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## The Japan Disaster: Rebuilding Supply Chains

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## Agenda

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- What has happened?
- What will happen?
- What should companies do?

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## What has happened: business impacts?

- Primary impacts – earthquake and tsunami damaged facilities, personnel lost, destroyed communications systems in northern Japan
  - Automotive finished vehicles & parts (esp. engine air flow sensors & engines): Honda, Toyota, Nissan, Mazda
  - High tech: semiconductors, technology (e.g. LCD, silicon wafers, rechargeable batteries, DRAM, NAND, digital cameras): Sony, Hitachi, Shin-Etsu, SUMCO, Toshiba, Nikon, Fujitsu
  - Pharmaceuticals (insulin, penicillin): Novo Nordisk, GSK, Roche
  - Others: Apparel (high tech fibers), Food (soy sauce): Kikoman
  - Some attempting to restart this week
- Secondary impacts – loss of supply from primary impacts causing shutdowns
  - Retailers and downstream customers of those industries currently working off of already lean inventories and starting to see cessation or slowdowns in supply
  - Factories in Japan shuttered to conserve power
  - Unreliable utilities (power, water) continue to impact operations
- Discovery of critical dependence
  - Hitachi engine air flow sensors
  - Renesas drive train microprocessors

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## Business Impacts: Capacity Losses

Company	Product	Core Capacity Loss (Failure mode)	Brief Impact
Apple	iPad 2	Expect loss of supply	Key component suppliers shutdown (NAND flash memory, touch screens, iPad batteries)
Freescale	Accelerometers, pressure sensors and other chips	Loss of internal capacity	Plant in Sendai shutdown, shifting production to other facilities
GM	Automobiles	Loss of supply	US plant closed because lack of supply of engine air flow sensors
Hitachi	Engine air flow sensor	Loss of internal capacity	Plant damaged
Honda	Finished vehicles, auto components	Loss of supply	Dependent on 10 suppliers located in radiation zone; Closed 3 component & 2 assembly plants; expect to lose 16,500 units; lost contact with 44 of 113 suppliers
Kikoman	Soy sauce, seaweed, wasabi	Loss of internal capacity	Impacting buyers in Isreal which purchases 85% of soy sauce supply from Kikoman
Mazda	Finished vehicles, auto components	Loss of supply	Plants closed, some to be closed until April
Nikon	SLR cameras	Loss of internal capacity	Plant closed; only plant making SLR cameras
Nissan	Finished vehicles, engines	Loss of internal capacity, loss of supply	Facility closed; lack water, electricity and gas to operate. Considering sending engines from Tennessee plant to Japan
ON Semiconductor	Semiconductors	Potential loss of internal operations	Temporary shutdown expected at several facilities
Ports in Japan	Various	Loss of supply	Est cost of port closures \$3.4B
Powerchip Tech.	DRAM	Loss of supply	Redesigning product to use available supply
Renesas	Drive train microprocessor	Loss of internal capacity (clean room)	Facility closed; many auto companies dependent on this product
Shin-Etsu Chemical	Silicon wafers	Loss of internal capacity	World's largest maker of silicon wafers disrupted; 57% of world's wafers come from Japan
Sony	Rechargeable batteries, DVD, Blu-ray discs, lasers	Loss of internal capacity	Closed 10 factories
Toyota	Finished vehicles; Yaris, Scion xB and Scion xD, Pruis V	Loss of supply parts, Loss of internal capacity	Shutdowns across all TMC plants. Expected loss of 140,000 <sup>4</sup> units, Pruis only made in Japan.

## What has happened: company response?

- Company response
  - Emergency Response Centers (ERC) activated
  - Business Continuity Plans (BCP) exercised
  - “Broken field running”
    - Day-by-day adjustments of plans dependent on facility, supply and utility availability
    - Shifting operations outside of affected area
    - Resupply from non-traditional sources (internal & external)
  - Those without ERCs and contingency plans (or enough contingency) are searching for back-up options
    - Searching after a disruption is not the best time to be setting up back-up options

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## Japan: contrast with recent disasters

New Zealand Earthquake Feb 2011  
 Haiti Earthquake Jan 2010  
 Gulf Oil Spill Summer 2010  
 Australian Floods Dec 2010  
 Iceland Volcano Mar-Apr 2010  
 Landslide in Peru Jan 2010  
 Chile Earthquake & Tsunami Feb 2010  
 Russian Wildfires Jul 2010  
 Hurricane Earl Aug 2010  
 Pakistan Floods July 2010  
 Hungary Toxic Spill Oct 2010  
 Haiti Cholera Outbreak Oct 2010  
 Indonesia Volcano & Tsunami Oct 2010  
 Guatemala Sinkhole may 2010  
 US East Coast Blizzard Feb 2010

