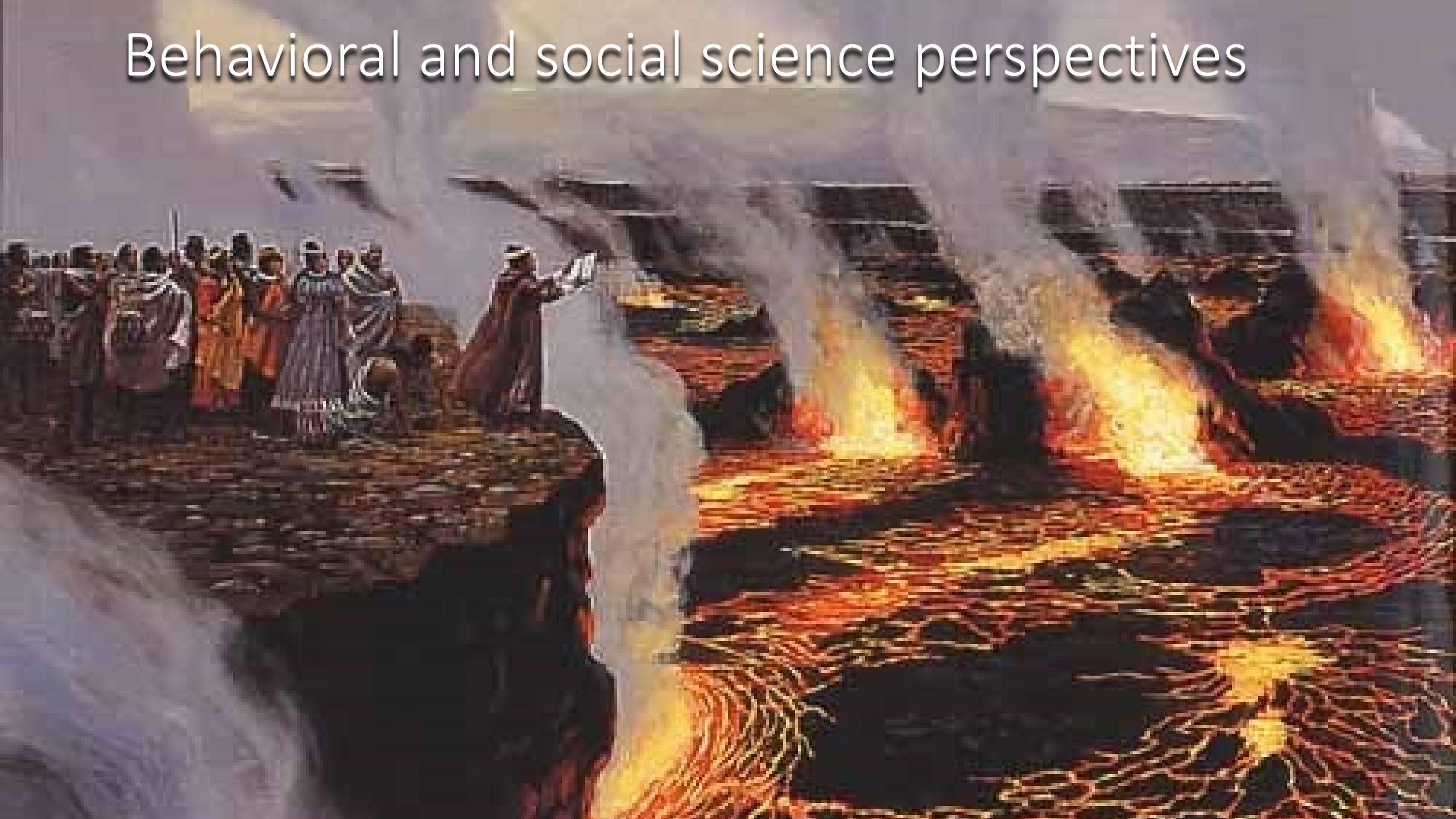



# Behavioral and social science perspectives





# How do stellar warnings And forecasts elicit woefully Inadequate responses?

1. Public & expert views of risk
2. Pre-crisis
3. During crises
4. Behavioral science measure
5. Cognitive bias

# 1. Risk and Risk Perception

## *Risk (Analysis):*

- the likelihood that an individual will experience the effect of danger

## *Risk Perception:*

- the subjective judgements people make about the characteristics of risk and its severity.

**Risk is perceived and acted on in 2 fundamentally different ways (Slovic et al, 2005):**

- 1. *Risk from feelings:* refers to individuals' fast, instinctive, and intuitive reactions to danger. Described as the affect heuristic. [laypeople]**
- 2. *Risk from analysis* brings logic, reason, and scientific deliberation to bear on risk management. [scientists]**

# ..... Leading to variations in behaviors

## Expert view of risk

- Objective
- Constant
- Quantitative
- Product of natural hazards and vulnerability
- Decisions based on probabilities

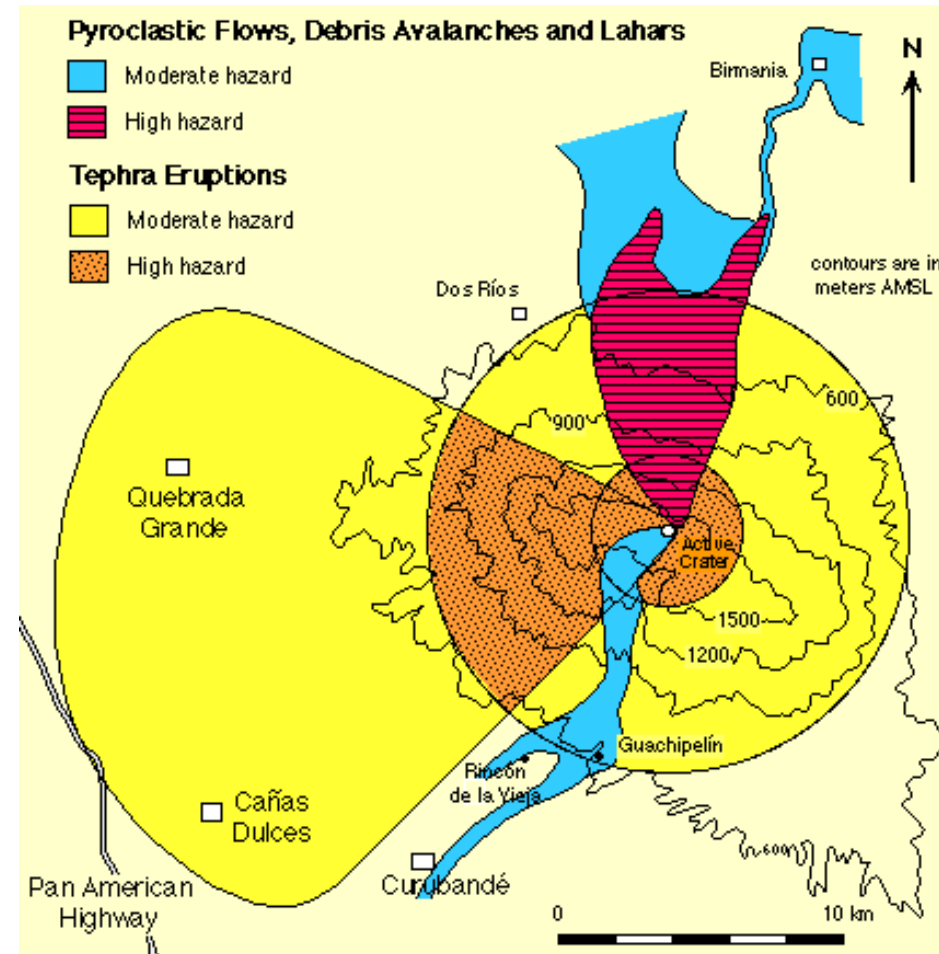
## Public view of risk

- Subjective
- Conditional and personal
- Quantitative and qualitative
- Product of perceptions and social context
- Decisions based on social and economic cost-benefit



