

YUMA Pacific AIHA

Risk Concepts

Michael Larrañaga, CIH, CSP, PE, PhD

ENVIRON International Corporation



Benjamin Lee Whorf

The commonly held belief that the cognitive process of all human beings possesses a common logical structure which operates prior to and independent of communication through language is erroneous.

Whorf

Linguistic patterns determine what the individual perceives about the world... and therefore, what the individual thinks about the world. Since these patterns vary widely, modes of thinking and perceiving in those utilizing different linguistic systems results in different world views.

Whorf

We are thus introduced to a new principle of relativity which holds that all observers are not led by the same physical evidence to the same physical picture of the universe...unless their linguistic backgrounds are similar.

Whorf

We cut up and organize the spread and flow of events because, through our mother tongue, we are parties of an agreement to do so, not because nature itself is segmented in exactly what way for all to see.

Eskimo Words to Describe Snow

Powder	Partially melted	Snow bricks
Crusted	Slush	Marked by wolves
Drifting	Accumulating	Marked by Eskimos
Still	Snow vapor	Small flakes
Large wet flake	Ordinary	Sparkling
Melted and refrozen	Blinding	Melting
Blowing	Night snow	Death drift
Packed	Snow at dawn	Burning snow

Indo-European (this is us)

- Indo-European languages emphasize time.
 - Past, present, future
 - Keeping of records, mathematics, chronology
 - Time as used in physics
 - Interest in the past - archaeology

Hopi and Nootka (Vancouver Island)

- Distinction between past, present, and future does not exist.
- There are no distinction between tenses, but only an intonation of fact, memory, expectation or custom
- Timelessness – time is not a concept understood



Be Rational

i

Get Real

π

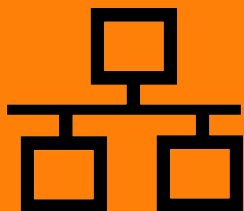
sight

touch

hearing
smell

taste

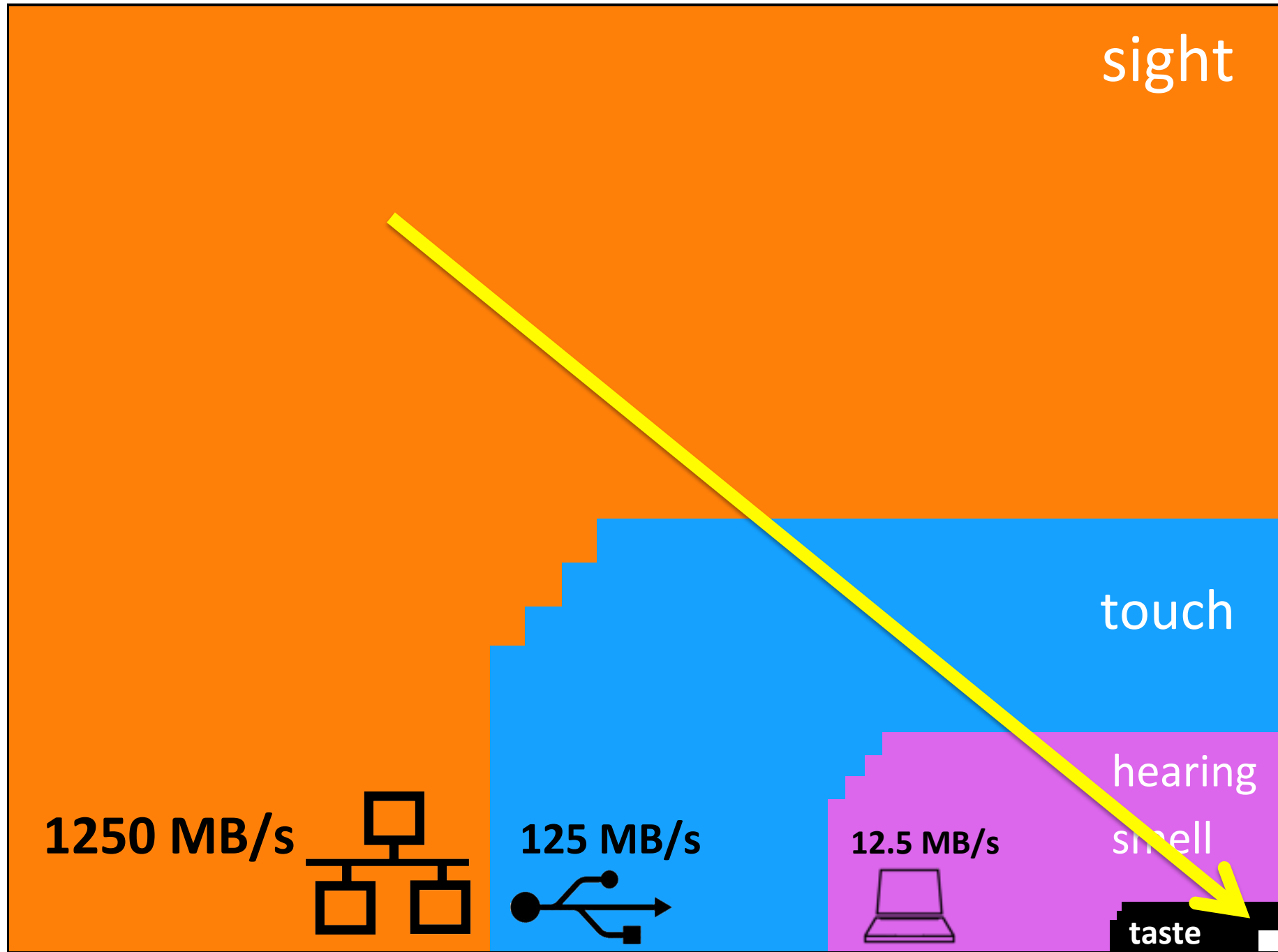
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12.5 MB/s



Awareness Test



What is Risk

1 in a Million

1 in 10 Million

Six Sigma

10 Sigma

6%

Once in 100 years

Probability and Risk

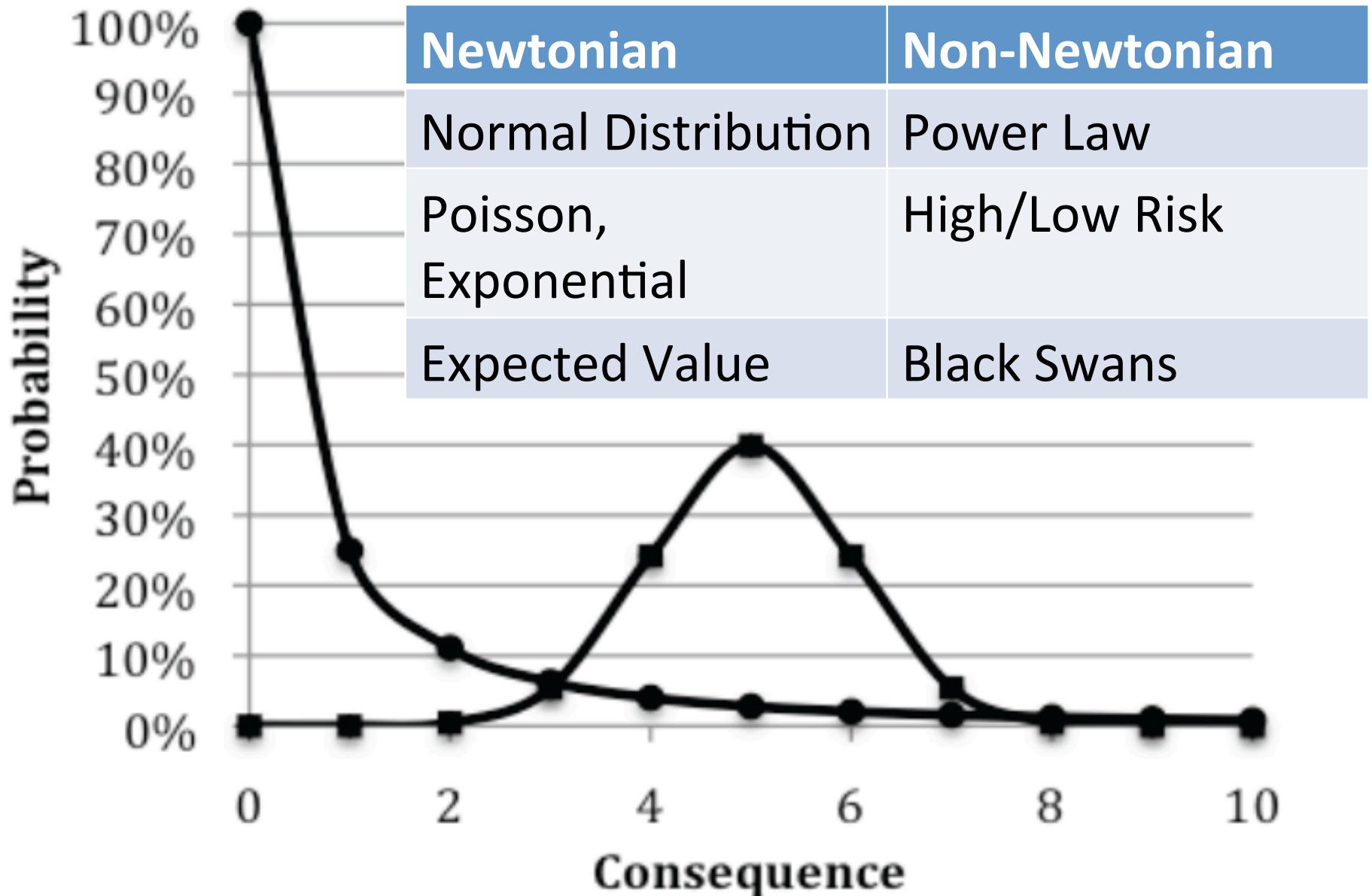
- This year, at least one of your family members will develop one of the most deadly diseases known to man.