Japan is a

- Major supplier region
- Major consumer region

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## Japan as a consumer of the world

- Top 10 imports into Japan from the US\*
1. Civilian aircraft including parts
  2. Yellow corn
  3. Soybeans
  4. Artificial human body parts and related accessories
  5. Fresh or chilled pork, unprocessed ...
  6. Medications for retail sale
  7. Frozen pork, unprocessed
  8. Silicon
  9. Wheat
  10. Semiconductor manufacturing machines

Supply Chain Disruptions in the rest of the world:  
- Lack of demand parts causes production to slow down or stop

\*Source: Daniel Workman based on Sources: *This analysis presents independent calculations and insights based on the United States International Trade Commission's Interactive Tariff and Trade [Dataweb](#). This is a publicly available, interactive database for international trade queries.*

Also - Japan is one of the world's largest importers of Luxury goods ( apparel, shoes, accessories, jewelry, etc.)

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## What has happened: indirect impacts?

**Price of Oil** – reduced demand by Japan lowers the price for the rest of the world (masked somewhat by the fighting in Libya)

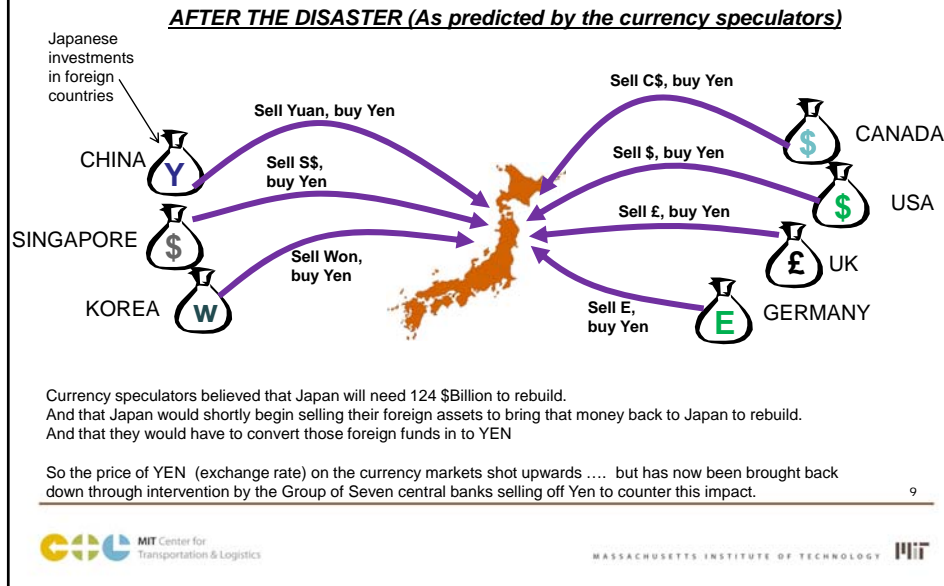
**Price of electricity** -- likely immediate increase in Japan will make production costs higher for energy intensive products from basic industries. Long term big global impact as it will be much harder to re-license existing nuclear power plants, become much harder to build new ones, and costly to retrofit old ones based on the learning from Japan.

**Toyota and Honda** – there are intense capacity planning talks going on right now as they are both ramping up production at their US plants for export to other countries. They are beginning to promote the vehicles that they make outside of Japan for export to world markets. Both are activating suppliers in the US, asking US suppliers to resurrect recent quotes on parts that they bid on up to 4 years ago. They are asking "How fast can you get up an running on these parts?"

**Currency Exchange rates** – currency speculators drove up the price of the Yen in anticipation of Japanese businesses needing to sell of foreign assets to bring those funds home to pay for the reconstruction – this was thwarted by the intervention of the Group of Seven (sold off Yen to bring down the price)

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## What has happened: the Yen?



## What will happen?

- Unanticipated disruptions in the coming weeks/months in downstream supply chains
  - Not limited to automotive & high tech industries
- Likely material hoarding
- Expect some costs to increase (electricity)
- Growth opportunities
  - For those firms that fill the void left by lost capacity
- Resilience and risk management will matter to many
  - But only for a little while
  - Longer term only a subset will take action
  - Will your company take action now to prepare for the next disruption?
- Wisdom of JIT & Lean practices will be challenged
  - But the advantages are so high and downsides can be mitigated

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## What should companies do: now?

- Use your business continuity plans!
- Contact your suppliers
  - How are they being affected?
  - How are their suppliers being affected?
  - Understand the details of exposure: Trust but verify (material availability)
  - Specifically: look for dependence on suppliers of LCD materials, silicon wafers, and those who use those materials; check your suppliers' suppliers
  - There will be surprises....
- Contact your customers
  - Do they expect their demand to fall off?
  - What is their dependency on demand from Japan?
  - What is their dependency on supply in Japan?
  - Grow! What material supply voids can your company fill?