# Public perception of risk

- Psychological components
- Behavioral factors
- Community factors.
- Belief.
- Perception of responsibility.



# Public perceptions of risk


## Public- perceived risk


- experience
- culture
- trust
- anxiety
- beliefs
- control
- dread





# Public perception

based on  experience + belief

shaped by  psychological  
social FACTORS  
cultural  
economic

huge inter-&-intra community variations



# Hazard Awareness and Risk Perception are only...

- two factors in decision making-- other factors are important
- Real question is: what motivates people to adopt protective actions?



# Cultural and economic issues

- Place volcanic risk in a **social context**
- **Risk tolerance and ability & willingness to pay** varies among your audience



Adolfsson, 2010

People make decisions based on their values and priorities and these vary from ours

## 2: PRE-CRISIS: community preparedness

- Complex 4-stage path :
  - Perception of risk.
  - Formulation of intention.
  - Action.
  - Maintenance.



**Involve community members and existing social networks to build adaptive capacity**

# Pre-crisis: challenges

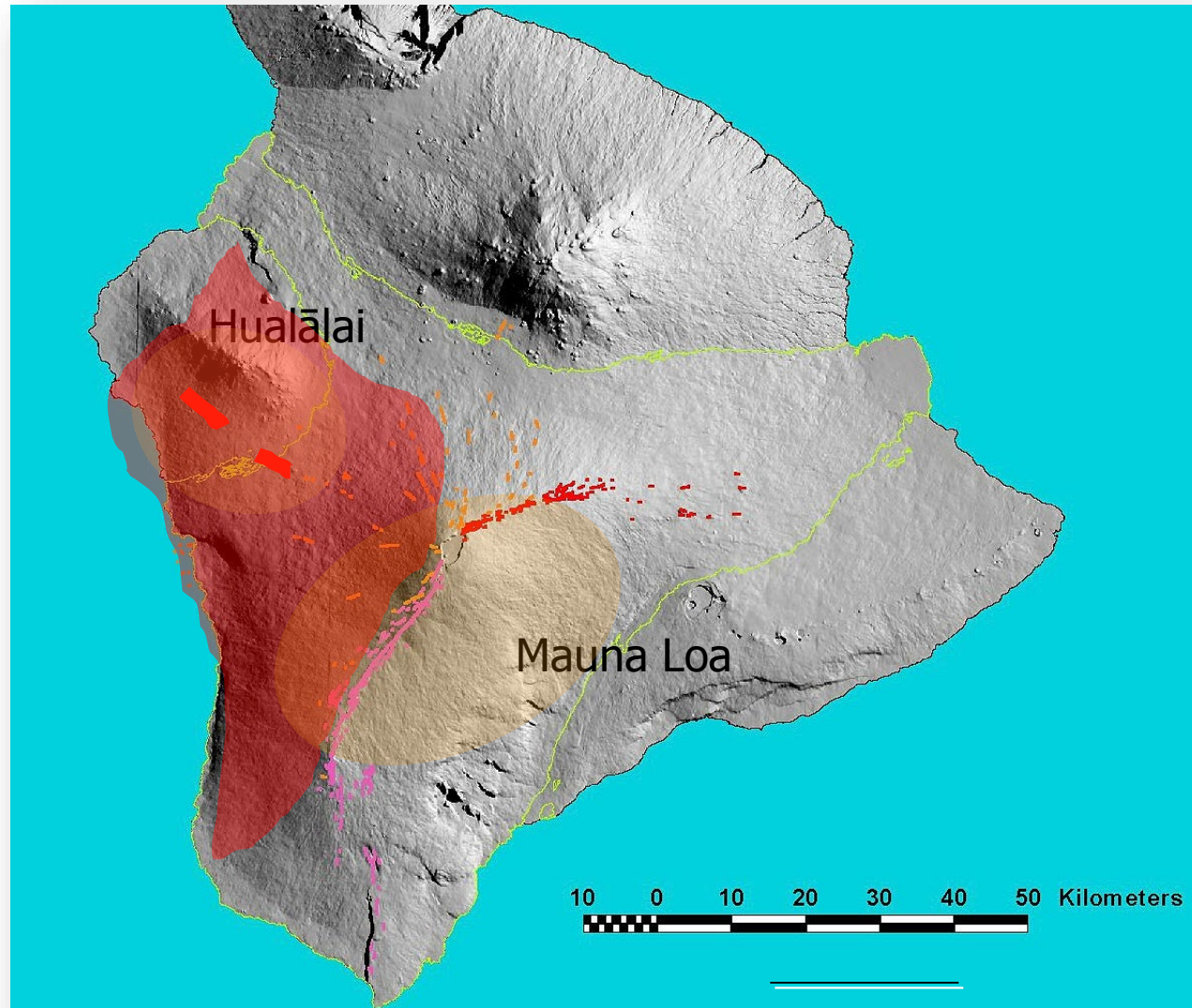
**better informed  $\neq$  better prepared**

**awareness  $\neq$  behavior change**

The **link** between hazard awareness and preparation is **weak** even if the hazard is well understood