Probability and Risk

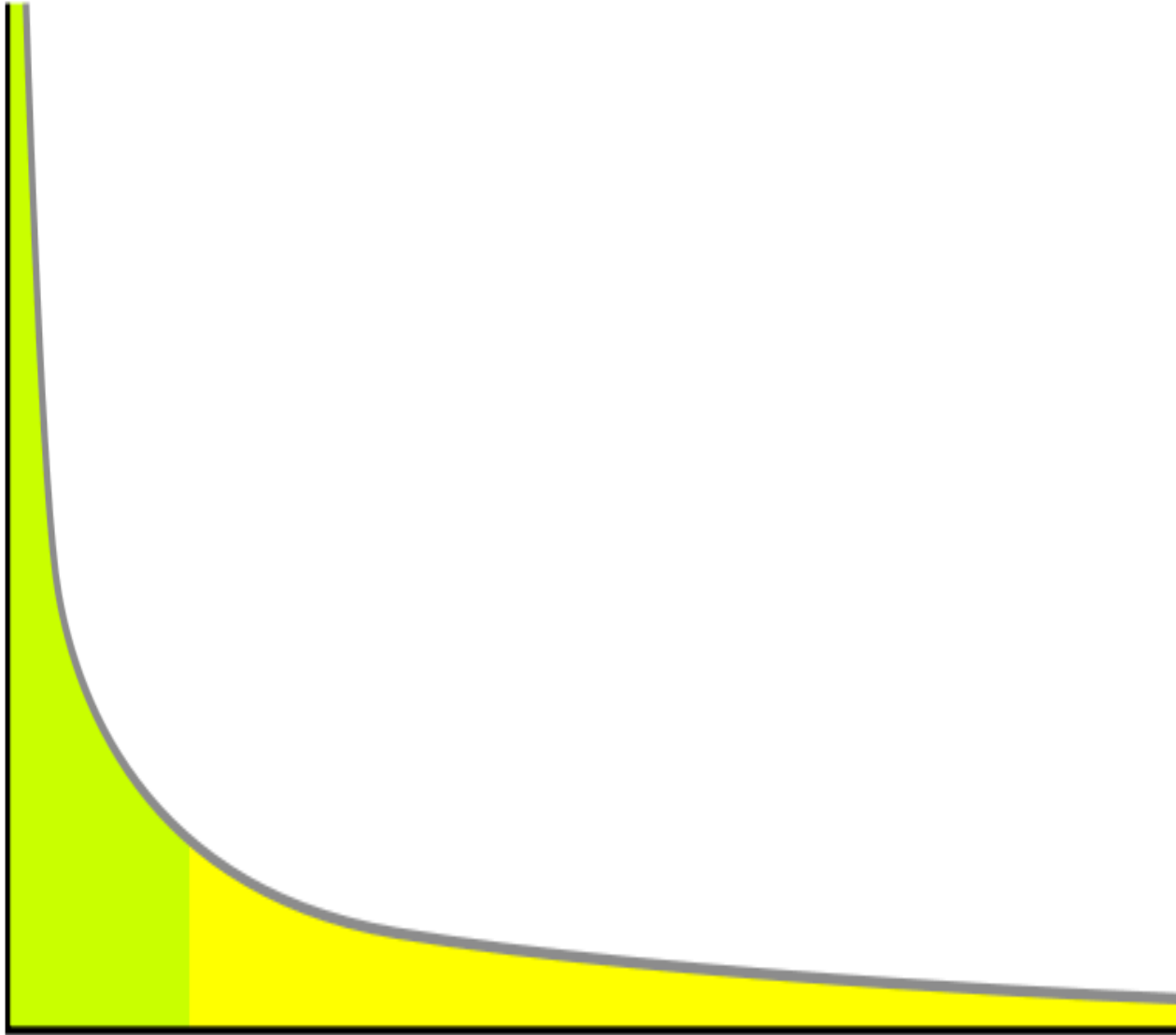
- This year, at least one of your family members will develop the flu.

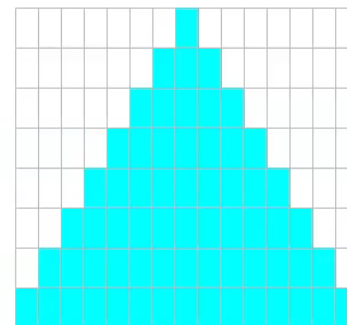
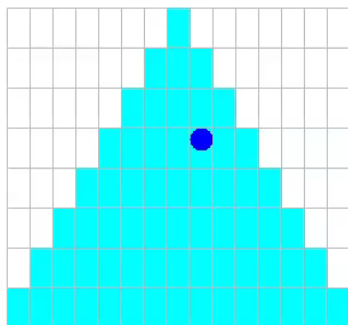
Risk Score Calculation			Risk Score	Risk Level
Probability (P)	Frequency (F)	Severity (S)	P x F x S	
0.5 Only Remotely Possible	1 Very Rare	1 Near Miss	0 to 12	I
1 Very Unlikely	1.5 Rare	3 Minor	13 to 84	II
2 Unlikely	2 Unusual	7 Moderate	85 to 160	III
4 Unusual But Possible	3 Occasional	15 Serious	161-600	IV
6 Quite Possible	4 Daily	40 Severe	601 to 1600	V
8 Very Likely	6 Repetitive	100 Catastrophic	1601 to 4800	VI

Bell Curve, Power Law vs. Consequence



Earthquake magnitude distribution showing a power-law behavior over 6 decades.





Newtonian

Equi-likely events

Regression to mean

Vanishing extremes

Non-Newtonian

Lop-sided events

No mean value

Non-zero extremes

Inputs:

Self-Organization

0 10 20 30 40 50 60 70 80 90 100

Speed

0 10 20 30 40 50 60 70 80 90 100

Select Display Options:

☐ Show probability density function

☐ Show exceedence probability histogram

Simulate

Stop

Reset

Inputs:

Self-Organization

0 10 20 30 40 50 60 70 80 90 100

Speed

0 10 20 30 40 50 60 70 80 90 100

Select Display Options:

☐ Show probability density function

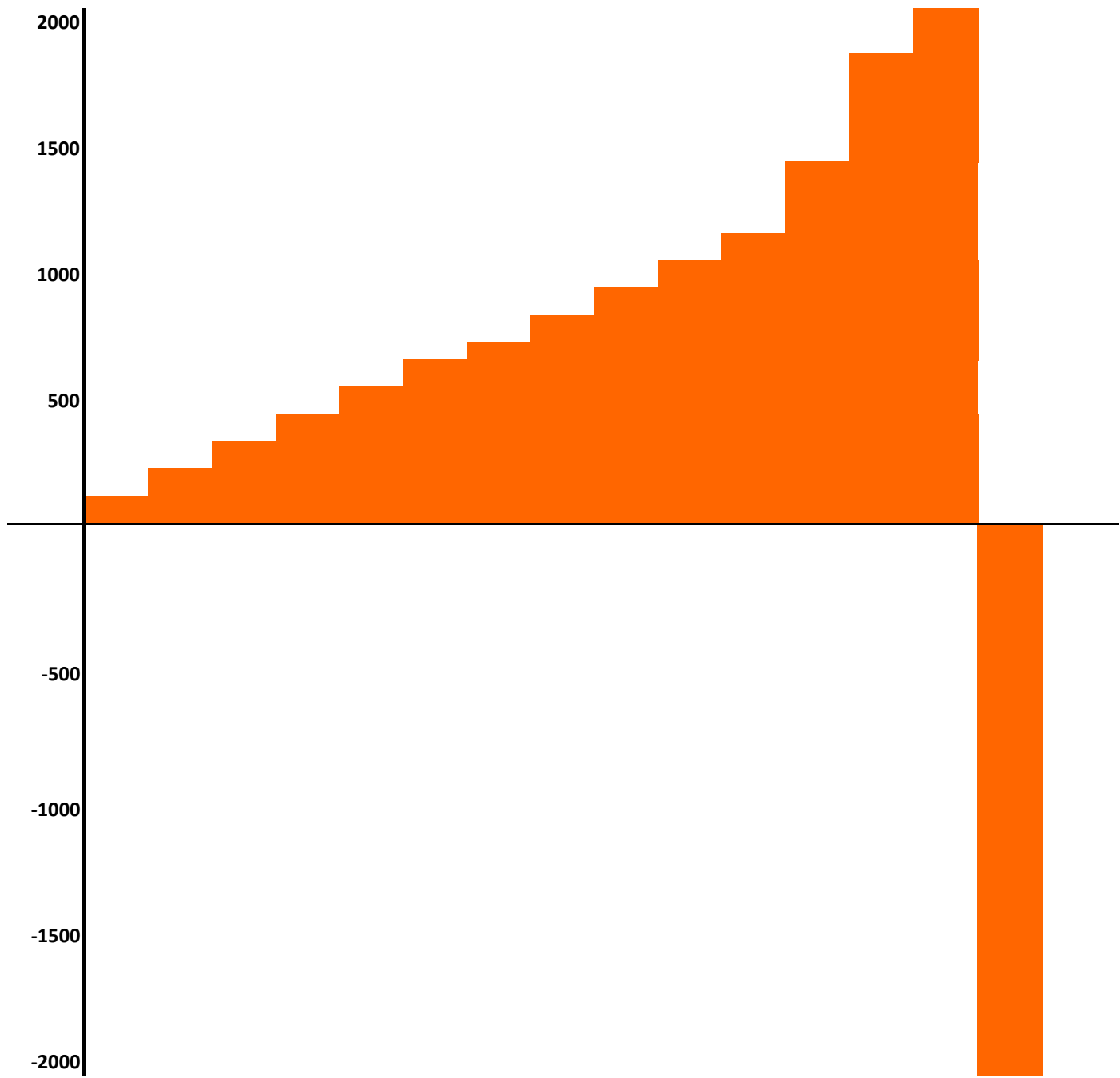
☐ Show exceedence probability histogram

Simulate

Run

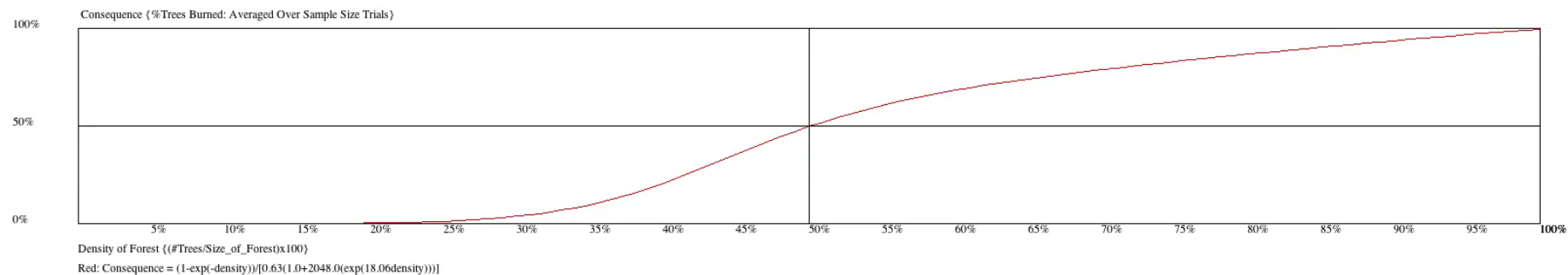
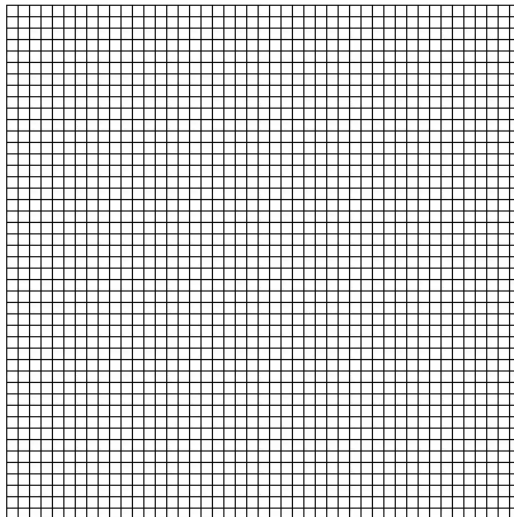
Reset





