

Lecture 1: Background and Introduction

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Some Background – Definitions of Logistics

The word *logistics* comes from the Greek *logistikos*, which means “skilled in calculating,” and from medieval Latin, where *logisticus* means “of calculation.”

The Random House dictionary defines *logistics* as the branch of military science and operations dealing with the procurement, supply, and maintenance of equipment, the movement of personnel, the provision of facilities, and with related matters.

Some Background – Definitions of Logistics

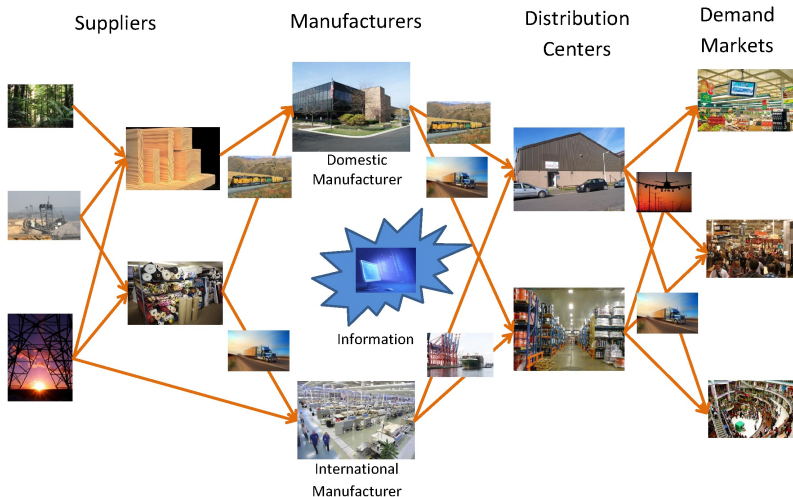
The US Department of Defense (2002) defined *logistics* as the science of planning and carrying out the movement and maintenance of forces ... those aspects of military operations that deal with the design and development, acquisition, storage, movement, distribution, maintenance, evacuation and disposition of material.

**There is an old military saying, which speaks volumes:
Armchair generals talk strategy. Real generals talk logistics.**

Some Background – Definitions of Logistics

To business, *logistics* is defined as the planning framework for the management of material, information, financial, and service flows and includes the increasingly complex material, informational, communication and control systems in today's business environment.

Complex Logistical Network



Supply Chains

In this course, we will use *supply chains* and *logistics* interchangeably.

Supply Chains

According to Nagurney (2006): Supply chains are the **critical infrastructure and backbones** for the production, distribution, and consumption of goods as well as services in our globalized *Network Economy*.

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Today, supply chains may span thousands of miles across the globe, involve numerous suppliers, retailers, and consumers, and be underpinned by multimodal transportation and telecommunication networks.

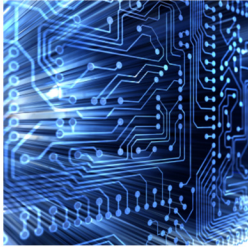
Examples of Commercial Supply Chains

- ▶ food and food products
- ▶ high tech products
- ▶ automotive
- ▶ energy (oil, electric power, etc.)
- ▶ clothing and toys

Food Supply Chains



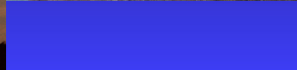
High Tech Products



Automotive Supply Chains



Energy Supply Chains



Clothing and Toys



Humanitarian and Healthcare Supply Chains

In this course, we will be focusing on humanitarian and healthcare supply chains.