# Case Study: Kona lava hazard



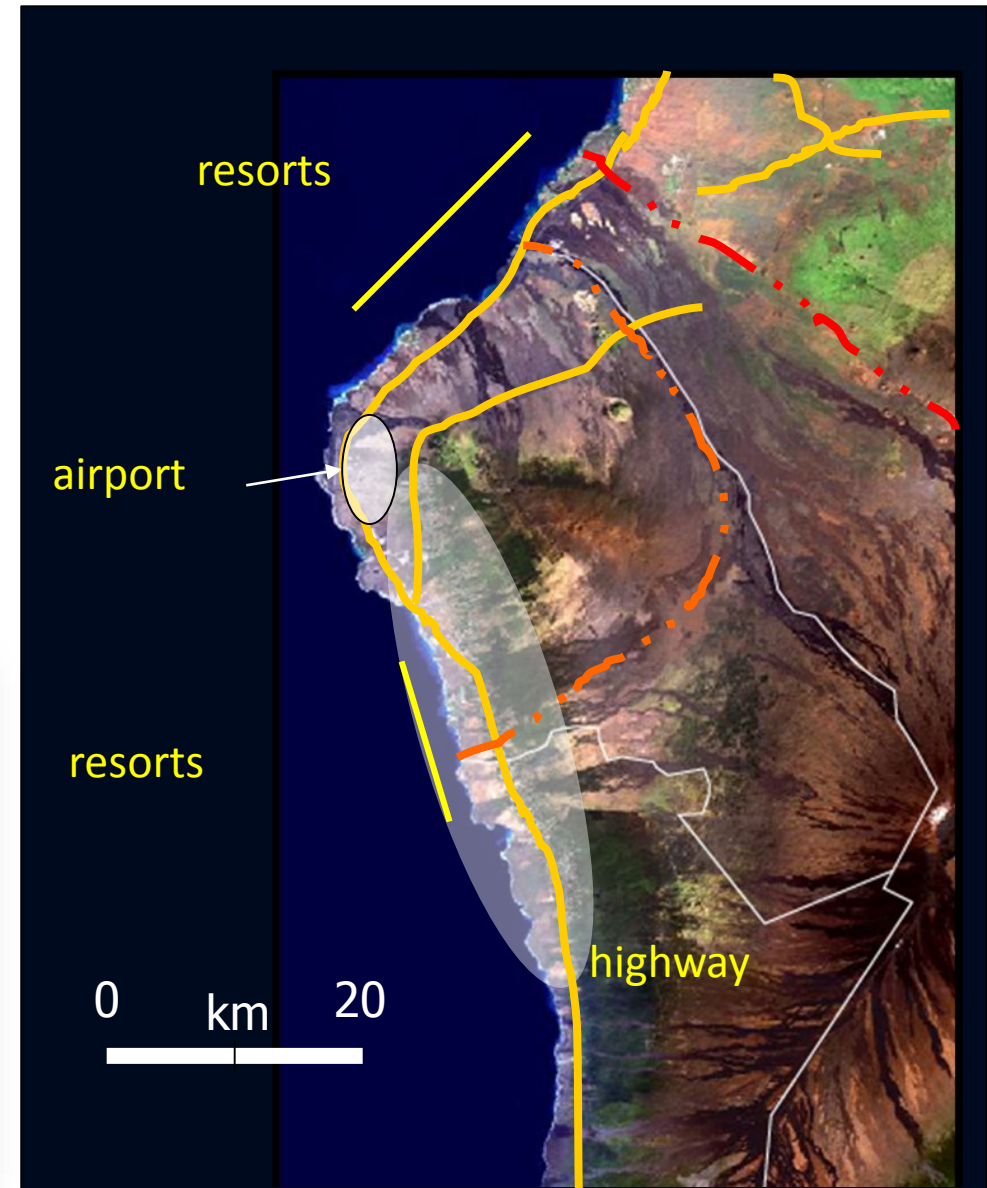
1. Understand the audience and its needs

2. **Tailor** outreach to audience



# Kona lava hazard

- Population 37,000
- Significant tourism investment
- Single arterial highway
- Development <15 km of vents
- Last destructive eruption 1950





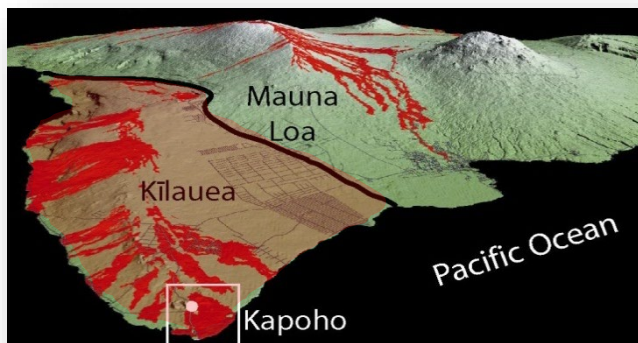
# Levels of preparedness

- 66% - adopted easy & less costly measures
- 26% - adopted more difficult & costly measures
- emergency response plan (33%)



# Why?

- Collective and individual memory: Long time since the last eruptions in Kona
- Low direct experience in damaging events
- Non-specific Yellow Page information contributes to lack of awareness of threat
- Incomplete awareness: Misconceptions of lead time & speed of onset reduce perceived risk & urgency to prepare
- ‘Transfer of responsibility’: people are less likely to prepare



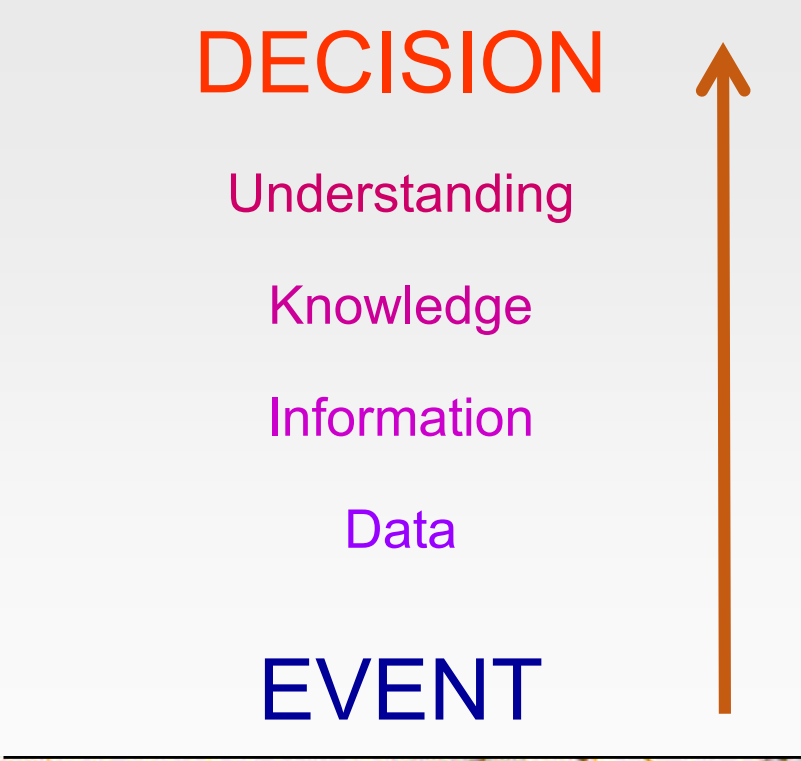
### 3. CRISES: from alert to action

- Message composition.
- Delivery.
- Message confirmation (**milling**).
- Formulation of intentions.
- Action.