Size of Forest = 2048 Ignite probability% = 100.0 Sample Size = 50 Sample Interval = 20 Strike Interval/#Percolated = 25 Max. Catastrophe% = 1.0 Speed

Medium Reset: 0 Trees in forest.
#Trees = 0



Display

☐ Show EP ☐ Show Time EP ☒ Show Consequence

☐ Show Log(EP) ☐ Show Distance EP ☐ No Display

Simulate

Percolate Exceedence

Clear Consequence

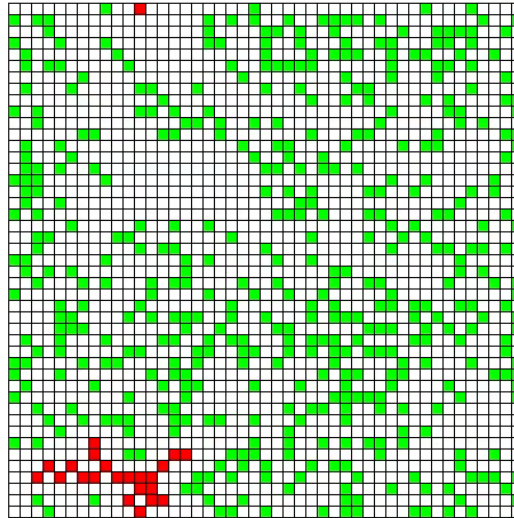
Reset

Forest Fires Simulation 4.2

Size of Forest = 2048 Ignite probability% = 100.0 Sample Size = 50 Sample Interval = 20 Strike Interval/#Percolated = 25 Max. Catastrophe% = 1.0 Speed

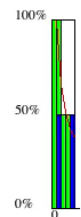
Fast Exceedence Probability....

