

Santiago, Chile – May 25-29, 2015

Workshop on  
**National Geophysical Networks in Latin America**  
Best Practices, Challenges, and Opportunities for Collaboration

# Sustainable Networks: Challenges and Opportunities

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# Out of Africa

Adapting the AfricaArray Model  
– Building Capacity Around the World

NSF workshop in conjunction with 2008 AAAS meeting on transitioning networks of earthquake monitoring stations into fully **sustainable** networks of advanced seismic observatories

sustainable networks...

**oxymoron** |,äksə'môr,än| noun

a figure of speech in which apparently  
contradictory terms appear in conjunction

**sustainable** /sə'stānəbəl/ adjective  
able to be maintained at a certain rate or level

**sustainability** /sə'stānəbiliti/ noun  
the capacity to endure

# sustainable networks challenges and opportunities

what does it take?

making the case

moving forward



components	analysis	using results
seismometers, gps	quality control	earth structure and dynamics
data logger	earthquake catalogs	earthquake monitoring
telemetry	shake maps	fault rupture models
data center	velocity models	hazard assessment and risk reduction
<b>people</b>	moment tensor solutions	resilient communities

# sustainable networks challenges and opportunities

what does it take?

making the case

moving forward



components		using results
seismometer		earth structure and dynamics
data logger		earthquake monitoring
telemetry		capture models
data center		hazard assessment and risk reduction
<b>people</b>	monitoring sensor stations	resilient communities

instrumentation  
hardware  
software  
people  
money \$\$\$

# sustainable networks challenges and opportunities

what does it take?    making the case    moving forward

*hardware and software have existing technology solutions*



- ✓ initial investment
- ✓/? operation and maintenance
- ? adopting new technologies
- ? recapitalization
- ✓ training and education (ongoing?)
- ? development of pipeline
- ✓/? education and outreach

# sustainable networks challenges and opportunities

what does it take?    making the case    moving forward

synergy between research and application

balance of resources: human, financial, technical

complex responsibilities: monitoring, hazard assessment, mitigation and response, early warning,

links between seismology, geodesy, engineering, education, public policy, etc....

importance of community



# sustainable networks challenges and opportunities

what does it take?    making the case    moving forward

- synergy between research and operations
- assess, prepare, sustain and follow through
- adopt systems approach: hardware → data → knowledge
- end-to-end integration → instrumentation → data → earthquake location and reporting → early warning
- use appropriate and stable technology
- use standards and open data exchange
- educate and inform policy makers and general public
- leverage diversified support
- develop mutually beneficial and productive collaborations

# sustainable networks challenges and opportunities

what does it take?

making the case

moving forward

skills needed:

technical

administrative

management

political

financial

communication

media smarts

personal vs. institutional...

politics, politics, politics...

# sustainable networks challenges and opportunities

what does it take?

making the case

moving forward

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# sustainable networks challenges and opportunities