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## What should companies do: near term?

- Seize the moment: get senior exec support for risk mgmt action
- Develop back-up plans
  - 'Business continuity plans' (BCP) focused on restoring lost capacities
  - Failure mode focus (the limited set of core capacities)
- Identify full supply chain network (Tier 1, 2, 3, etc.) & risks
  - Who are my suppliers?
  - Assess geographical risk (Are my suppliers all located in the same geo?)
  - Assess organizational risk (Are we sole sourced?)
  - Assess embedded risk (Are my various suppliers all dependent on a common material source?)
- What are the probabilities & consequences of loss
  - Reduce probability of disruption through preventative measures
  - Reduce consequences through mitigation measures: resilience
  - Choose balanced mix of redundancy & flexibility

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## Supply Chain Failure Modes/Core Capacities

All disruptions result in one or more of these capacity losses for a period of time:

- Capacity to acquire materials (supply)
- Capacity to ship/transport
- Capacity to communicate
- Capacity to convert (internal operations)
- Availability of human resources (personnel)
- Financial flows (e.g. demand)

## Resilience Through Flexibility & Redundancy

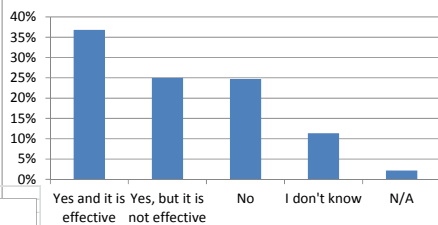
- Flexibility
  - Requires prior investments in infrastructure & capabilities
  - E.g. contingent/reconfigurable capacity, multi-skilled workers
  - Flexibility through interchangeability
    - Standard facilities (Intel, GM), Standard parts (Dell, Lucent SCN, Southwest Airlines), Standard processes (Helix, UPS)
  - Flexibility through postponement (Benetton, H-P)
  - Flexibility through supply (Jabil, Lucent, Toyota)
  - Flexibility through distribution (Caterpillar, Dell)
  - Flexibility through flexible culture
    - Awareness of risks & tradeoffs, distributed decision-making (P&G, UPS), open and unconstrained communication (Dell)
- Redundancy
  - Requires prior investment in capacity that may not be used
  - E.g. Inventory & Excess capacity

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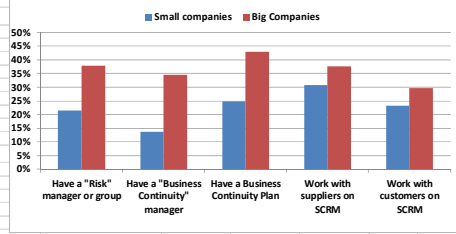
## What should companies do now?

Implement their Business Continuity Plan !

We have a Business Continuity Plan



Supply Chain Risk Management Practices

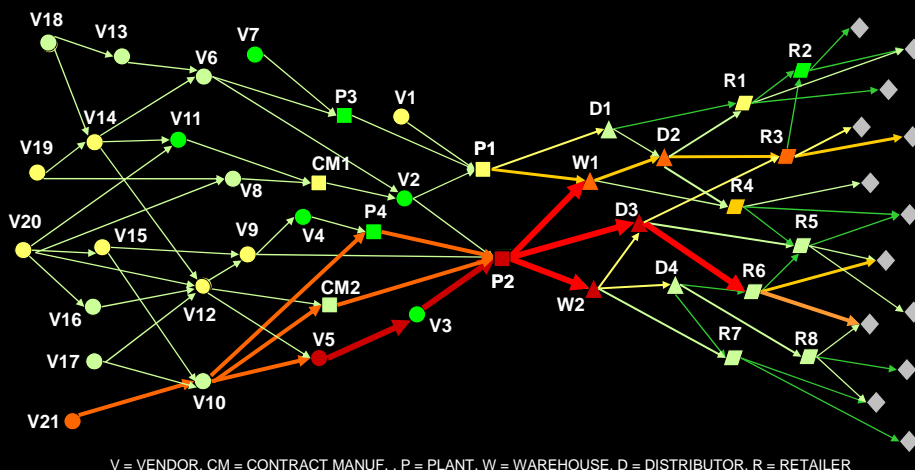


Use the crisis to further SC Risk Management in your company --- while you still have Management's attention.

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## MIT Project to show the Network Impacts of SC Disruptions

HI-Viz Supply Chain Project





## Understand network dependencies



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- THANK YOU
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