#Trees = 470



EP: Catastrophe Threshold $\geq 1.0\%$ Collapse , Ignite Probability = 100.0%

Red = Power Law , Blue = Frequency , Green = EP



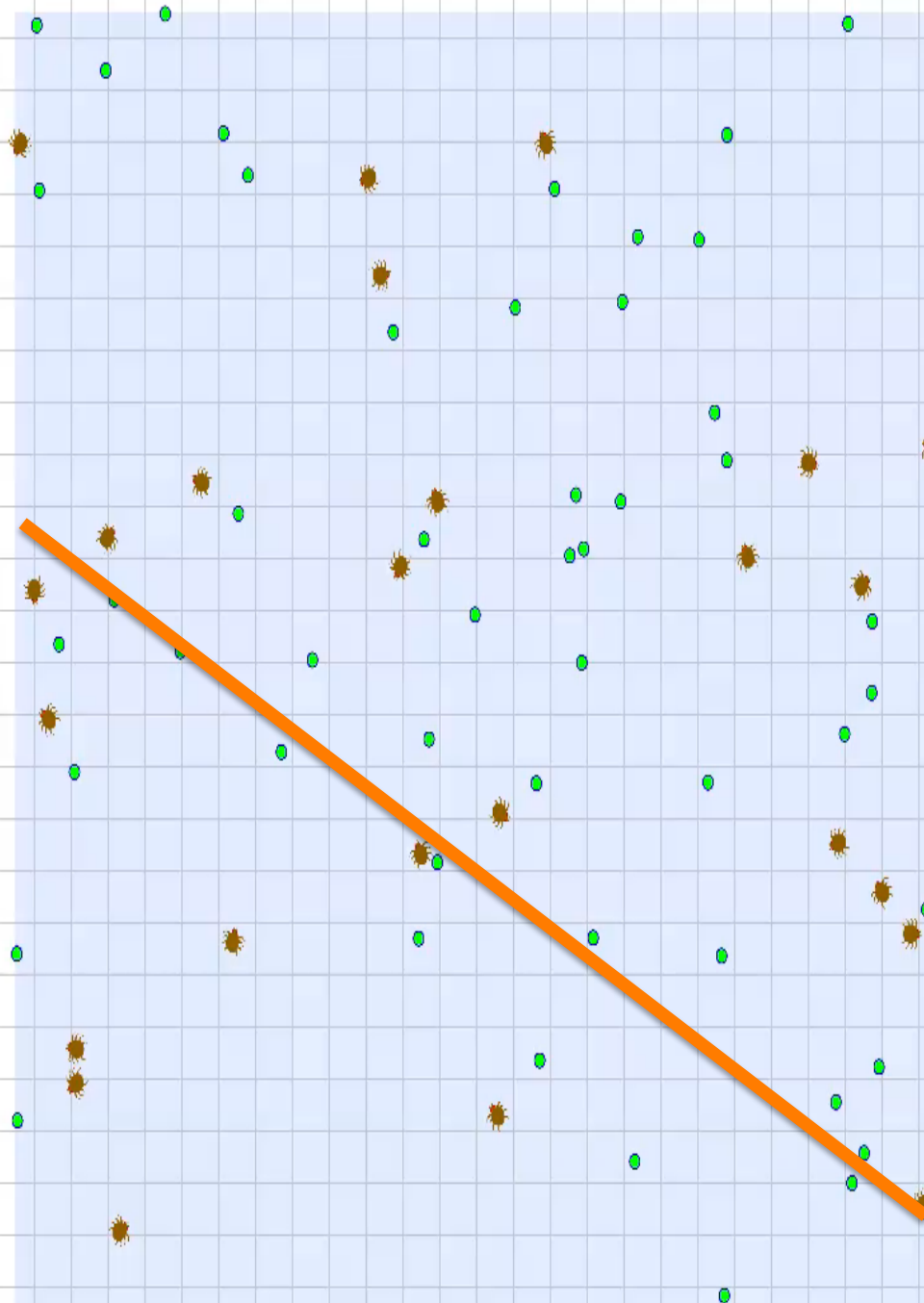
EP Power Law Exponent = 0.61

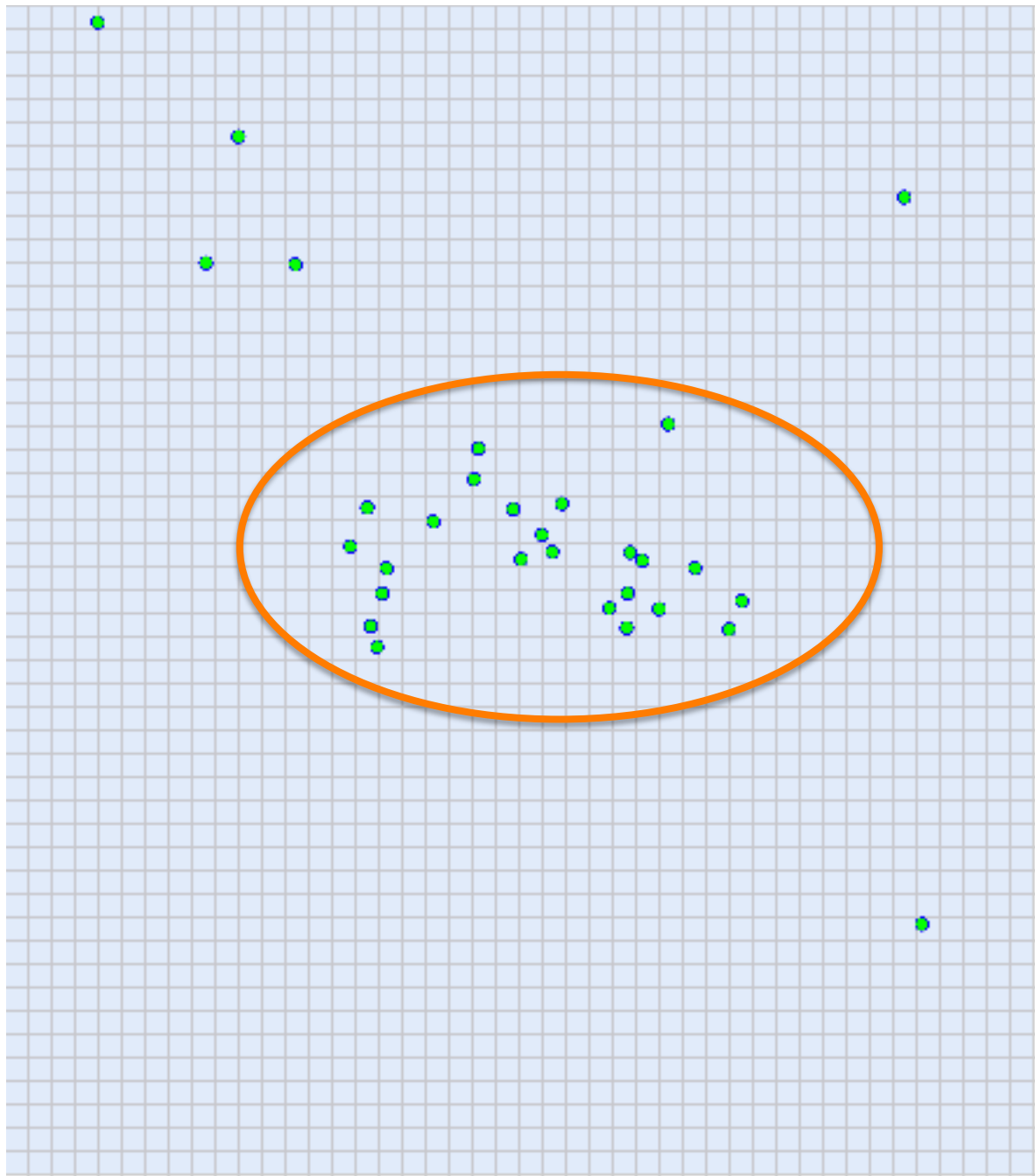
Display

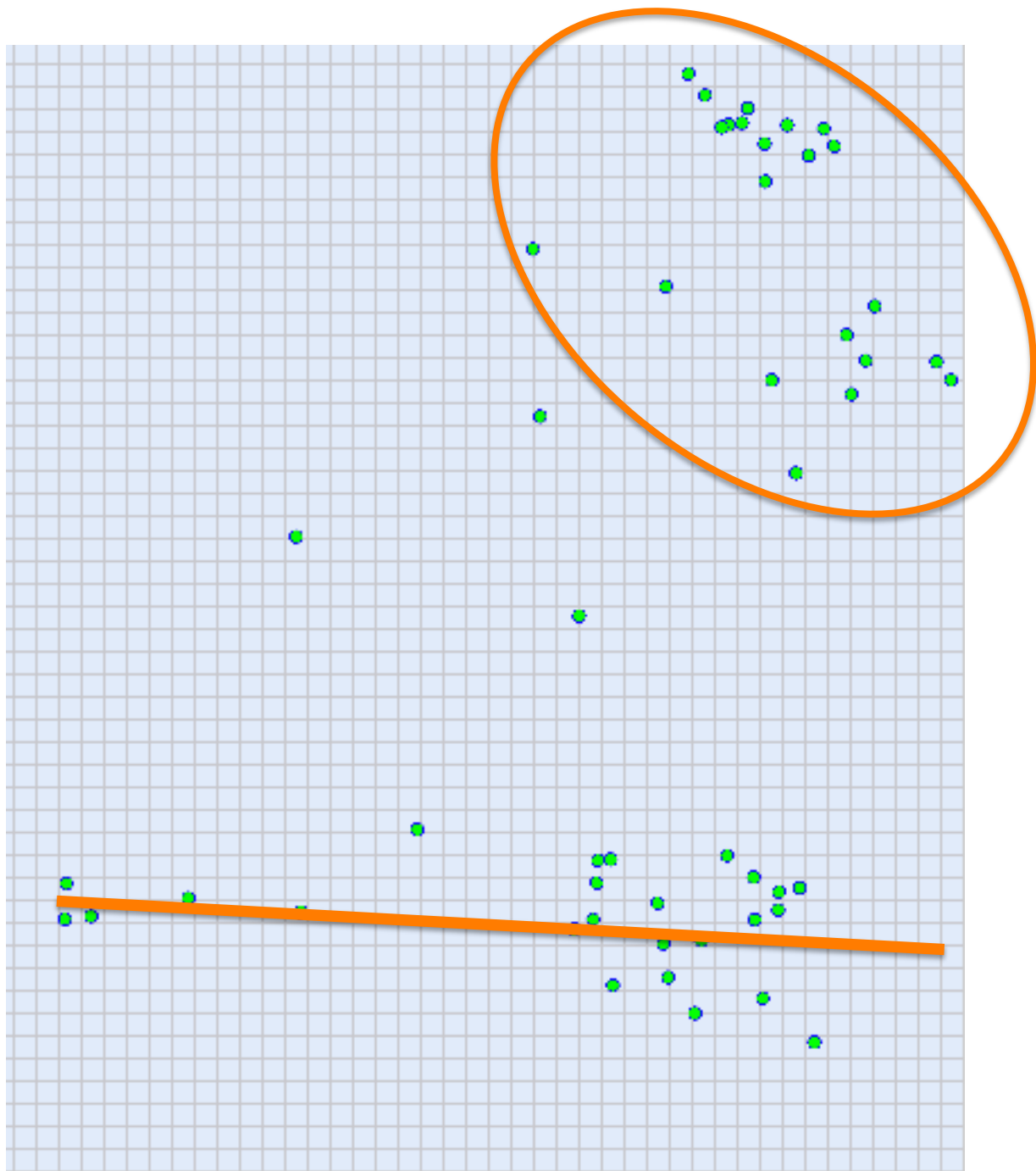
- ☒ Show EP ☐ Show Time EP ☐ Show Consequence
☐ Show Log(EP) ☐ Show Distance EP ☐ No Display

Simulate

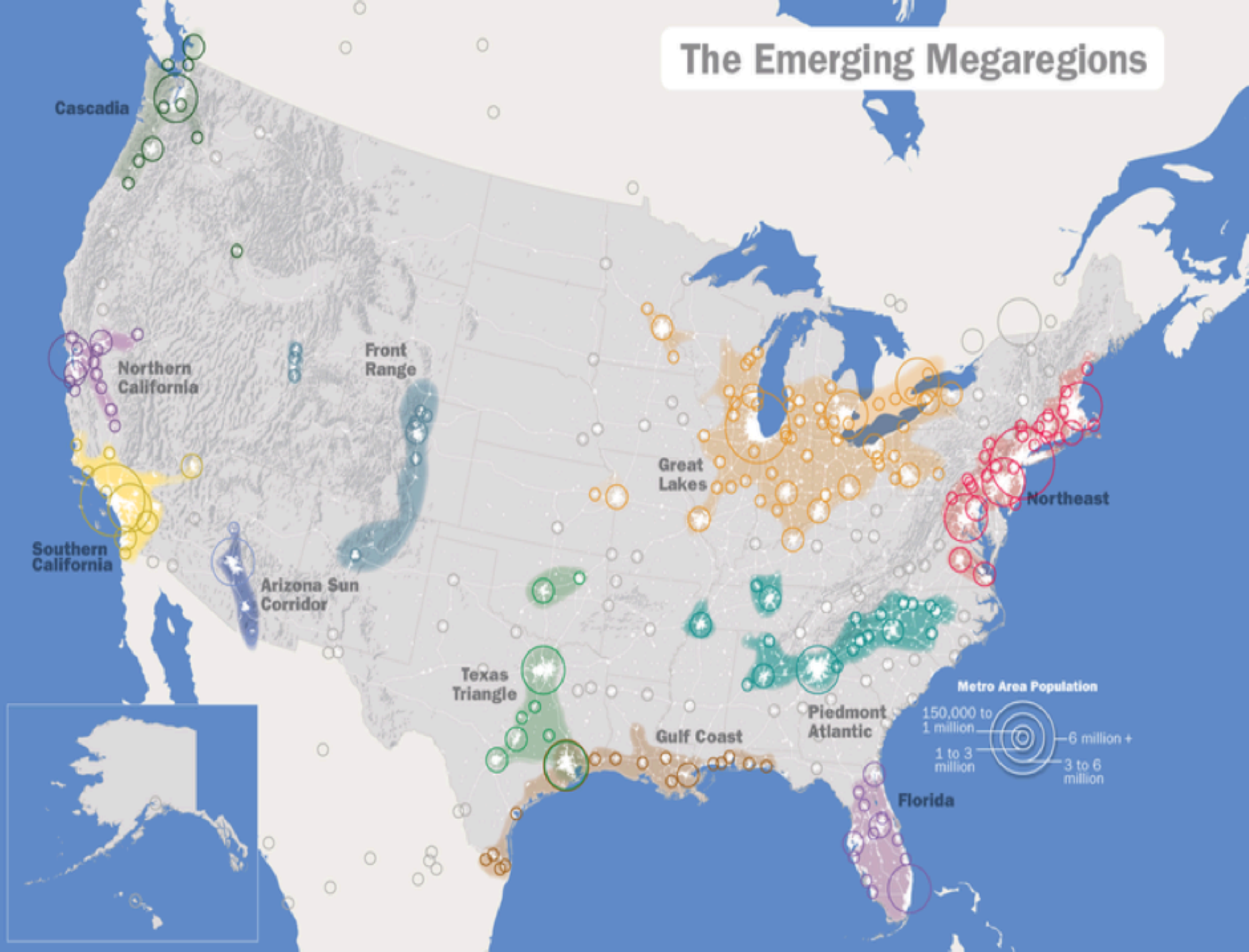
Percolate Exceedence
Clear Consequence
Reset







The Emerging Megaregions



The rise of the Megaregion

As metropolitan cities continue to grow at incredible rates alongside each other across the globe, their boundaries start to blur. This has given rise to a new scale of geography known as "megaregions". These vastly populated settlements have interlocking economic systems, common natural resources and shared transportation links. But they also have shared problems...