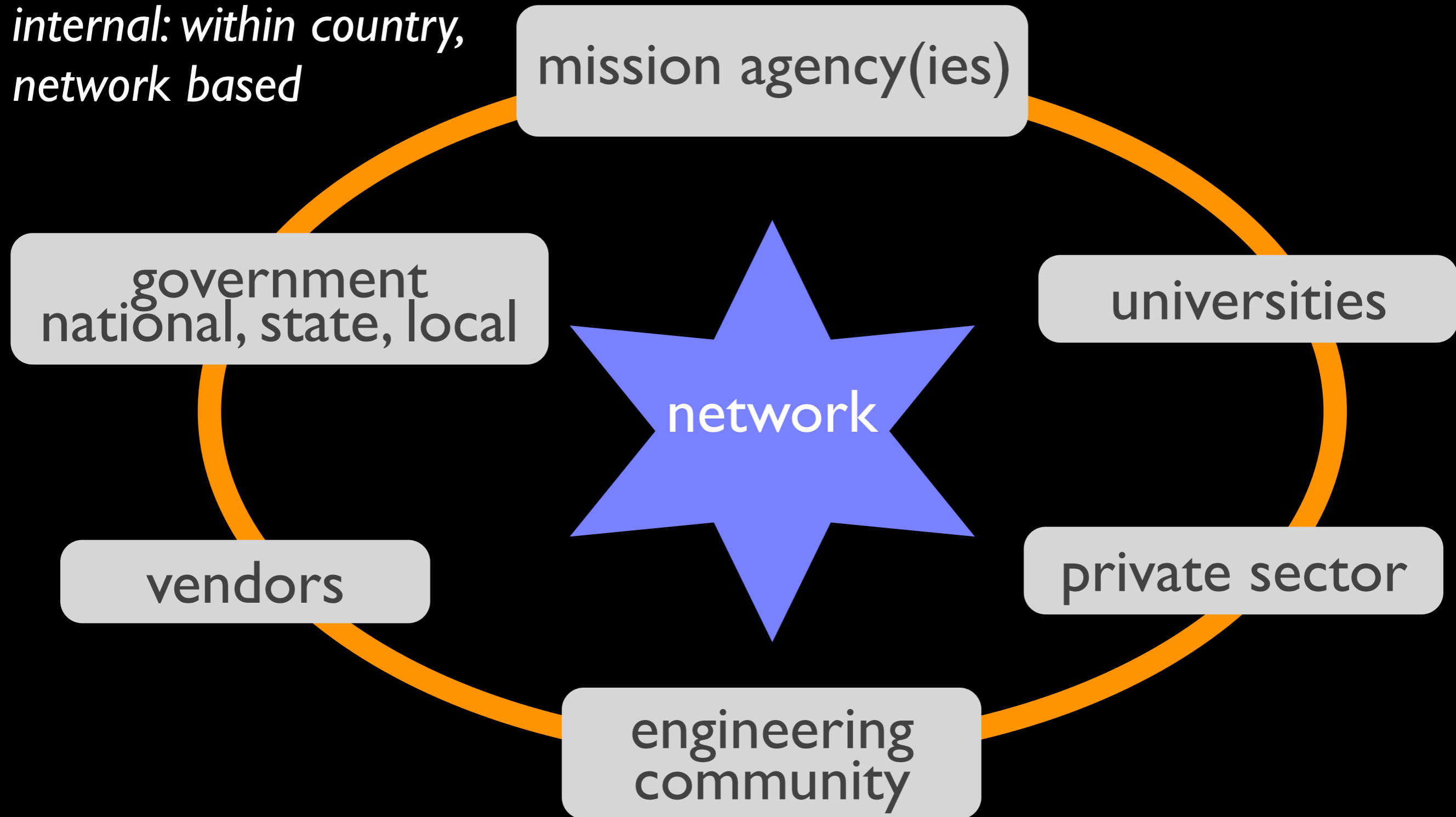
what does it take?

making the case

moving forward

complex network of partnerships and relationships

*internal: within country,  
network based*



# sustainable networks challenges and opportunities

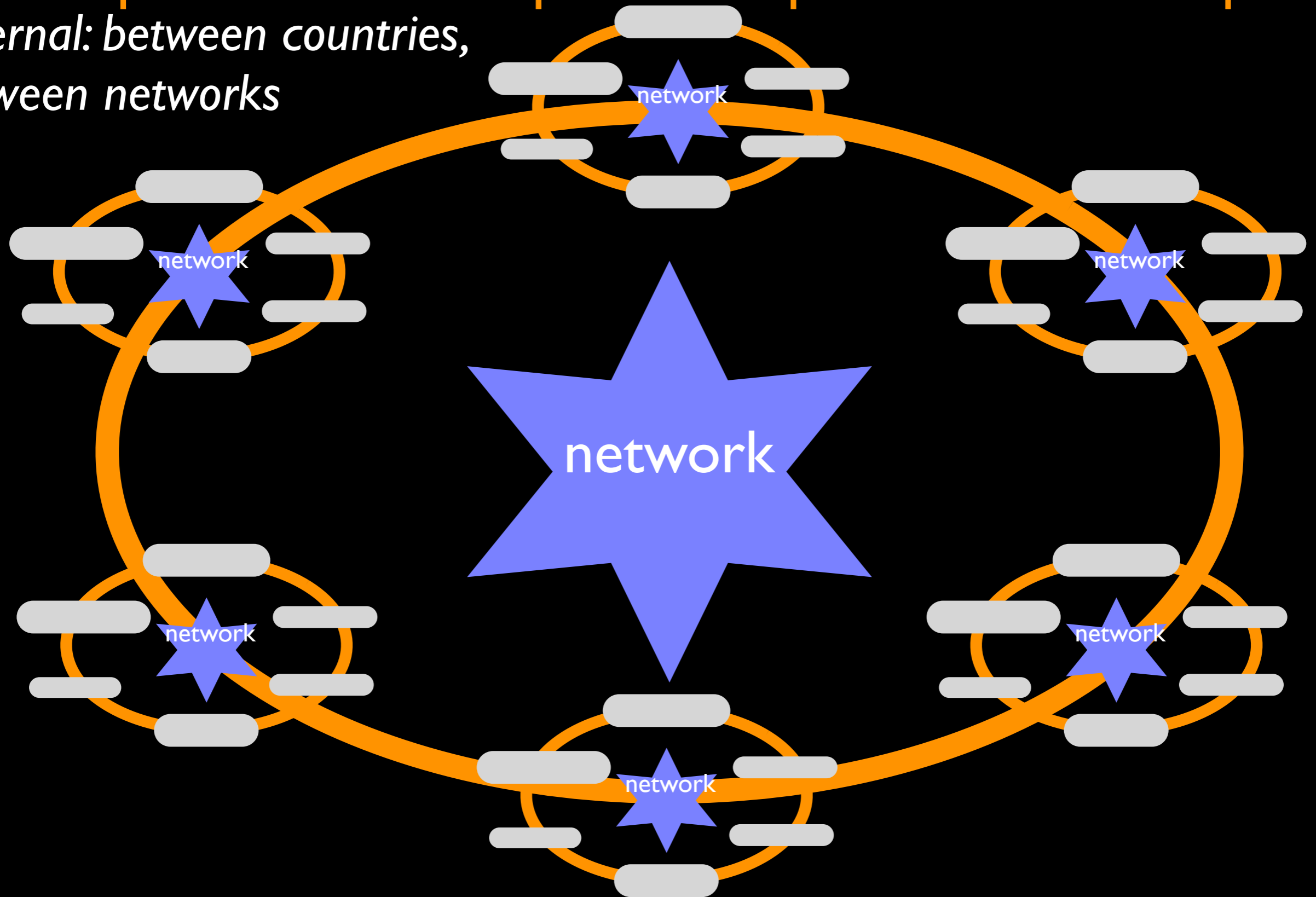
what does it take?