Role of social messaging







RESPONSE TEAM



PUBLIC, MEDIA



WARNING

Receipt

Confirmation

Intention

ACTIONS





# Warning Response Model (Mileti and Sorensen)

Describes warnings as a process or sequence where people have to :

1. hear or perceive (understand, believe, and personalize) a message
2. decide how to respond:
  1. either continue normal routine or
  2. take alternative protective actions & perform them

...people don't passively wait for information, they actively seek it through the Warning Confirmation Process

# Warning confirmation process

Sequence and human outcomes depend on:

1. *Message content* received

- Hazard, source, timing, guidance

2. *Style of message* received

- specificity, consistency, certainty, clarity, accuracy, sufficiency, and channel

3. *Receiver* characteristics

- environmental cues, social setting, social ties, social structure, psychological

Concerns: focuses on immediate aspects of the message rather than long term receiver factors

# During Crises: public response challenges

Why can “*good*” warnings elicit inadequate or *inappropriate responses*, such as the general public:

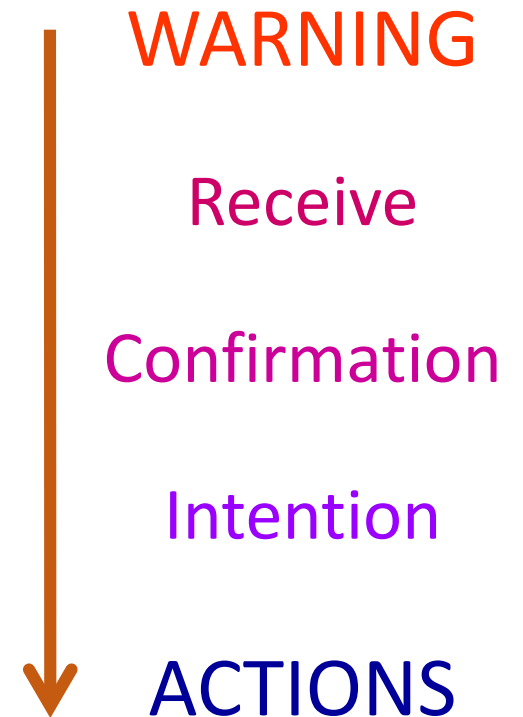
- doing nothing
- delaying an evacuation
- going to watch the volcano



# Public behavior following warnings



1. Alert generated
2. Warning message composed
3. Message received by public
4. Message **confirmed** by public
5. Public decides to act
6. Action taken



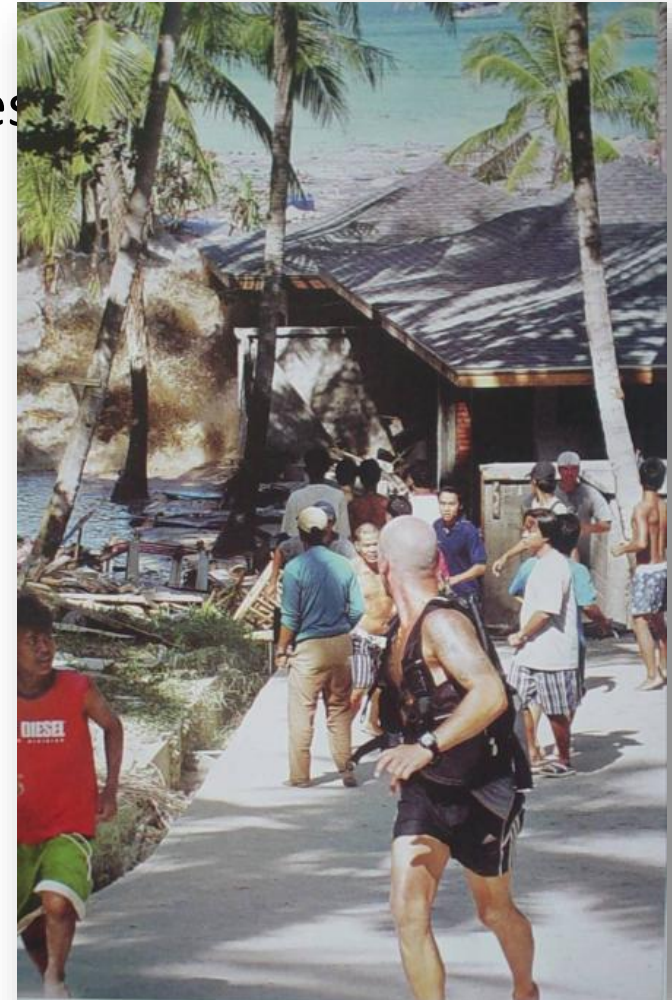
# Physical, social and environmental cues

Different mechanisms in the community reinforce the message

- Physical cues: Objects that reinforce warnings
- Social cues: Observations of other people's activities—businesses closing and neighbors evacuating
- Environmental cues: Sights, sounds, other sensory cues



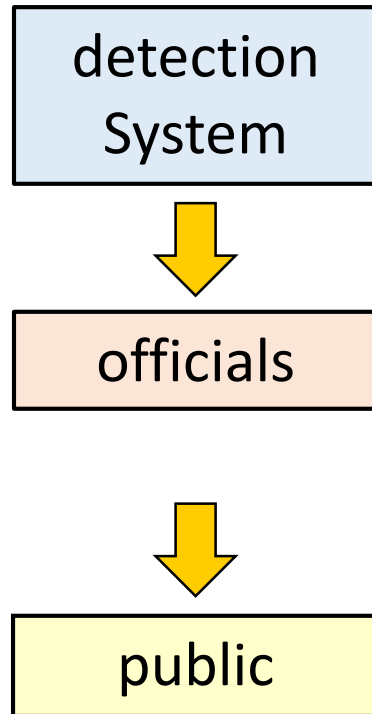
People react positively to visual stimuli and to others' behavior that reinforces proper risk-reduction efforts