Mega Cities in Asia

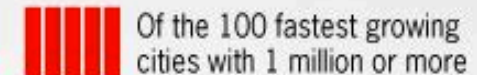
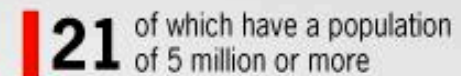
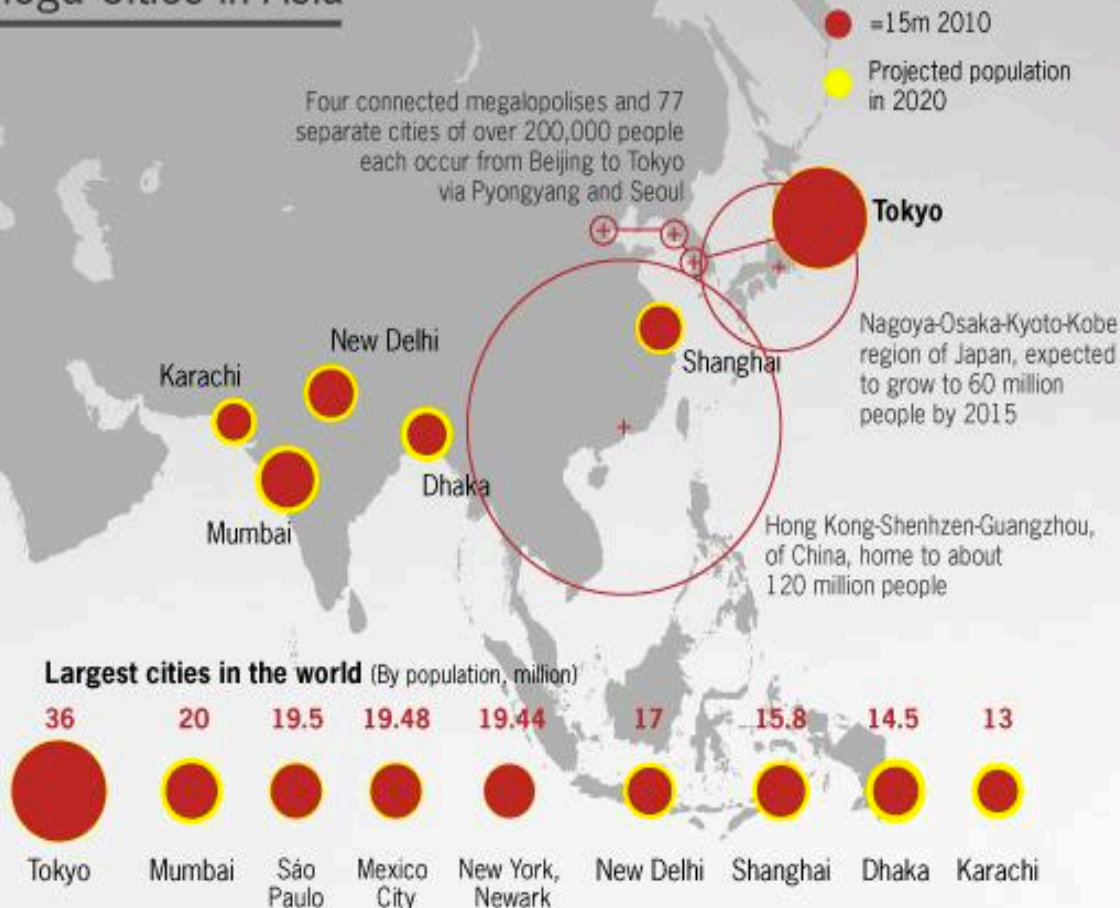
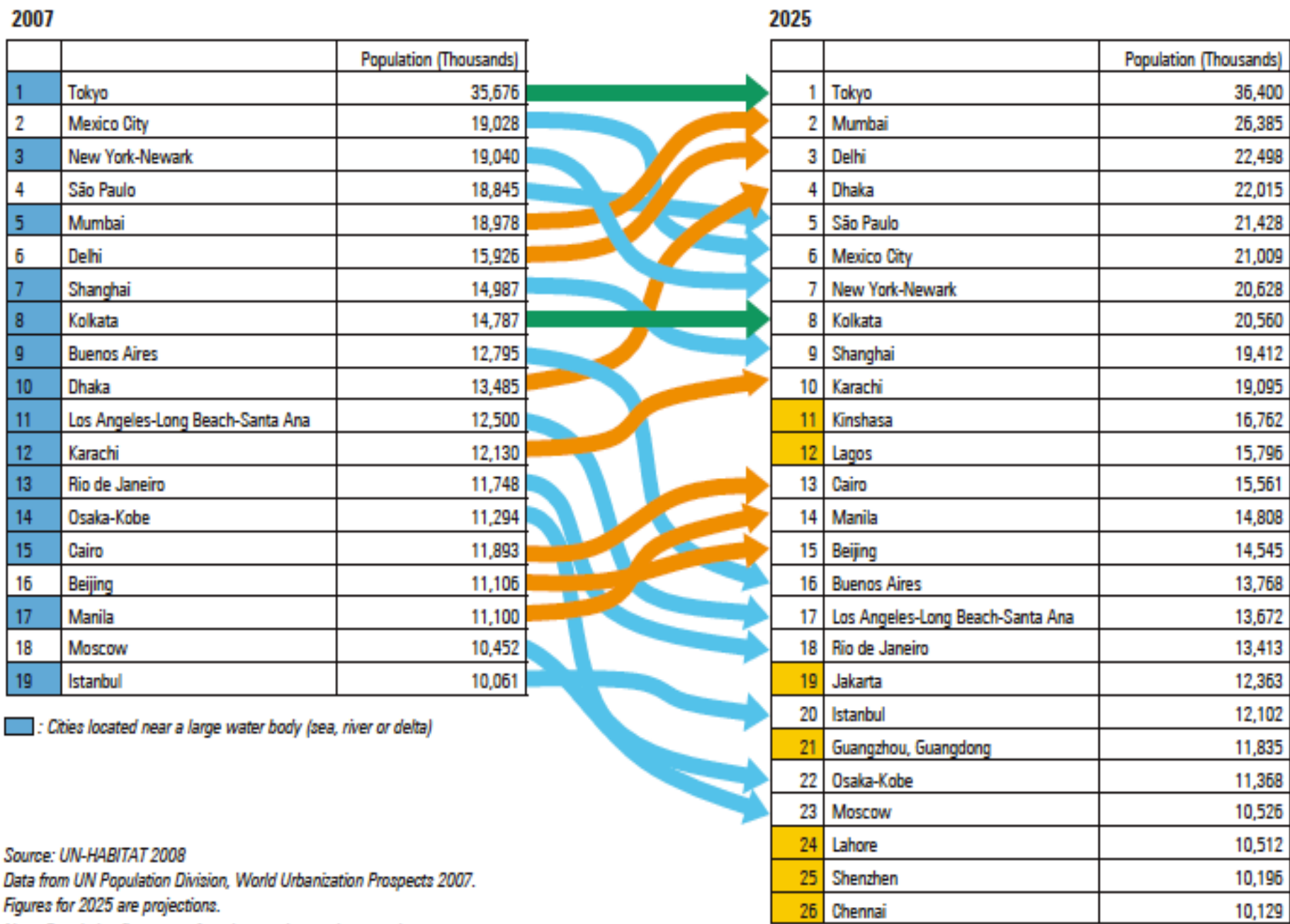


FIGURE 1.1.2: THE WORLD'S MEGACITIES, 2007 AND 2025



Source: UN-HABITAT 2008

Data from UN Population Division, World Urbanization Prospects 2007.

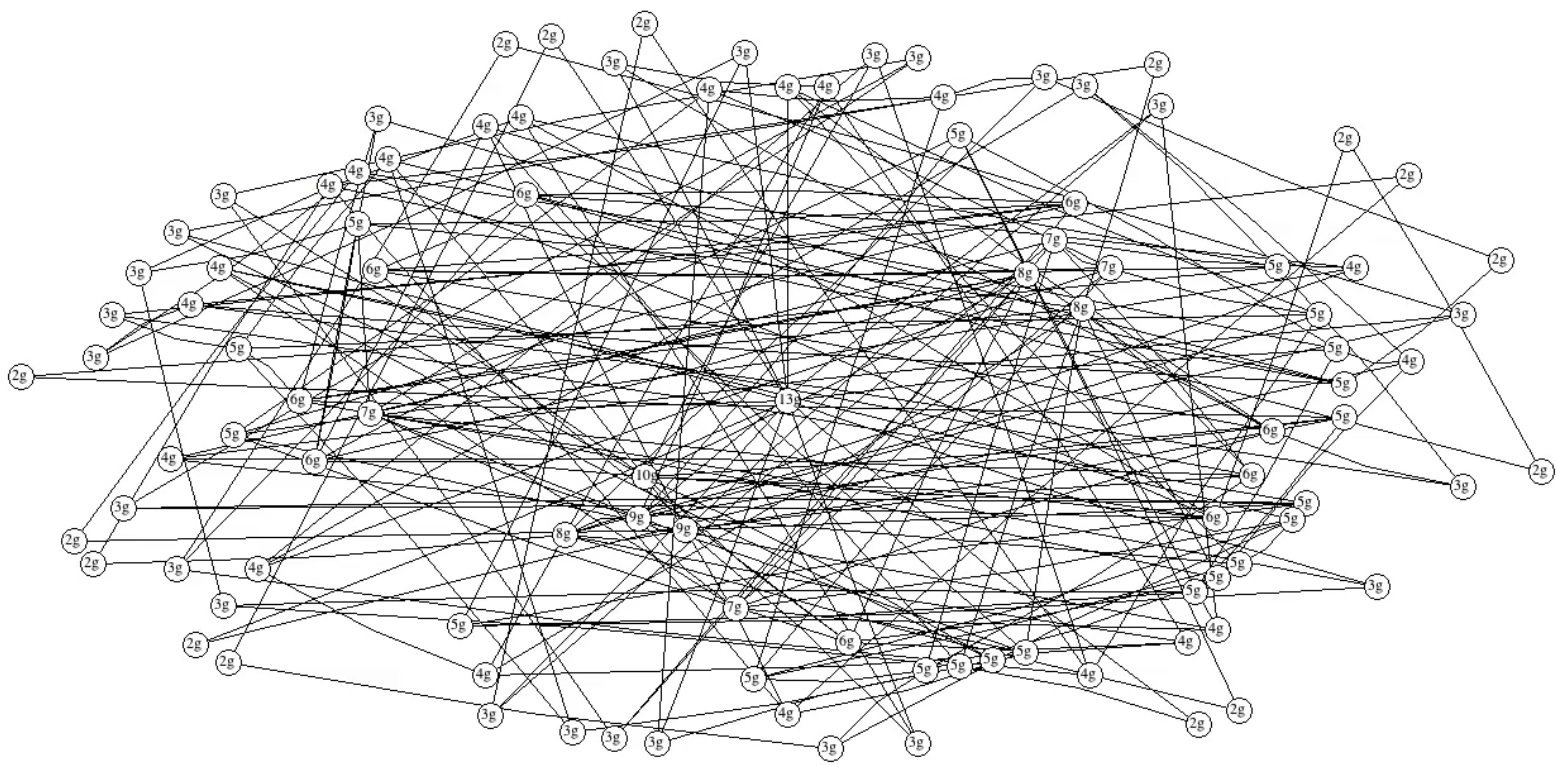
Figures for 2025 are projections.

Note: Population figures are for urban agglomeration, not city proper.

