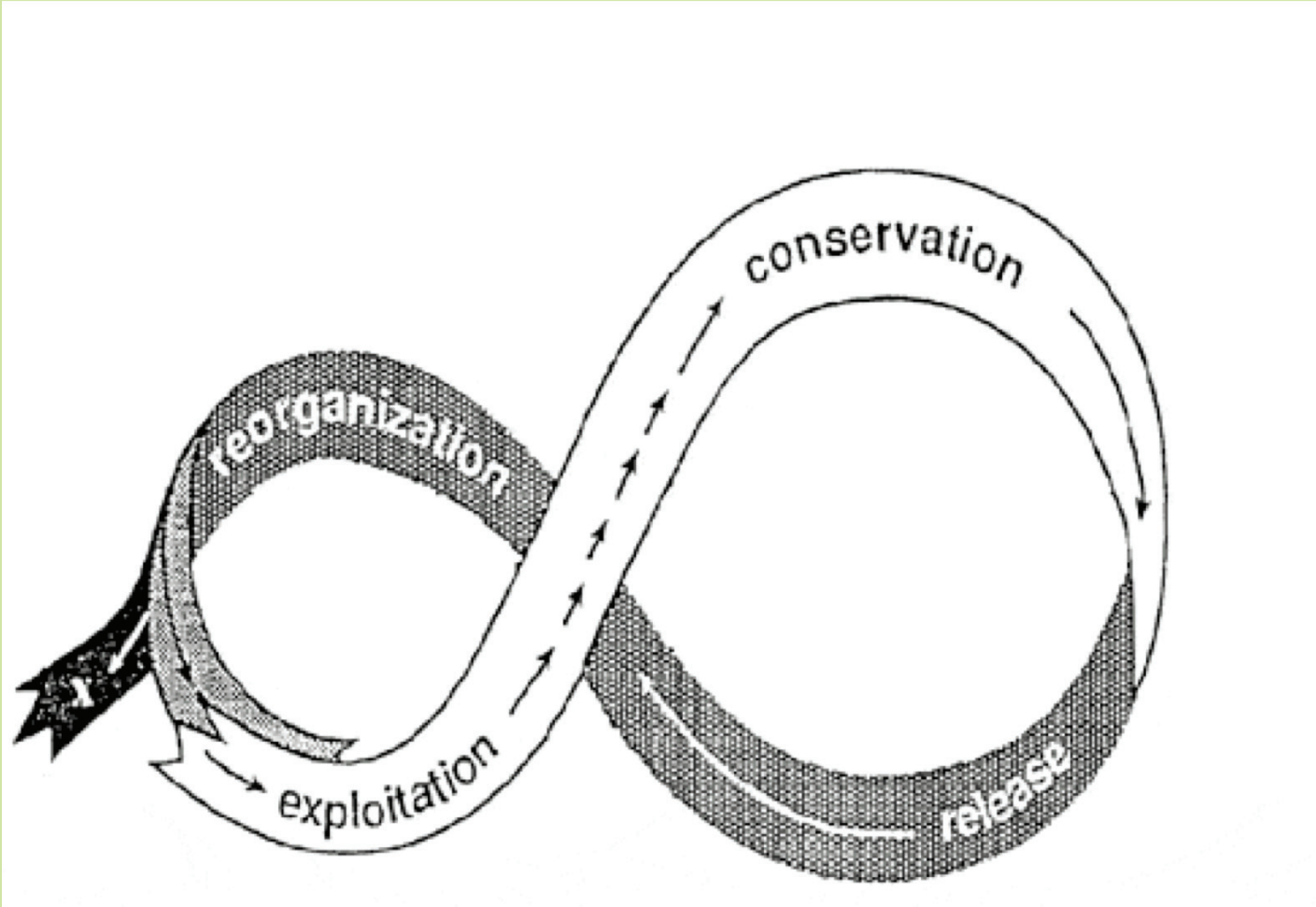
  - 10 day food supply for Hawai'i Island

  - But: no food plan, food manager or other controlling process.

