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Managing Next Generation Risks to Urban Resilience:

Tools, Governance, Behaviors & Skills

NRC's Roundtable on Science & Technology for Sustainability

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World Environment Center

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Washington, D.C.

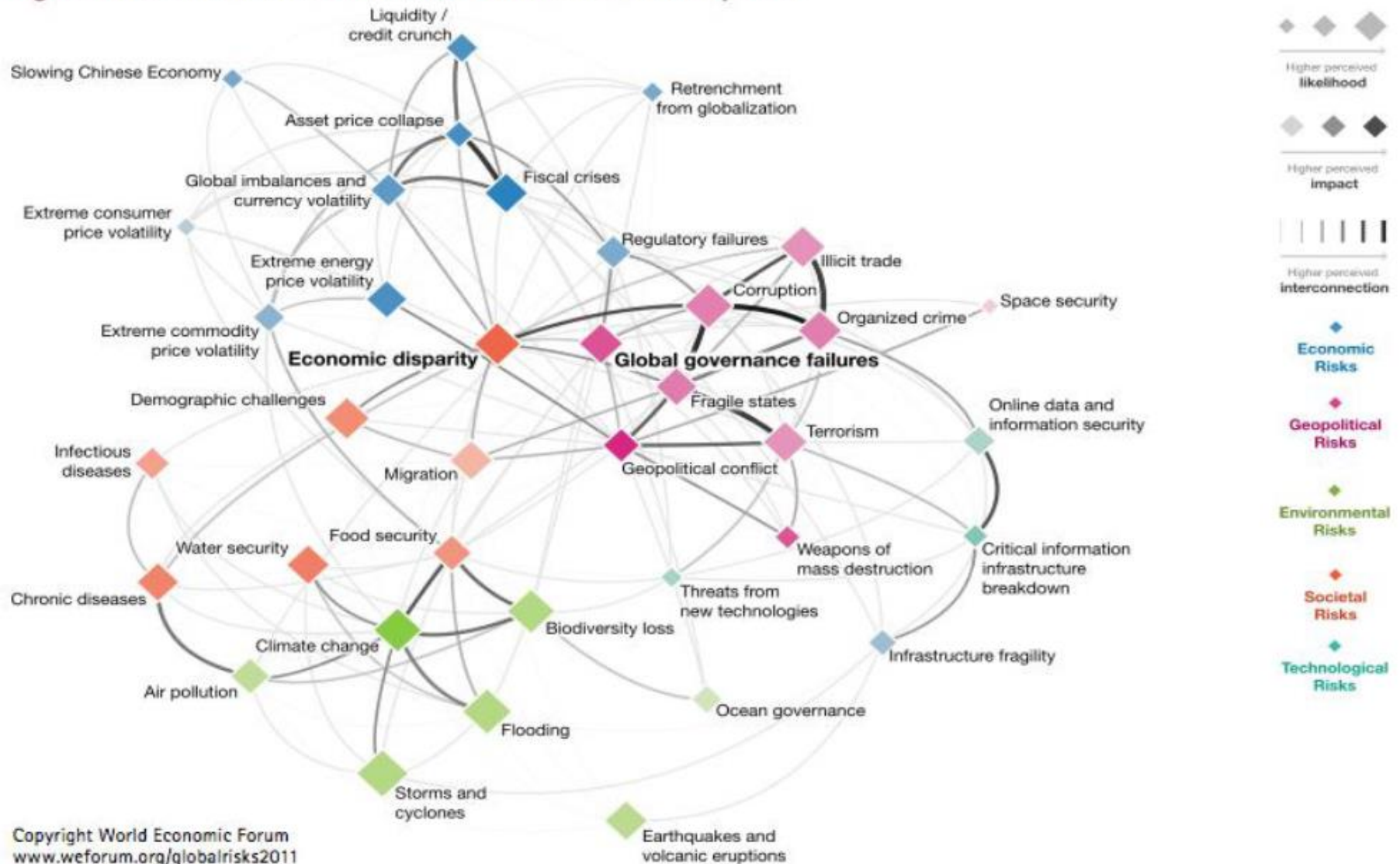
Today's discussion

- Risk—the changing context
- Emerging tools
- Evolving governance approaches
- Behavioral and skills challenges
- Implications for public policy and education
- Some questions for social and decision sciences