Humanitarian Relief Chains



Healthcare Supply Chains



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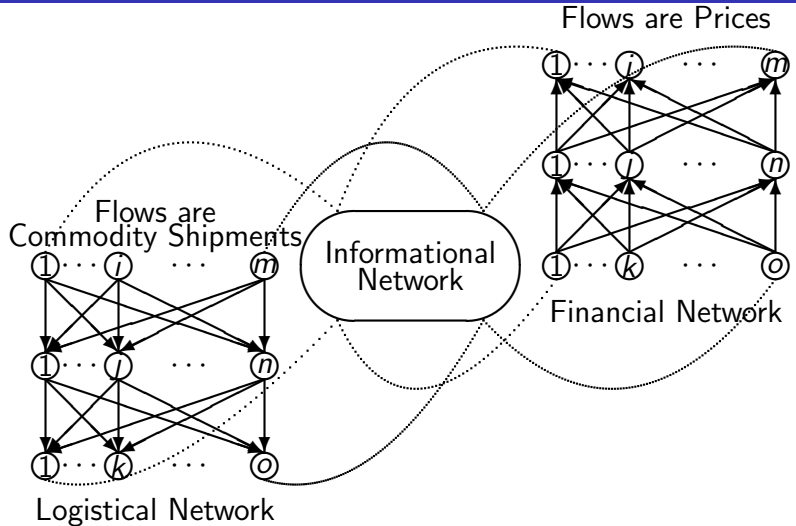
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Indeed, such crucial issues as the stability and resiliency of supply chains, as well as their adaptability and responsiveness to events in **a global environment of increasing risk and uncertainty** can only be rigorously examined from the view of supply chains as network systems.

Multilevel Network Structure of the Supply Chain



A. Nagurney, K. Ke, J. Cruz, K. Hancock, and F. Southworth, 2002. Dynamics of supply chains: A multilevel

(logistical/informational/financial) network perspective, *Environment and Planning B* 29, 795-818.

Characteristics of Supply Chains Today

- ▶ **large-scale nature** and complexity of network topology;
- ▶ **congestion**, which leads to nonlinearities;
- ▶ **alternative behavior of users of the networks**, which may lead to paradoxical phenomena;
- ▶ **possibly conflicting criteria associated with optimization**;
- ▶ **interactions among the underlying networks themselves**, such as the Internet with electric power networks, financial networks, and transportation and logistical networks;
- ▶ recognition of **their fragility and vulnerability**;
- ▶ policies surrounding them may have major impacts not only economically, but also **socially, politically, and security-wise**.

What is Humanitarian Logistics?

The Fritz Institute working with senior logisticians came up with the following definition since there was a clear need: *it is the process of planning, implementing and controlling the efficient, cost-effective flow of and storage of goods and materials as well as related information, from point of origin to point of consumption for the purpose of meeting the end beneficiary's requirements* (Thomas and Mizushima (2005)).

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For humanitarians, logistics consists of the processes and systems involved in mobilizing people, resources, skills and knowledge to help vulnerable people affected by disaster (Van Wassenhove (2006)).

What is Humanitarian Logistics?

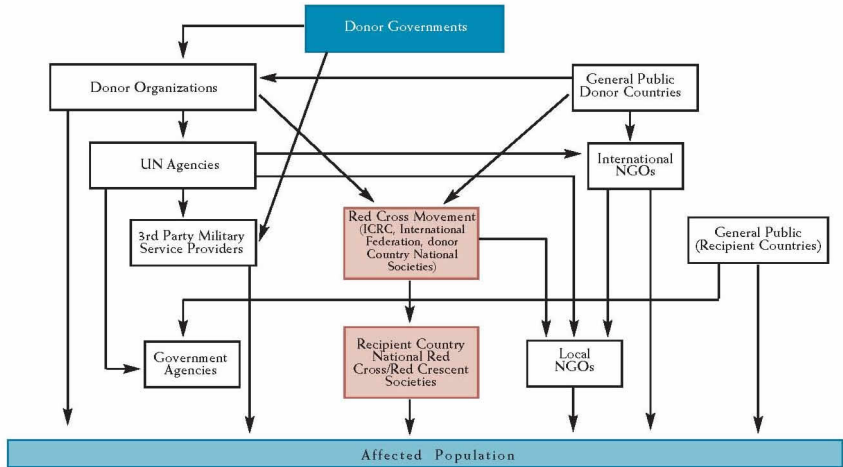
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Moreover, donors, who pledge millions in aid and goods, see the impact of the aid.

Humanitarian Sector Funding Flows



Source: A. Thomas and L. R. Kopczak, 2005. From logistics to supply chain management: The path forward in the humanitarian sector, Fritz Institute. DAC report on the sector.