  - Self organizing system of many components constantly adapting to the overall environment

  -Even an individual food shop is itself a system with many parts

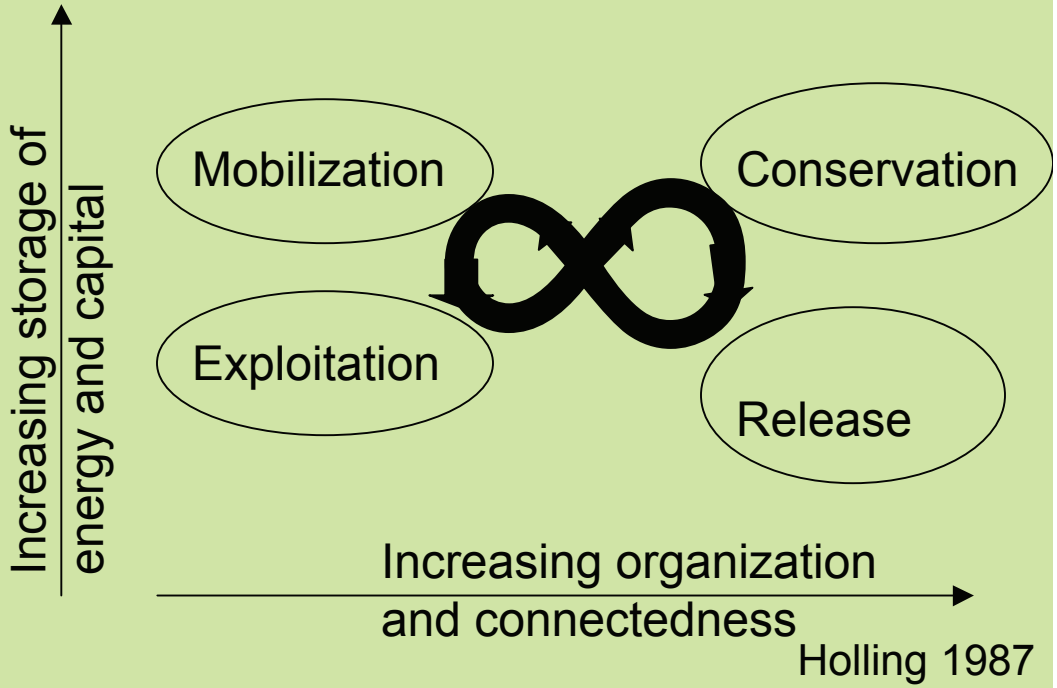
The on-going phases of an ecosystem – C.S. Holling