The Risk Context: Everything's Connected

Figure 1: World Economic Forum: Risks Interconnection Map 2011





Emergence of New Tools and Methods for Identifying and Assessing Risks

End-to-end Traceability for a System Level View

Reporting & Analytics

- ✓ End-to-end Traceability
- ✓ Inventory Visibility
- ✓ Temperature Tracking

Business Benefits

- ✓ Targeted Recall
- ✓ Reduced Spoilage and Waste
- ✓ Increased Consumer Safety

Event Time	Category	Resource Location	Resource	Resource Type	Disposition
Mar 15, 2018 7:03:37 PM	Manufacturer 1	San Diego - P/W Plant	Compressing 1	Compressing	Active
Mar 15, 2018 10:03:37 PM	Manufacturer 1	San Diego - P/W Plant	Storage 2	Storage	Active - In Storage
Mar 15, 2018 10:48:41 PM	Manufacturer 1	San Diego - P/W Plant	Knocking	Knocking	In Progress
Mar 24, 2018 10:12:18 PM	Manufacturer 1	San Diego - A/W Plant	Shipping Deck Over 2	Shipping	In Transit
Mar 27, 2018 5:11:17 PM	Manufacturer 1	San Jose - A/W DC	Shipping Deck Over 1	Receiving	In Progress
Mar 30, 2018 9:51:15 PM	Manufacturer 1	San Jose - A/W DC	Storage 2	Storage	Active - In Storage
Apr 7, 2018 4:30:40 PM	Manufacturer 1	San Jose - A/W DC	Shipping Deck Over 1	Shipping	In Transit
Apr 9, 2018 7:30:07 PM	Manufacturer 1	San Jose - A/W DC	Knocking	Knocking	In Progress
Apr 12, 2018 6:30:28 PM	Distribution Center 1	Pemex A/W DC	Knocking	Knocking	In Progress
Apr 12, 2018 10:00:23 PM	Distribution Center 1	Pemex A/W DC	Shipping	Shipping	In Transit
Apr 15, 2018 12:08:15 PM	Manufacturer 1	Austin A/W DC	Shipping Deck Over 2	Receiving	Active - In Storage
Apr 16, 2018 06:00:23 PM	Manufacturer 1	Austin A/W DC	Controlled Substance Storage	Storage	Active - In Storage
Apr 23, 2018 12:03:47 PM	Manufacturer 1	Austin A/W DC	Knocking	Knocking	In Progress
Apr 23, 2018 7:45:11 PM	Manufacturer 1	Austin A/W DC	Shipping Deck Over 1	Shipping	In Transit