What is a Disaster?

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- 4). results in calls for international assistance.

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- causes extensive damage or destruction of facilities that provide and sustain human needs; produces an overwhelming demand on state and local response resources and mechanisms;
- causes a severe long-term effect on general economic activity;
- and severely affects state, local, and private-sector capabilities to begin and sustain response activities.

What is a Disaster?

From these definitions, we see that although disasters may have different meanings, depending on the specific domain, they have one thing in common: they have a catastrophic effect on human lives and a region's or even a nation's resources.

Classification of Disasters

	Natural	Man-made
Sudden-onset	Earthquake Hurricane Tornadoes	Terrorist Attack Coup d'Etat Chemical leak
Slow-onset	Famine Drought Poverty	Political Crisis Refugee Crisis

Classification of Disasters

L.N. Van Wassenhove, 2006. Blackett Memorial Lecture: Humanitarian aid logistics: supply chain management in high gear, *Journal of the Operational Research Society* **57**, 475-489.

Examples of Recent Disasters

- The biggest blackout in North America, August 14, 2003;
- The Indonesian tsunami (and earthquake), December 26, 2004;
- Hurricane Katrina, August 23, 2005;
- The Minneapolis I35 Bridge collapse, August 1, 2007;
- The Mediterranean cable destruction, January 30, 2008;
- The Sichuan earthquake on May 12, 2008;
- The Haiti earthquake that struck on January 12, 2010 and the Chilean one on February 27, 2010;
- The triple disaster in Japan on March 11, 2011.

Hurricane Katrina in 2005



Hurricane Katrina has been called an **“American tragedy,”** in which essential services failed completely.

Video and Commentary of Devastation Wreaked by Hurricane Katrina and the Aftermath

URL is <http://www.youtube.com/watch?v=pvoEiBnpCc8>

Click on underlined text:

[Images of Devastation of Hurricane Katrina in August 2005](#)



The Haitian and Chilean Earthquakes



Graphic Video of the Aftermath of the Haiti Earthquake from *The New York Times*

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<http://video.nytimes.com/video/2011/01/09/world/americas/1248069541193/surviving-the-haiti-earthquake.html>

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The Triple Disaster in Japan on March 11, 2011



H1N1 (Swine) Flu

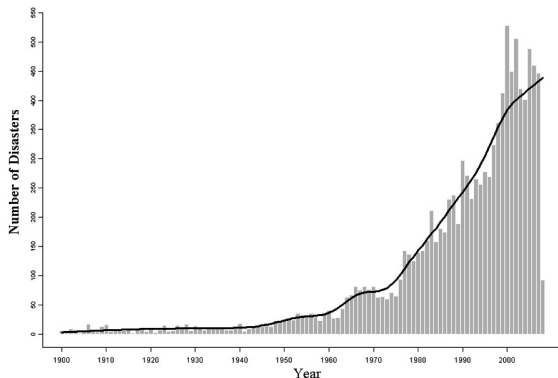
As of May 2, 2010, worldwide, more than **214** countries and overseas territories or communities have reported laboratory confirmed cases of pandemic influenza H1N1 2009, including over **18,001** deaths (www.who.int).

Parts of the globe experienced serious flu vaccine shortages, both seasonal and H1N1 (swine) ones, in late 2009.



The Impact of Disasters

Disasters have brought an unprecedented impact on human lives in the 21st century and the number of disasters is growing. From January to October 2005, **an estimated 97,490 people were killed in disasters globally; 88,117 of them because of natural disasters.**



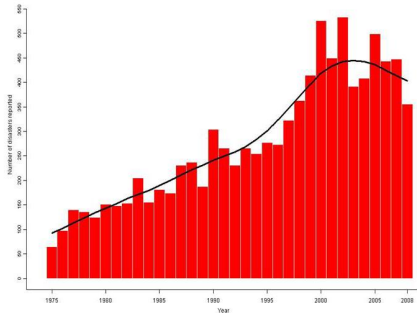
The Impact of Disasters

The number of disasters is increasing globally, as is the number of people affected by disasters. At the same time, with the advent of increasing globalization, viruses are spreading more quickly and creating new challenges for medical and health professionals, researchers, and government officials.