Industrial system evolution in Barceloneta, Puerto Rico

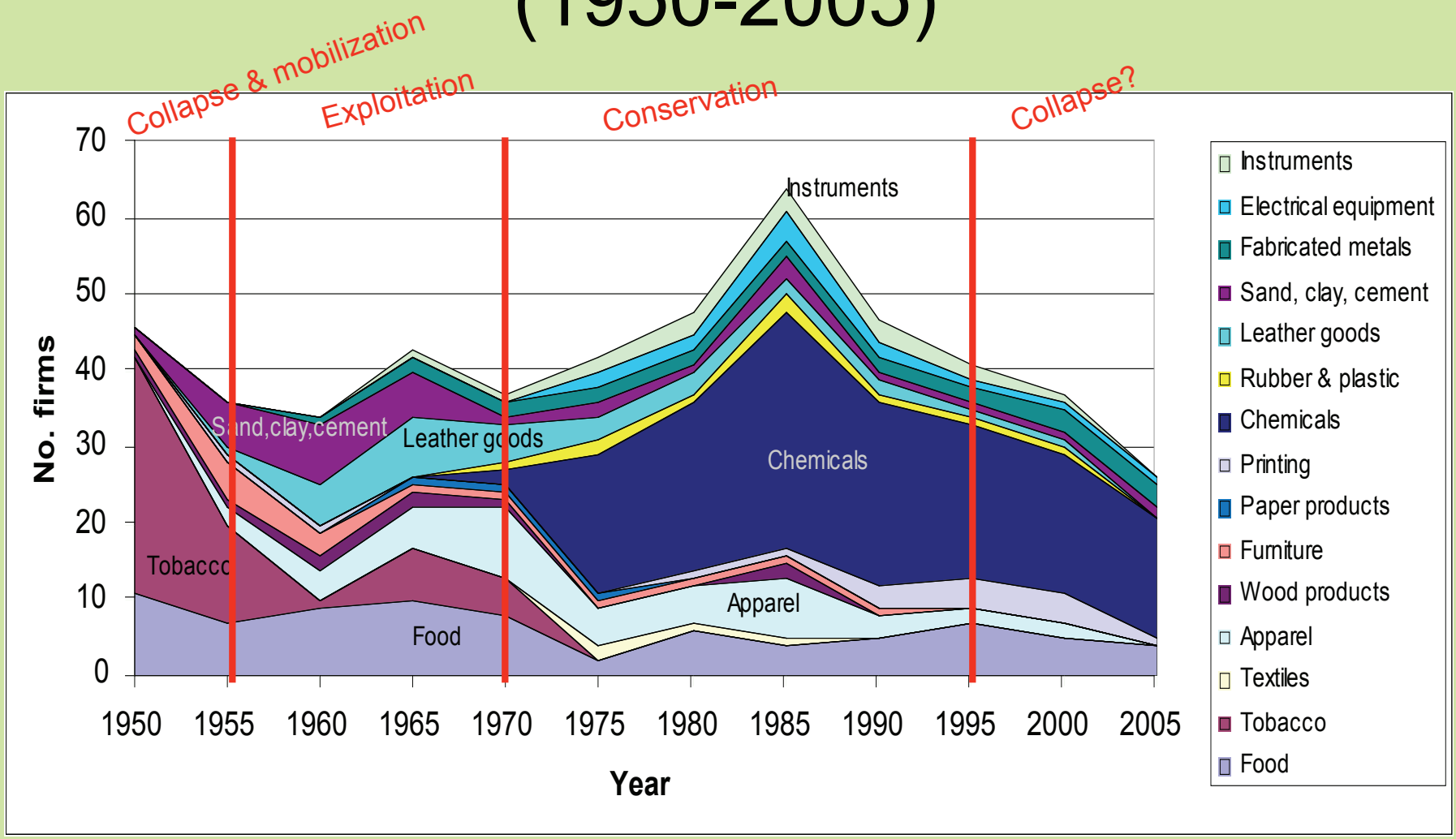
Complex system cycle

- Collapse of agriculture led to release of resources and subsequent exploitation by manufacturing firms
- Increasing no. and types of structural linkages among firms
- Increasing amount of local resource conservation and recycling
- Shifting industrial composition, but system maintains high level of diversity
- Pharmaceutical industry entering transition period