TRUSTED INFORMATION



Genomics/ Breeding

Corn Farmer

Cattle Farmer

Feedlot

Beef Packer/ Processor

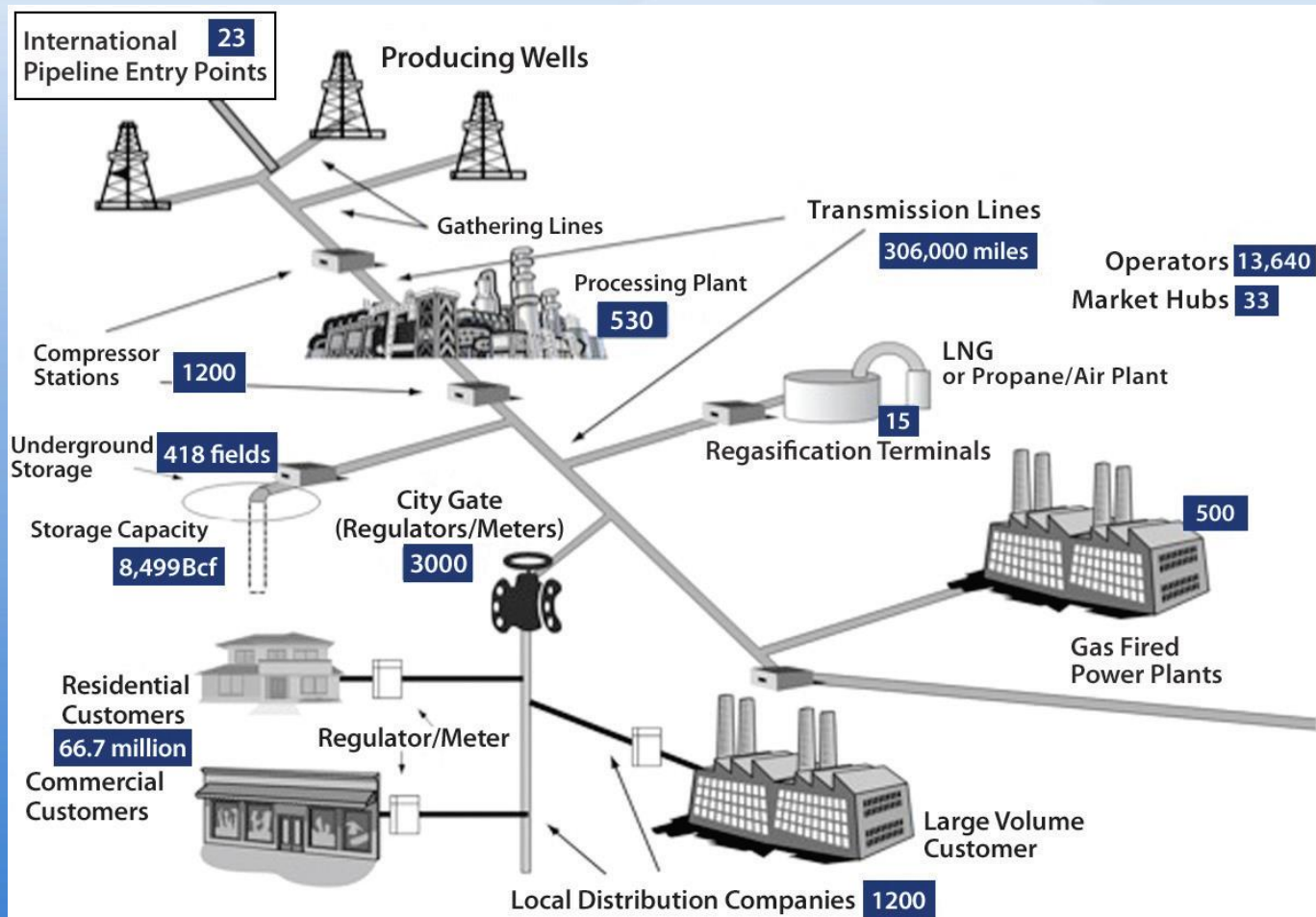
CP
Manufacturer

Distribution/ Export

Retailer/
Restaurant

Source: IBM/WEC Innovations for Environmental Sustainability Council, Feb. 2012 presentation, Orlando, FL

Value Chain Analysis: Natural Gas





Examples of Emerging Resilience Strategies from the Public and Private Sectors

Risk Profiles

- Summarize risk to Sea Level Rise for asset managers
- Provides information to inform most appropriate adaptation strategies
- Includes data on:
 - ‘vital characteristics’ of the physical and operational functionality
 - Sensitivity
 - Exposure to SLR (depth of inundation at 6 different scenarios)
 - Vulnerability and risk rating

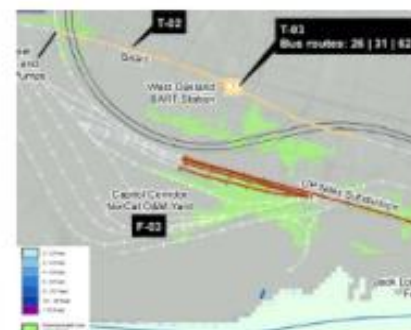
Asset Risk Profile

West Oakland BART Station (T-03)