	Asset/Sector	Consequence	Exponent
Low Risk	S&P500	\$Volatility	3.1-2.7
	Large Fire in Cities	\$Loss	2.1
	Airline Accidents	Deaths	1.6
	Tornadoes	Deaths	1.4
	Terrorism	Deaths	1.4
	Floods	Deaths	1.35
	Forest Fires in China	Land Area	1.25
	East/West Power Grid	Megawatts	1
	Earthquakes	Energy, Area	1
	Asteroids	Energy	1
	Pacific Hurricanes	Energy	1

	Asset/Sector	Consequence	Exponent
High Risk	Hurricanes	\$Loss	0.98
	Public Switched Telephone	Customer-Minutes	.91
	Forest Fires	Land Area	.54-.66
	Hurricanes	Deaths	.58
	Earthquakes	\$Loss	.41
	Earthquakes	Deaths	.41
	Wars	Deaths	.41
	Whooping Cough	Deaths	.26
	Measles	Deaths	.26
	Small Fires in Cities	\$Loss	.07

Random Network



#Links = 216 #Nodes = 100 #Iterations = 0 Legend: g=Degree, c=Cluster, r=Radius, b=Betweenness

Display

- ☐ Show Degree
- ☐ Show Radius
- ☐ Show Betweenness
- ☐ Show Diameter
- ☒ Show EP

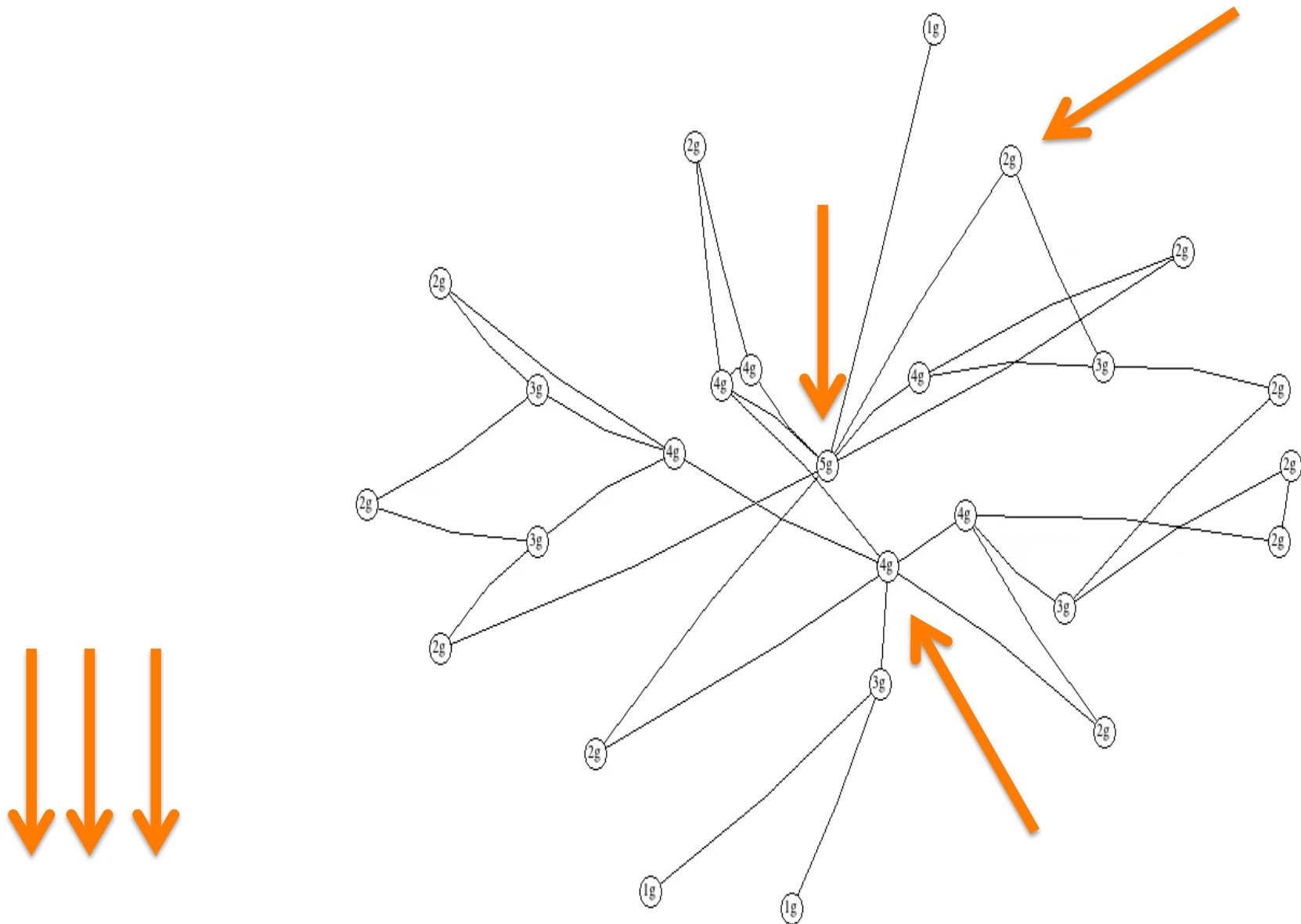
Emerge Objective

- ☒ Spread Epidemic
- ☐ Increase Clusters
- ☐ Increase Degree
- ☐ Depercolate Links
- ☐ Percolate Nodes/Links
- ☐ Scale-Free Percolate
- ☐ Increase Betweenness
- ☐ Follow-d'Leader

Control

EMERGE ON

Reset





Perception
Culture

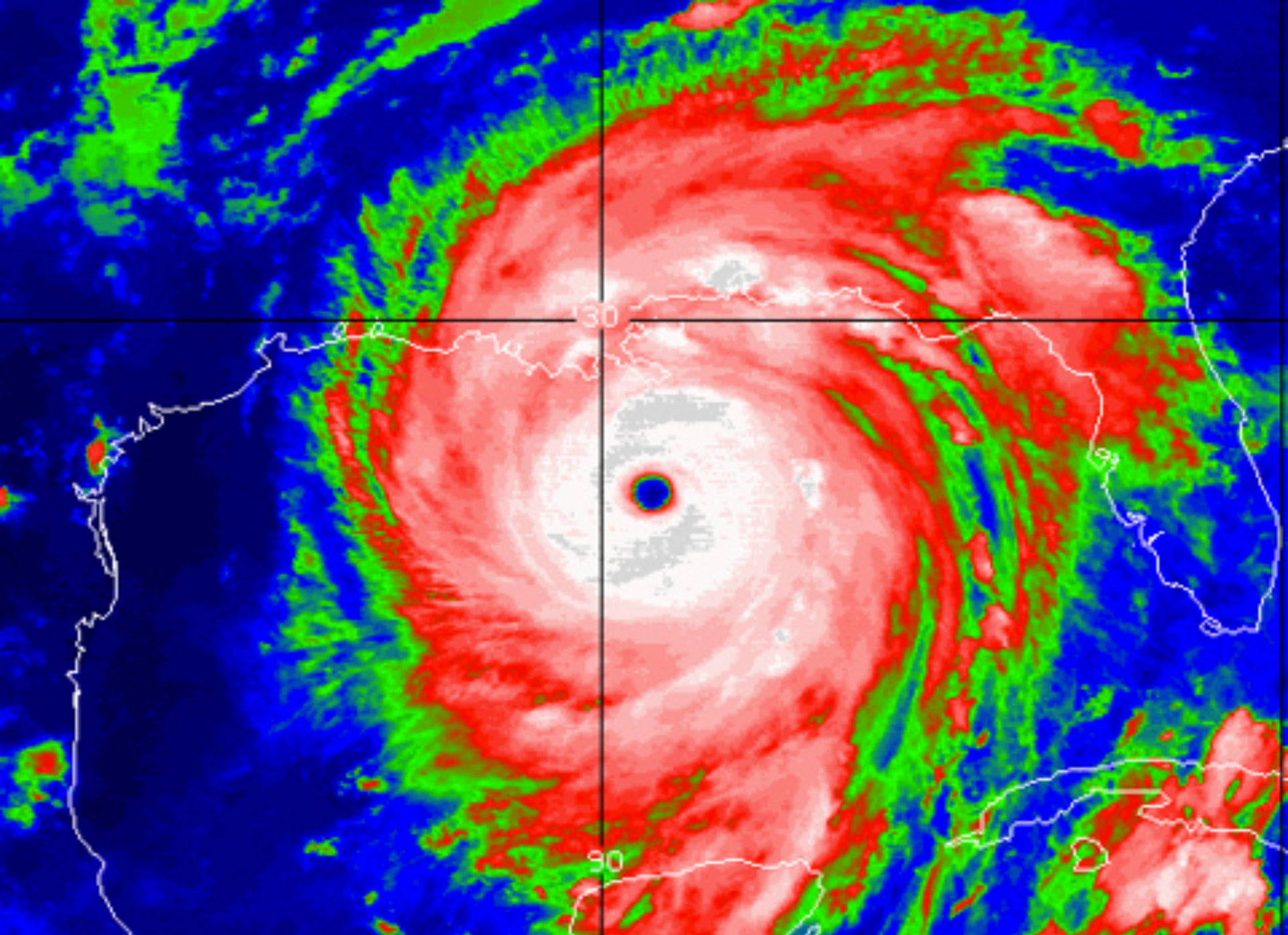
Decision-making
Language
History
Experience
Communication
Education
Risk
Whorf
Decision-Making
Behavior-Action

Risk

- Probabilistic
- Historical
- Part of a broader human experience
- Not a fact
- Time-Based (Association Bias)
- Subject to anchoring
- Nonlinear and non-Newtonian

Probability

- Laplace
- Pascal
- Newton
- Particular problems with low probabilities
 - Little experience
 - Tend to think of low probability events as “rare”
 - 1 in 10,000,000
 - 1 in 17,600,000
 - 1 in 50,000,000
 - 1 in 100 Billion