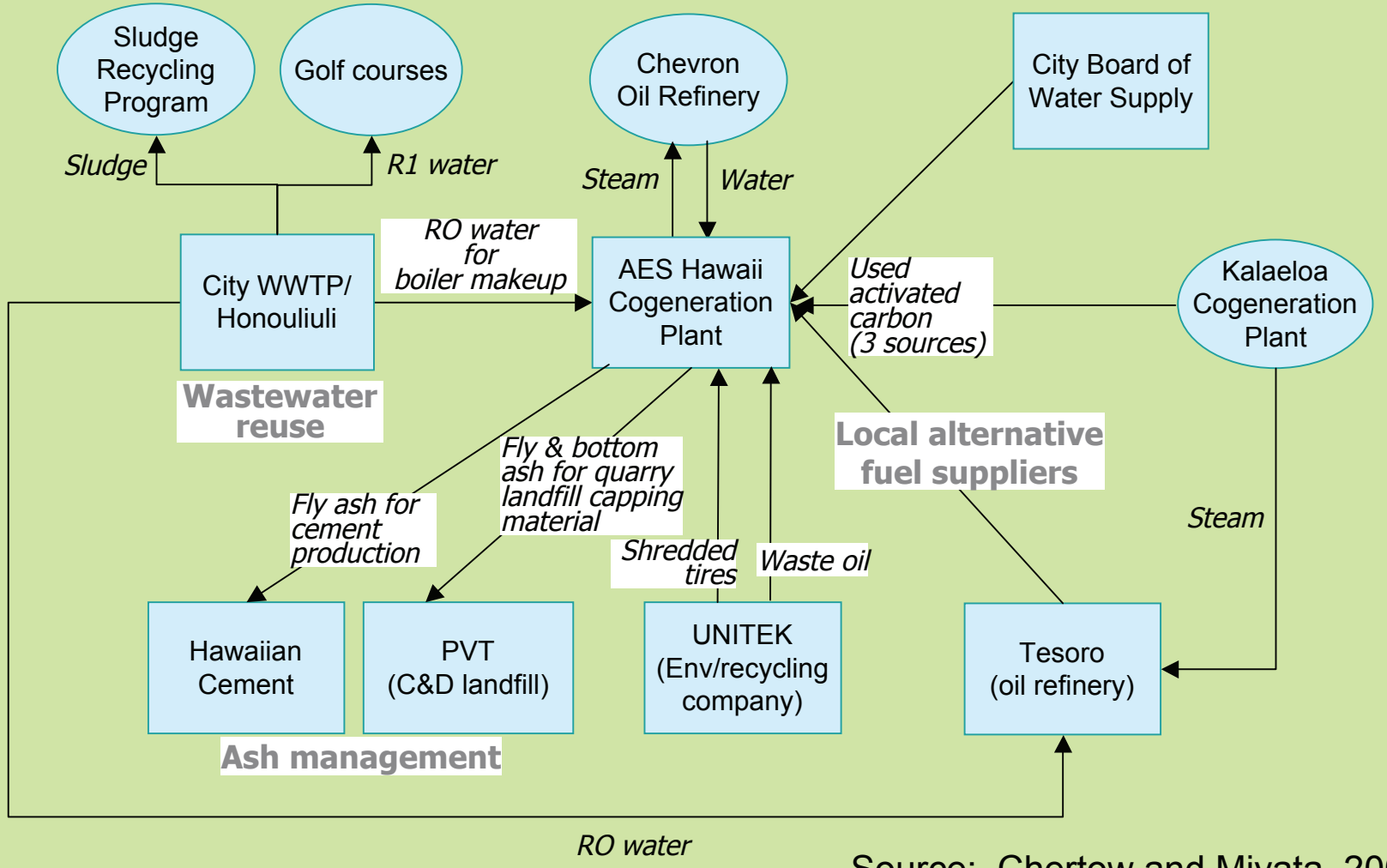
Source: W. Ashton, *Journal of Industrial Ecology*, 2009

Industrial community composition in Barceloneta, Puerto Rico (1950-2005)