Between 2000 and 2004, the average annual number of disasters was **55%** higher than in the period 1994 through 1999, with **33%** more humans affected in the former period than in the latter (cf. Balcik and Beamon (2008) and Nagurney and Qiang (2009)).

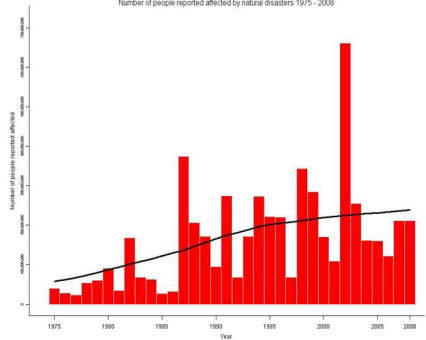
Natural Disasters (1975–2008)

Natural disasters reported 1975–2008



EPH-GAT The GFSC/PHD International Disaster Database - International Institute of Health in London, England - England

Number of people reported affected by natural disasters 1975–2008



EPH-GAT The GFSC/PHD International Disaster Database - International Institute of Health in London, England - England

The Impact of Disasters

Although the average number of disasters has been increasing annually over the past decade **the average percentage of needs met by different sectors in the period 2000 through 2005 identifies significant shortfalls.**

According to Development Initiatives (2006), based on data in the Financial Tracking System of the Office for the Coordination of Humanitarian Affairs, from 2000-2005, **the average needs met by different sectors in the case of disasters were:**

- ▶ 79% by the food sector;
- ▶ 37% of the health needs;
- ▶ 35% of the water and sanitation needs;
- ▶ 28% of the shelter and non-food items, and
- ▶ 24% of the economic recovery and infrastructure needs.

Disaster Response

Disaster response may be at the local/regional, national, or international levels (Van Wassenhove and Pedraza Martinez (2012)).

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Typically, the immediate response to disasters comes from *local* systems. These systems are comprised of governmental agencies NGOs (non-governmental agencies) with local representation, National Societies of Red Cross and Red Crescent with local branches, the army, fire and police departments, and other civil agencies.

Disaster Response

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If the national system does not have the capability/capacity to respond and the affected country approves it, the international system is activated.

Disaster Response

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The response, as a whole, should be led by the national government of the hosting country, with respect for the national sovereignty (Van Wassenhove and Pedraza Martinez (2012)).

Humanitarian Supply Chains

The ultimate humanitarian supply chain has to be able to respond to multiple interventions on a global scale as quickly as possible, and within a short time-frame.

Therefore, such supply chains need to be multiple, global, dynamic and temporary.

L. N. Van Wassenhove, 2006. Blackett Memorial Lecture: Humanitarian aid logistics: supply chain management in high gear, *Journal of the Operational Research Society* **57**, 475-489.

Humanitarian Supply Chains

Due to the enormous impact of disasters, disaster management and humanitarian logistics have become topics that are drawing attention from researchers in various disciplines.

Practitioners and researchers are working more closely together to learn from one another and to push knowledge in this growing and very challenging field forward.

Bellagio Conference on Humanitarian Logistics

Humanitarian Logistics: Networks for Africa



Rockefeller Foundation Bellagio Center Conference, Bellagio, Lake Como, Italy

May 5-9, 2008

**Conference Organizer: Anna Nagurney, John F. Smith Memorial Professor
University of Massachusetts at Amherst**

See: <http://hlogistics.isenberg.umass.edu/>

Humanitarian Supply Chains

In this course, we will be covering the foundations of humanitarian logistics and healthcare supply chains **with a focus not only on qualitative analysis and conceptual studies** but also on **quantitative methods and analytical tools**.

The course will use **both primary and secondary sources** and will also **experienced practitioners** to share their knowledge.

In addition, videos in which experts share the state-of-the-art of supply chain management and humanitarian logistics in times of disasters (and post) will also be viewed.

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