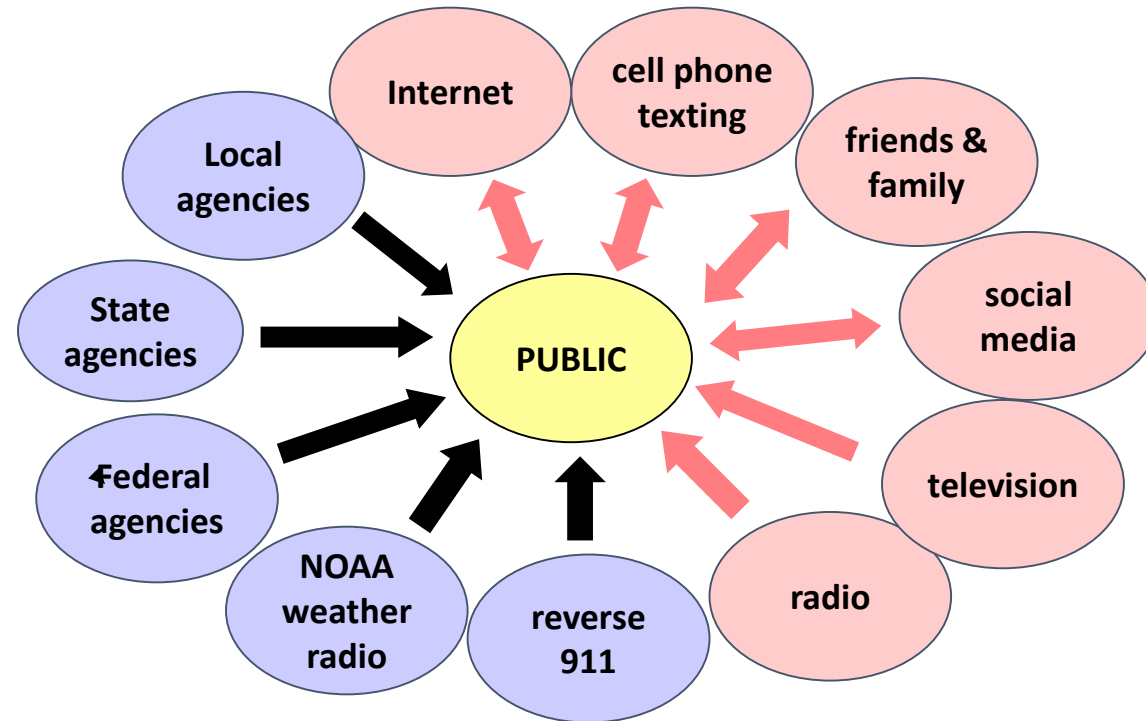
# Warning confirmation: milling

## View of scientists/officials



Clear, simple,  
Uni-directional  
messages

## View of at-risk individuals



Complex, possibly competing messages;  
official and unofficial sources; managing  
“warning conversations”

# Inconsistent formal and informal messaging

Inconsistency within/between messages can elicit inadequate or inappropriate responses, such as:

- Continuing normal activities;
- Delaying protective actions such as evacuation; or
- Going to see the hazard.



# Joint information center (JIC)

- Media Monitoring
- Rumor control
- Tracking JIC messages



- News releases
- Talking points
- JIC chronology



- Source for media and public inquiries

USGS, 2004



# Reasons for not evacuating

*“Evacuation behaviour is complex rather than simple, collective rather than individualistic and develops along multiple lines rather than a single path”*

Quarantelli 1985

- Clarity of the threat
- Sources of social influences
- Availability of resources

Riad et al. 1999





# 4. Personal demands and decisions

- Scale of impact/complexity
- Multi-agency/jurisdictional response
- Uncertainty, ambiguity and missing data
- Dynamic
  - conditions
  - goals and tasks
- Competing goals
- Time urgency/high risk
- Geographical dispersion of:
  - information sources
  - decision makers





# Stress and decision making

- High demand/stress situations
  - Positive and negative influences
- Performance enhancing effects
  - alertness
  - faster reactions
  - increased energy
  - accelerated thinking
- Continued exposure/negative reactions
  - ‘tunnel vision’
  - failure to prioritize
  - ‘freezing’
  - loss of concentration



*“There’s a 1,000 things happening, aware of 100, and you can only something about 10!”*

- Handling multiple, demanding problems under conditions of high stress
- Ranking and prioritizing competing tasks under high time pressure/significant consequences
- Implementing pre-defined options where appropriate
- Formulating new courses of action to deal with novel, emergent tasks
- Coordinating actions of several agencies

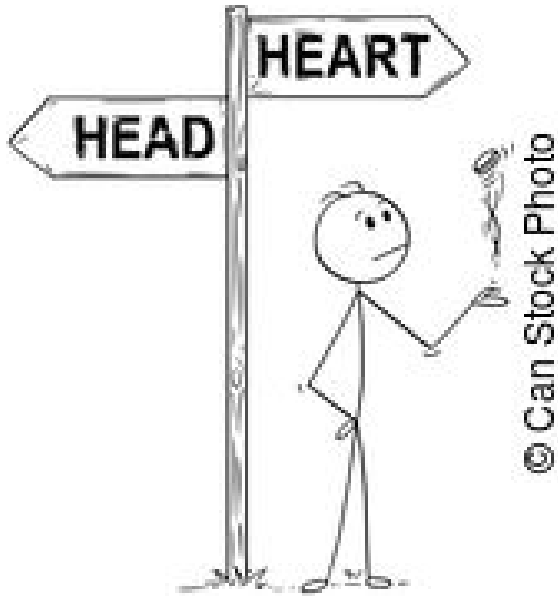


**Peter Sarna**  
(2002, pg 40)  
Chief of Police/Public safety  
Oakland, California

# Match style to hazard activity

Stable periods  
(low risk/high time) vs.

Escalating/active  
(high risk/low time)



*Analytical style*

*Naturalistic style*

## 5. Behavioral science measures

- a) Outcome expectancy
- b) Self efficacy
- c) Normalization bias
- d) False experience
- e) Optimization bias



## a) Outcome expectancy



Whether hazards are perceived as surmountable

“Will our actions reduce the problem, and have beneficial effects?”

# Low outcome expectancies

Perception that:

- actions cannot protect persons and property; or
- be useful for other purposes.





## b) Self-efficacy

People's belief in their own coping ability

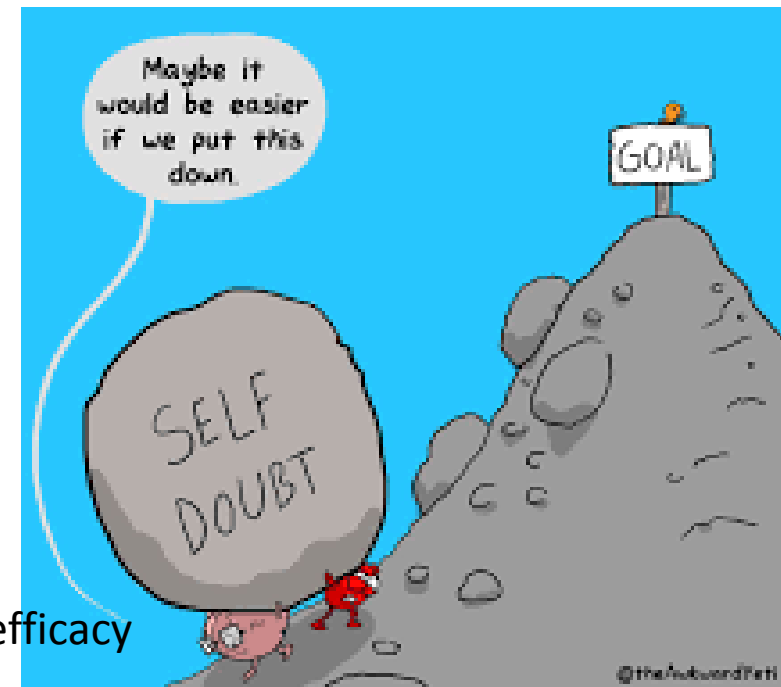
- Whether people perceive themselves as competent to take action.