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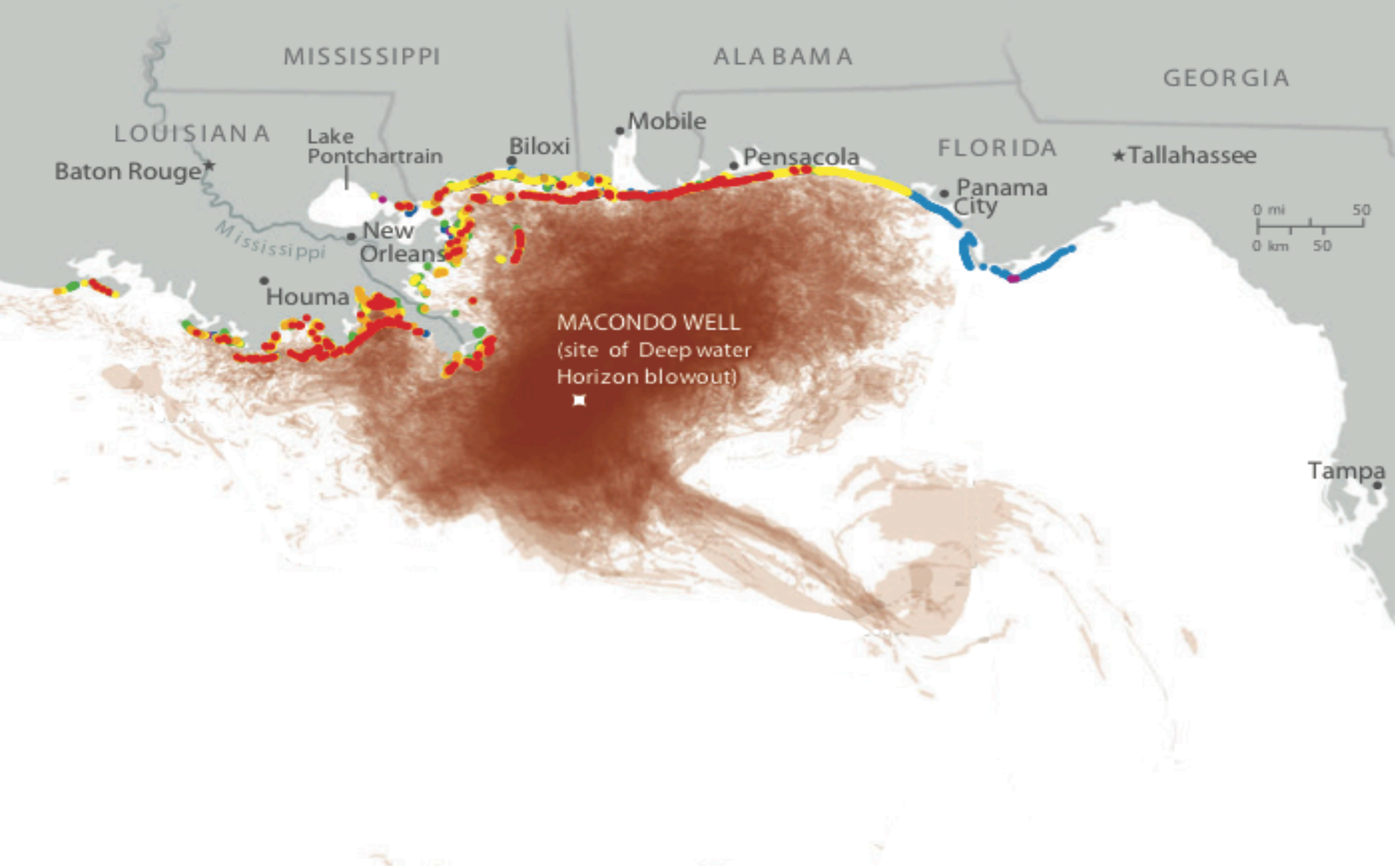


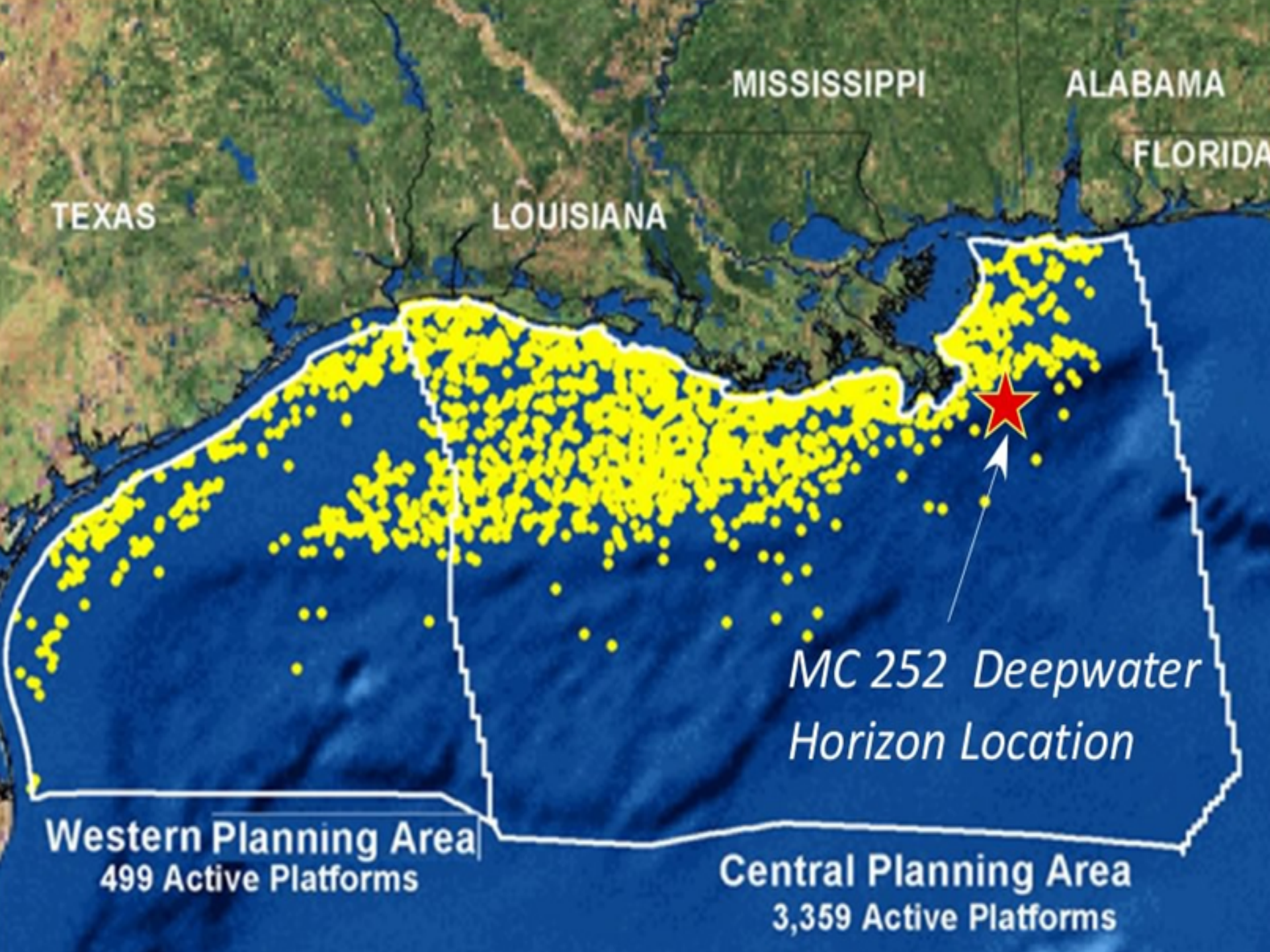
中部電力浜岡原子力発電所 Chubu Electric Power Hamaoka Nuclear Power Plant











TEXAS

LOUISIANA

MISSISSIPPI

ALABAMA

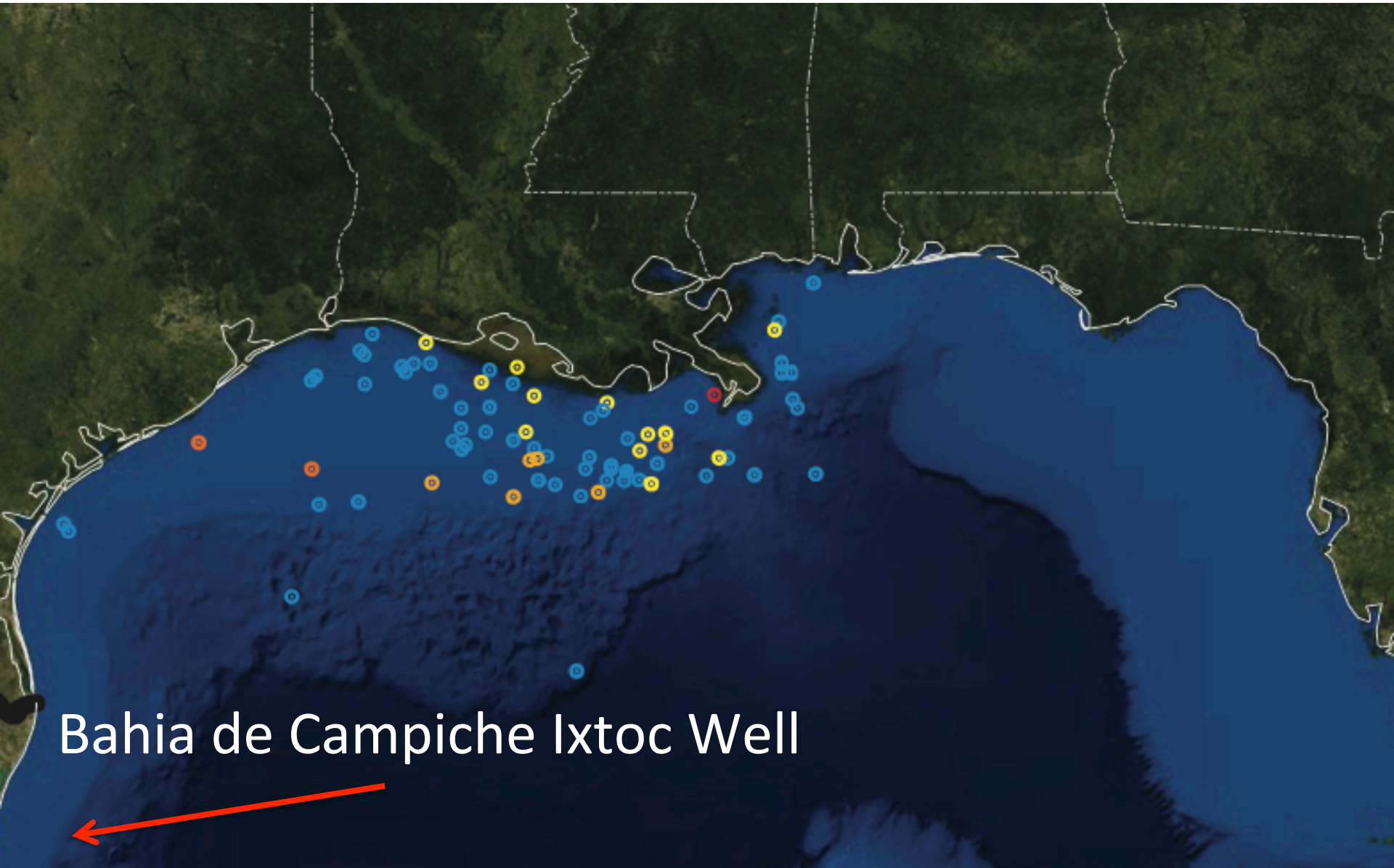
FLORIDA

*MC 252 Deepwater
Horizon Location*

Western Planning Area
499 Active Platforms

Central Planning Area
3,359 Active Platforms

Well-Flow Control Incidents (1996-2009)