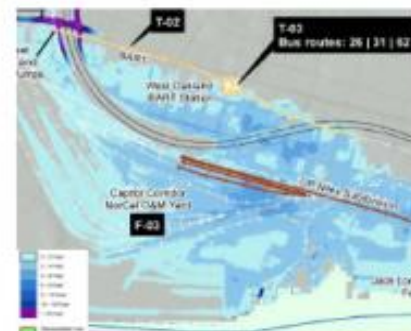
Asset Location / Jurisdiction Oakland / BART	
Summary West Oakland BART Station is a transit facility serving West Oakland neighborhoods and includes bus transfer and parking facilities. Due to lack of data, this asset was not rated with respect to sensitivity. Exposure is rated low, due to inundation under only 100-year SWEL + wind/waves for both the 16" and 55" SLR scenarios. No adequate alternative station exists for West Oakland BART Station, resulting in a medium vulnerability rating. Consequence is rated high for capital improvement costs, commuter use, and socioeconomic impact; moderate for time to rebuild; and low for public safety and goods movement, which does not apply. The overall consequence rating for this asset is 3.33, making this a medium-risk asset.	
Characteristics: <ul style="list-style-type: none"> • Elevated • Commuter route • Transit routes [4 BART lines: AC Transit: 26, 31, 62] 	

Sensitivity	
Data unavailable in project timeframe.	
Annual O&M	\$3.43 million
Liquefaction Susceptibility	Medium
Exposure: Low	
Maximum Inundation Depths	
16" + MHHW	0 ft
16" + 100-yr SWEL	0 ft
16" + 100-yr SWEL + wind waves	YES
55" + MHHW	0 ft
55" + 100-yr SWEL	0 ft*
55" + 100-yr SWEL + wind waves	YES
Inadequate Adaptive Capacity (16" SLR): High No adequate alternative station	
Vulnerability Rating (mid century): Medium	

* The BART station is elevated, hence no inundation at the 55" + 100-yr SWEL scenario, although access to the station will be impacted



Projected Inundation with 16 inch SLR + 100-yr SWEL



Projected Inundation with 55 inch SLR + 100-yr SWEL

Ingersoll Rand's Resilient Buildings Program

Example: High Temperatures Affect Hospital Operations



Situation:

- A hospital loses air conditioning with heat index topping 105 F in Virginia
- No cooling contingency plan in place and valuable time is lost determining what to do next

Solution:

- Trane brought on board as lead repair contractor
- 60 technicians work around the clock to bring the systems on line within 48 hours
- 5,200 tons of temporary cooling is commissioned within 24 hours

































Evolving Collaboration and Governance Approaches

Unilever's Governance Challenge

OUR FOOTPRINT



From Partnerships to Collaborative Governance: WWF

beef	cocoa	coffee	palm oil	sugar	soy	cotton	shrimp	whitefish
								
								
								
								
								
								
								
								
								

Behavior and Skills' Challenges



Implications for Regulatory Policy

- Policy should embody a “system-level understanding” to effectively assess and manage risks
- Need for integrated tools and methods—improved economic valuation, risk assessment/life cycle analysis
- Transition to regulation of value chains
- Achieve market scale in policy frameworks
- New skills and competencies required

What Skills Should Business and Engineering Schools Teach?

- Expertise in one or more business fundamentals: finance, marketing operations or science
- Understanding of customer needs/standards and legal requirements
- Ability to integrate sustainability into core business processes—sourcing of materials, supply chain management, manufacturing, logistics and distribution, post-consumer materials management
- Ability to work in teams with different skills/ cultures/ geographies
- Knowing how to manage complexity and disruption

How Can Universities Adapt to New Realities?

Models of business-university collaboration

- Consortium model—businesses and universities work to solve single problems
- Apprenticeship model—prominent in Europe, transported to US and other countries
- Network model—multiple businesses and universities work to share learning on many issues using many learning platforms

Universities must collaborate on a greater scale

Some Questions for Social & Decision Sciences

- What new business models should be developed to account for new sources of business risk and disruption?
- What new tools and methodologies need to be developed to manage simultaneous local/regional/global scale risks?
- How can regulatory agencies learn to adapt to the world of interconnected risks?
- What information and strategies are most persuasive to convince consumers to adopt more sustainable behaviors?
- How can collaboration skills and strategies be effectively learned and applied in universities, businesses and government bodies?



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Thank you

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