*"I am confident that I will be able to grasp the main ideas in this module."*

*"If I read this slide carefully, I will be able to explain what self-efficacy is."*

*"I know that I am capable of scoring 100% on the final test."*

- Influences intention to act
- Indicator of likely success

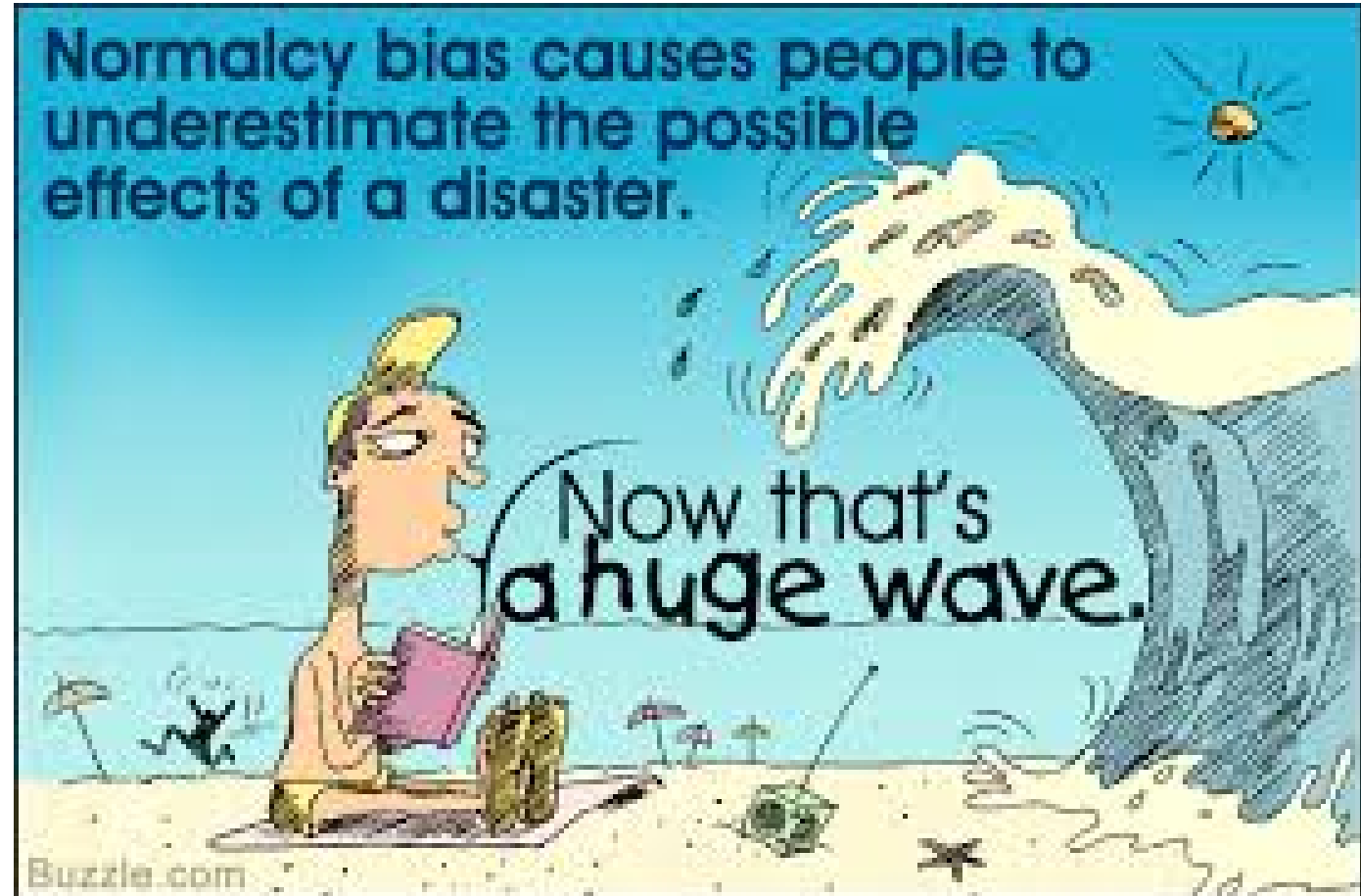


Low levels of self-efficacy

## c) Normalization/normalcy bias

Little damage in recent event = inference that future events will be similar. Hence, no concern.

Where a past experience of coping with a hazard may condition people to be complacent; expecting only what was experienced in the past.



# Normalization bias: example

Back in Red Hook, an unfazed Rosemarie Garcia chose to stick it out with her 76-year-old mother in their third-floor apartment. She grew up in North Carolina and was, sort of, used to hurricanes. *“I don’t understand why they shut down the elevators,”* she said, noting that NYCHA did not turn off elevators, heat, and hot water at Red Hook during Tropical Storm Irene last year.

Read more: <http://www.nydailynews.com/new-york/public-housing-tenants-refuse-leave-article-1.1194854#ixzz2wSvuUEsr>

*“I’m staying no matter what,”* said Evelyn Ortiz, 36, who lives in the United Towers on the fifth floor with her mom. *“I’m not too worried. Storms come and storms go.”*



# Normalization bias

## Japan: Tsunami deaths since 1900

DATE	TOLL
2011	(+18000)
1993	(330)
1983	(103)
1952	(33)
1944	(40)
1933	(3000)
1923	(2144)
(1896)	(26360)

*National Geophysical Data Center*

- normalization bias - little damage in recent events.



## d) “False” experience



- Overestimation of the severity of personal experience (confuses intensity and magnitude).
- People who are at the fringes of a major event tend to think they have experienced the worst of that event



# “False” experience: Example

**“Beware of false knowledge; it is more dangerous than ignorance.”** —George Bernard Shaw



Lacy Hartley was living in Waveland, Mississippi, when Hurricane Katrina was approaching the area and made a decision to stay at home after talking with neighbors.

*“They said, ‘No, we're not going to leave. We were here in 1969 for Hurricane Camille, and we didn't get a drop of water, so we're going to stay”* Hartley said.

# e) Unrealistic optimism bias

Perceive self as less vulnerable/more skillful than average: 95% of drivers think they are “better than average”

Therefore, fail to appreciate need for personal risk reduction, and instead:

- attribute need to others; and
- reduce their personal preparedness, attentiveness to information, and risk perception.



“Never mind a book about how to change myself. I need a book about making everyone else change.”



# Unrealistic optimism: Example



"Never mind a book about how to change myself.  
I need a book about making everyone else change."