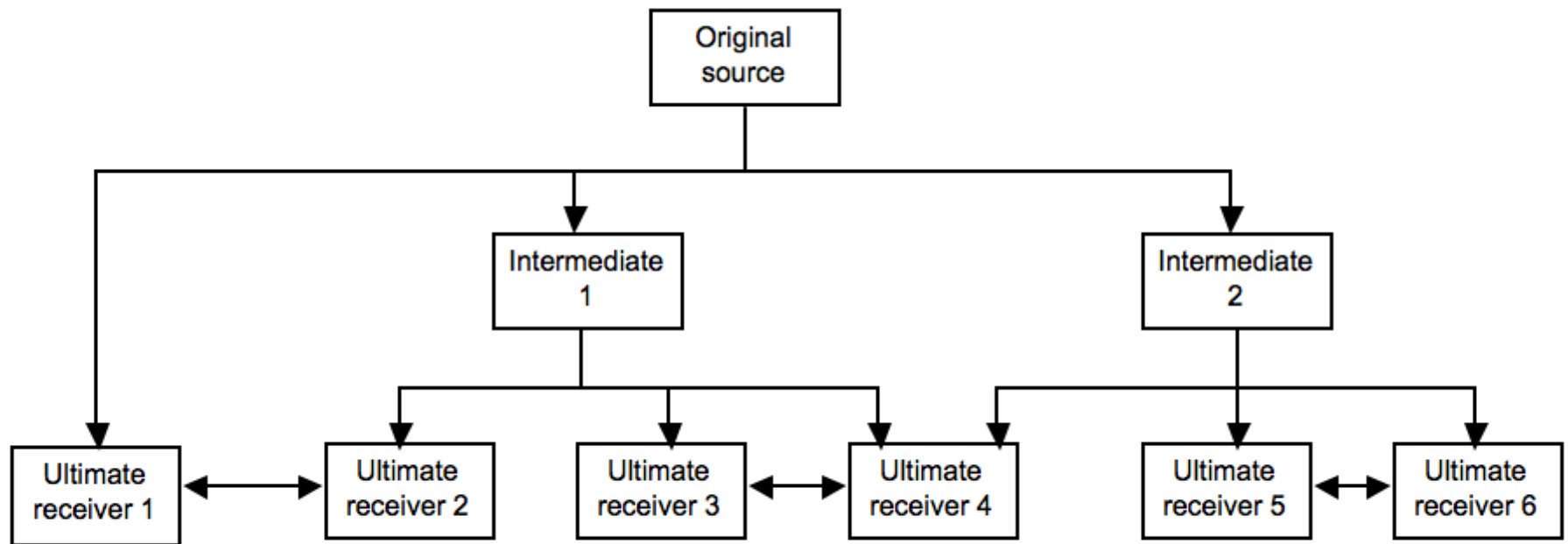
Consequence

- Injuries per year (time dependency)
- Deaths per year (time dependency)
- Loss of life expectancy (time dependency)
- Environmental damage (ecology network – food chain)
- Loss of market share (business network)
- Damage to reputation (social networking)

**THE
WORLD**



**IS
WATCHING**



Source: Lindell & Perry (2004).



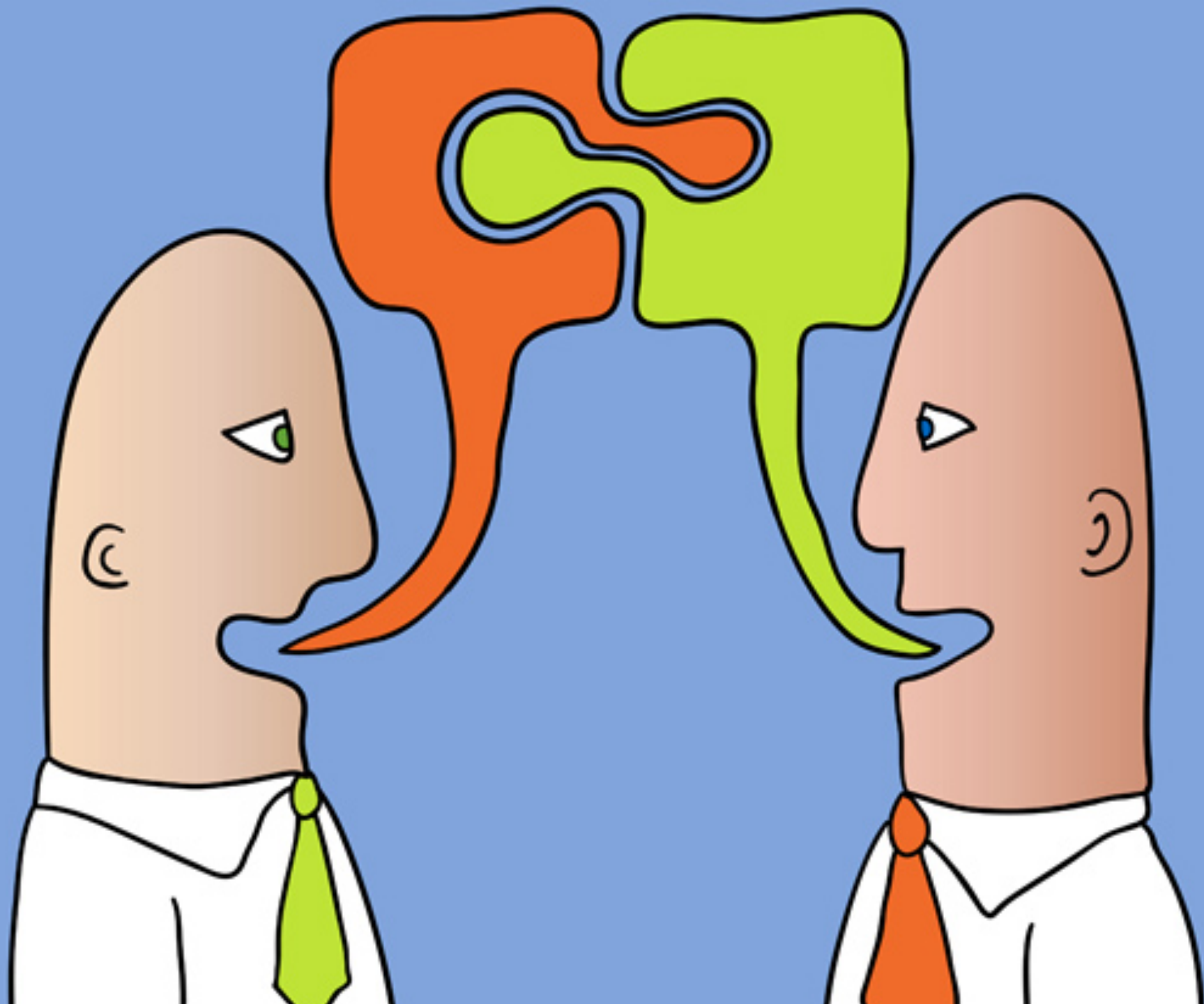
Social Media Landscape



Signal Intelligence

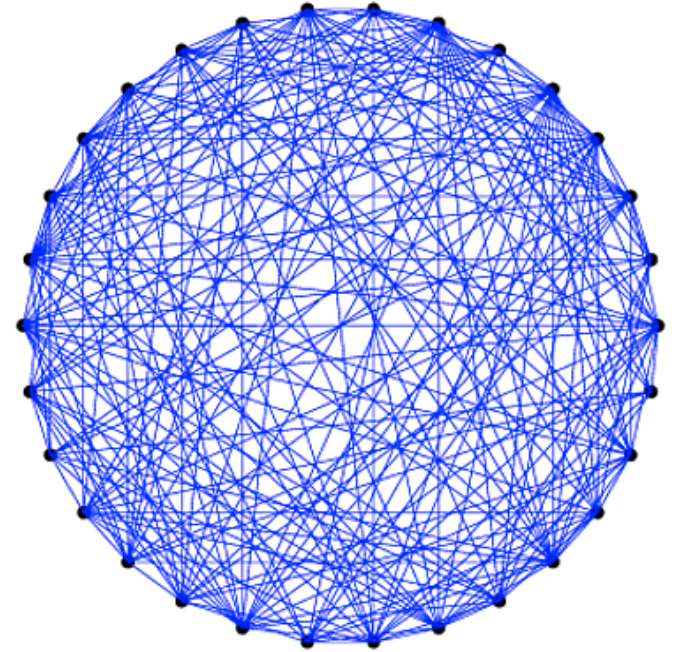


I knew that
would happen someday.
They just didn't listen.



Communication

- Understand networked risk
 - Be present
 - Be sincere
 - Listen
 - Be interdisciplinary
 - Identify preferential magnets
 - **Speak the same language**
 - **Have a conversation**
-
- **Risk communication will become increasingly difficult**
 - **Preparation is the key**



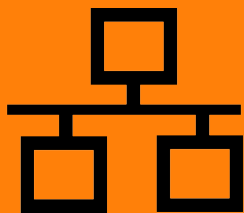
sight

touch

hearing
smell

taste

1250 MB/s



125 MB/s



12.5 MB/s