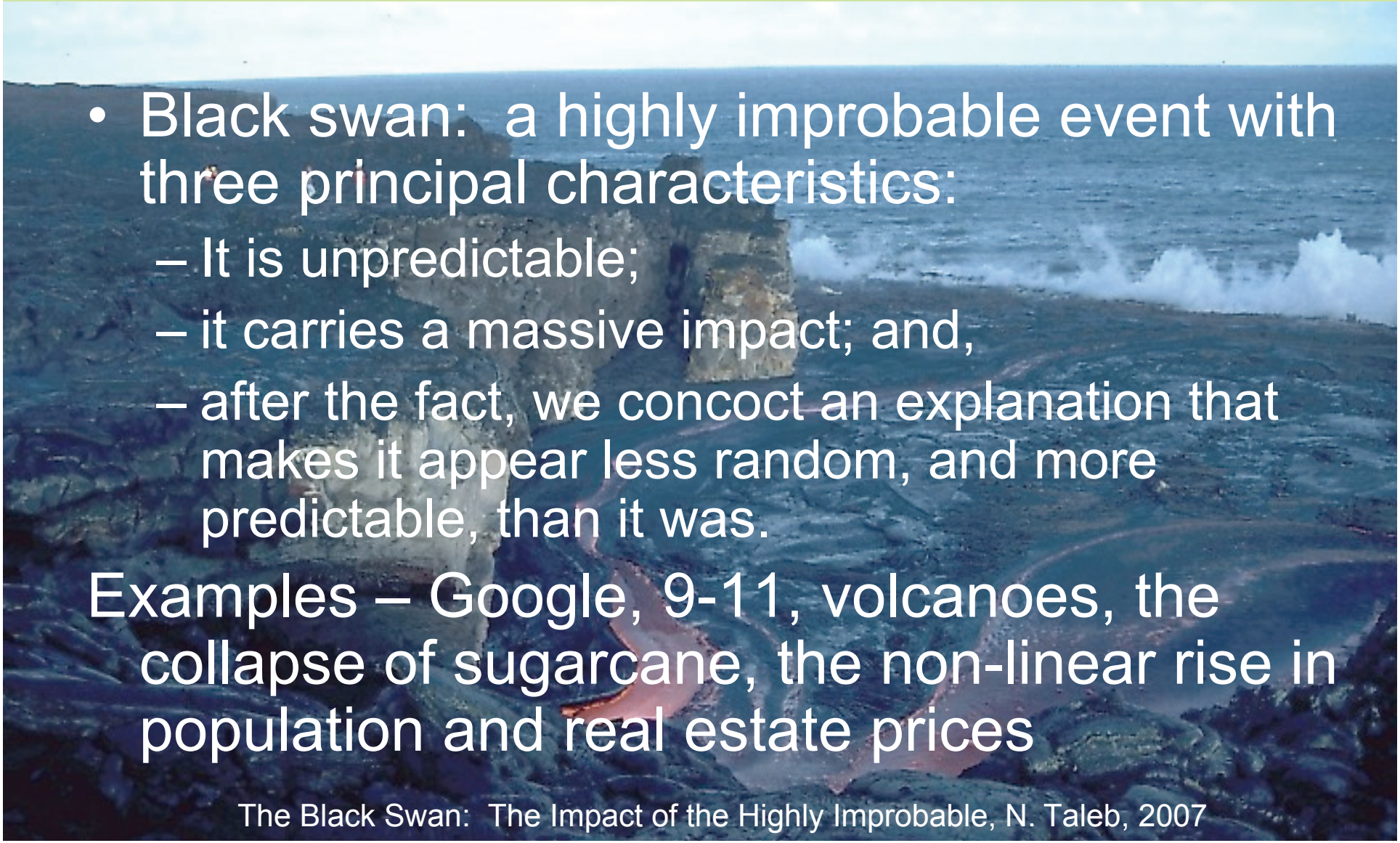
Based on data collected from PRIDCO, US Economic Census & US County Business Patterns, Ashton 2009

Industrial "Symbiosis" at Campbell Industrial Park



Source: Chertow and Miyata, 2009

Challenges II: Black Swans



- Black swan: a highly improbable event with three principal characteristics:
  - It is unpredictable;
  - it carries a massive impact; and,
  - after the fact, we concoct an explanation that makes it appear less random, and more predictable, than it was.

Examples – Google, 9-11, volcanoes, the collapse of sugarcane, the non-linear rise in population and real estate prices

The Black Swan: The Impact of the Highly Improbable, N. Taleb, 2007

LIEM Project ….drawing on Mauna Loa and Hubbard Brook

- a system followed in detail over an extended period of time, adding socioeconomic parameters to biophysical ones
- the idea of a system sufficiently contained so that inputs and outputs could be quantitatively determined, although this is more challenging in a human/industrial setting.
- rather than conduct experiments, emphasize the observation of approaches being implemented on the island to determine best practices e.g. in construction or biofuel development or tourism.

LIEM Project ….
learning with global scholars

- Prof. Peter Vitousek – Stanford University, USA
- Prof. Helmut Haberl, Institute of Social Ecology, Alpen-Adria University Klagenfurt, Austria
- Prof. Osamu Saito, Waseda University Institute for Advanced Study, Japan

Mahalo

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