*"I don't think we're in danger in the sense that the building is going to fall down," said Glenn Plaskin, president of the Tenants Association. "I think it's more a question of the electricity going out. For one night, we'll be alright."*

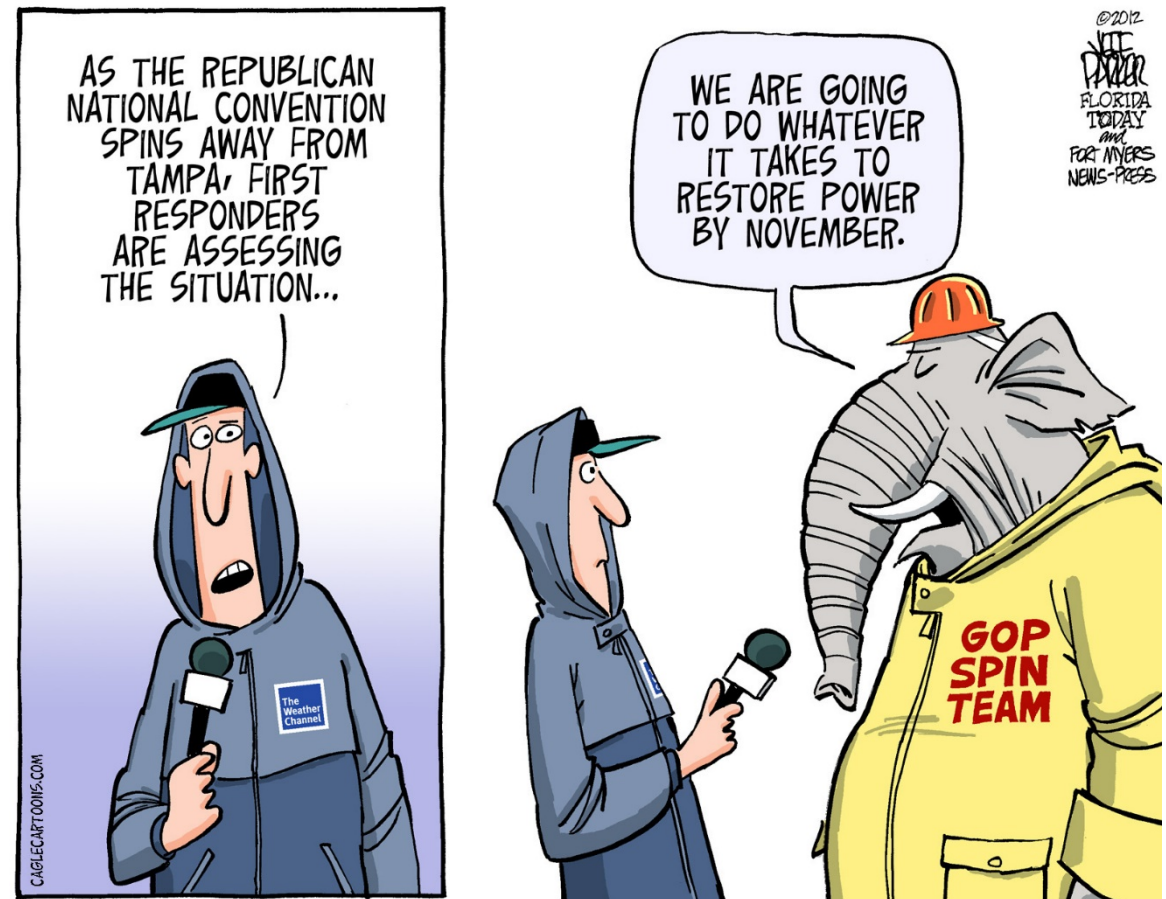
Read more: <http://www.dnainfo.com/new-york/20121029/battery-park-city/battery-park-city-residents-defy-hurricane-evacuation-order>

*"A hurricane is approaching my state but I don't live anywhere near the coast. I don't need to evacuate because the storm surge won't make it this far inland."*

Read more: [http://www.hernandosheriff.org/EM/Applications/EMPressReleases/PressReleases/20140319\\_WED2014\\_TADD.pdf](http://www.hernandosheriff.org/EM/Applications/EMPressReleases/PressReleases/20140319_WED2014_TADD.pdf)

# Behavioral science measures 2

- f) Exaggerated levels of knowledge
- g) Trust/distrust
- h) External transfer of responsibility
- i) False cues
- j) Law of randomness
- k)



# f) Exaggerated levels of knowledge

## Volcanic response actions

- Infer knowledge: 41%
- Actual ability: 6%
- Overestimate
  - Knowledge
  - Preparedness

## Reduces

- Perceived risk
- Need to prepare
- Attentiveness to new information

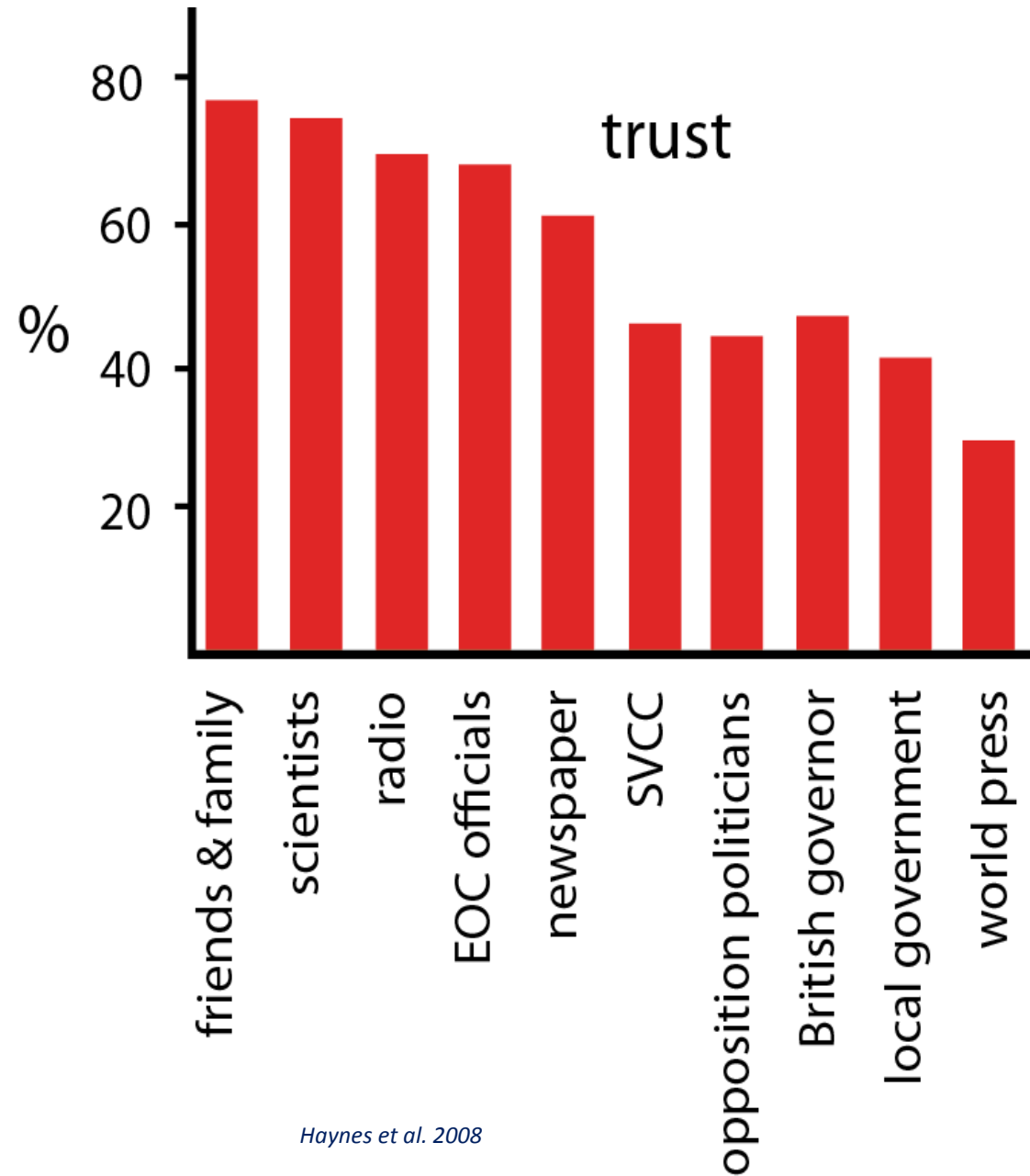




# g) Trust

Trust is a key to the extent to which the public follows guidelines and advice.

This diagram shows trust levels at the end of the long lived volcanic crisis on Montserrat.



# h) External transfer of responsibility

Attribution of protection to government agencies distributing information reduces:

- Perceived risk
- Need for preparedness
- Attentiveness to subsequent communication

*“I’m staying. I am scared but I hope it will pass,”* said Kymal Raginov. *“If anything happens, the police will save me.”*

Read more: <http://www.nydailynews.com/new-york/public-housing-tenants-refuse-leave-article-1.1194854#ixzz2wSvTFDiJ>

# Example: Transfer of responsibility

Seawalls offered little protection against tsunami's crushing waves

- seawalls line 40% of coastline
- tsunami walls based on much smaller tsunami heights: up to 12 m (3 m).
- unanticipated size of tsunami.



## i) False cues

- People react instinctively to unexpected events and to others' behavior
- Unanticipated reaction: generally to natural or social cues



*ITIC, A. Yamauchi*



*Wikimedia Commons / Rai Lay 2004*



## j) 'Law' of randomness

A hazard strikes only once and therefore it won't occur again.

*"Last year, a flood occurred that was considered a 'hundred-year' flood. This means that a flood of that magnitude will not happen for another 100 years."*

Read more: [http://www.hernandosheriff.org/EM/Applications/EMPressReleases/PressReleases/20140319\\_WED2014\\_TADD.pdf](http://www.hernandosheriff.org/EM/Applications/EMPressReleases/PressReleases/20140319_WED2014_TADD.pdf)

DOESN'T FEEL LIKE  
100 YEARS SINCE THE  
LAST FLOOD.

IT'S LIKE DOG  
YEARS, 6 EQUALS  
100.



*"Last week saw a repeat of the devastating 100-year flood that occurred in 2009."*

## k) Self perceptions

Self perceptions are:

- Always wrong
- Always more favorable



## 6. Cognitive biases

A **cognitive bias** is a mistake in reasoning, evaluating, remembering, often occurring as a result of holding onto one's preferences and beliefs regardless of contrary information.

“These guys are great. I picked them myself. The best advisors around”.



# Fallacies and heuristics

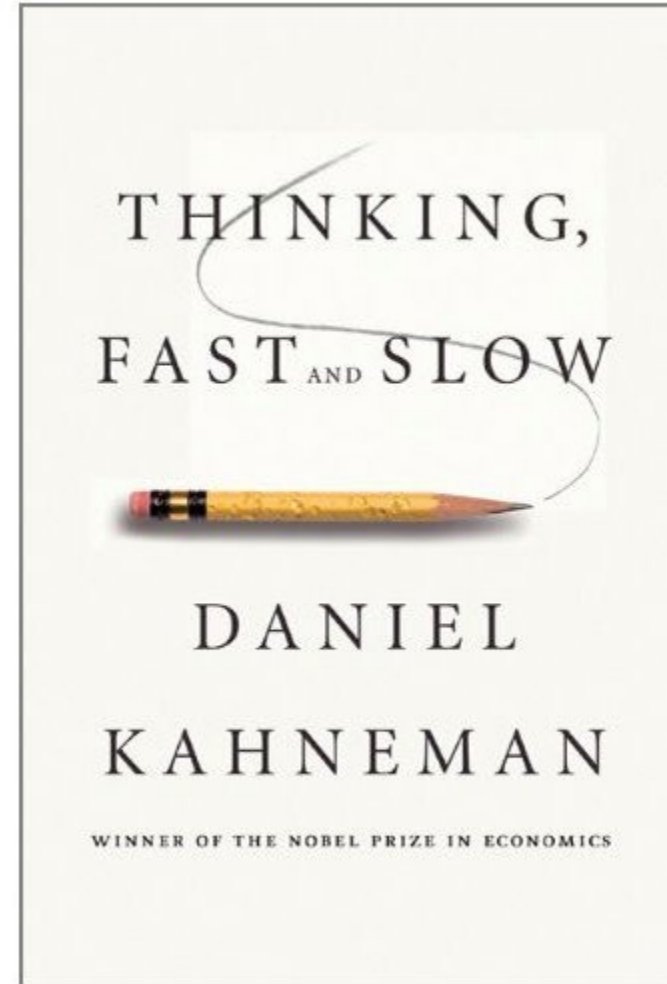
A **cognitive bias** is a mistake in reasoning, evaluating, remembering, often occurring as a result of holding onto one's preferences and beliefs regardless of contrary information.

- A **fallacy** stems from an error in a logical argument, (while a cognitive bias is rooted in thought processing errors often arising from problems with memory, attention, attribution).
- **Heuristics** are simple, efficient rules which people often use to form judgments and make decisions. They are mental shortcuts that usually involve focusing on one aspect of a complex problem and ignoring others.



# Cognitive biases

- Halo effect
- Availability heuristic
- Affect heuristic
- Base-rate neglect
- Hindsight bias
- Illusion of skill
- Illusion of validity
- Best-case fallacy
- Loss aversion
- Representativeness bias
- Sunk-cost fallacy
- Framing effect



# Other cognitive biases

Well groomed hair = neat, tidy

Smiling = Kind, open

- **Halo effect:** Over-rate or generalize first impressions/ single characteristics  
“Rate attractive individuals more favorably for personality than those who are less attractive.”
- **Availability heuristic:** judges the probability of events by the ease with which examples come to mind.
  - Survey road death 300 x diabetes death
  - Reality 1.7 x



Preppy dress = modest, conservative

# Other cognitive biases

- **Hindsight bias:** inclination to overestimate accuracy of past predictions
- “I-knew-it-all-along effect” or “creeping determinism”
- “Hindsight is 20/20”
  
- **Illusion of skill:** Success in predicting the unpredictable is due to talent not luck.

“you receive a letter from a publisher that states that they will publish your manuscript. You tell a friend that you knew that they would publish it. However, the friend reminds you that previously you said you were very uncertain about whether they would accept your paper.”

long-term weather forecasts in farmers' almanacs and the predictions of market gurus about the long-term trends of stock market.

# Bottom Line: Types of behavioral response

## 1. Protective response

- Take immediate action **OR**

## 2. Information seeking: original or new source

- Confirm/contradict existing information
- Obtain additional information
- Relay current information
- Discuss information implications **OR**

## 3. Emotion-focused coping

- Distraction, denial, self-medication



# The bottom line

Hazard awareness is not enough.....  
Knowledge of the community and its  
attitudes is critical