making the case

moving forward

complex network of partnerships and relationships

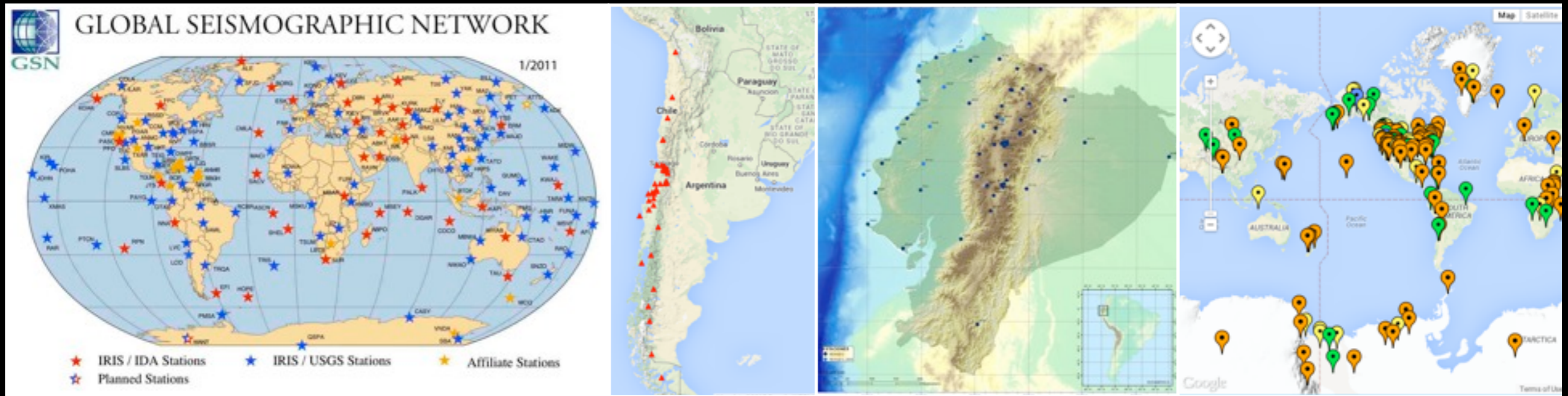
*external: between countries,  
between networks*



# sustainable networks challenges and opportunities

what does it take?    making the case    moving forward

## the importance of local and regional networks



continuum

- permanent observations
- high resolution
- local/regional interests and priorities

- earthquake physics, earth structure, deformation
- hazard assessment, risk mitigation, and early warning
- education

# sustainable networks challenges and opportunities

what does it take?    making the case    moving forward

## the importance of local and regional networks



Mw 7.0 Haiti Eq    Google Images



Mw 7.2 Mexicali Eq    LA Times



Mw 8.8 Maule Eq    Photofans.com



- permanent observations
- high resolution
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- earthquake physics, earth structure, deformation
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# sustainable networks challenges and opportunities

what does it take?

making the case

moving forward

monitoring  
networks and  
disaster reduction

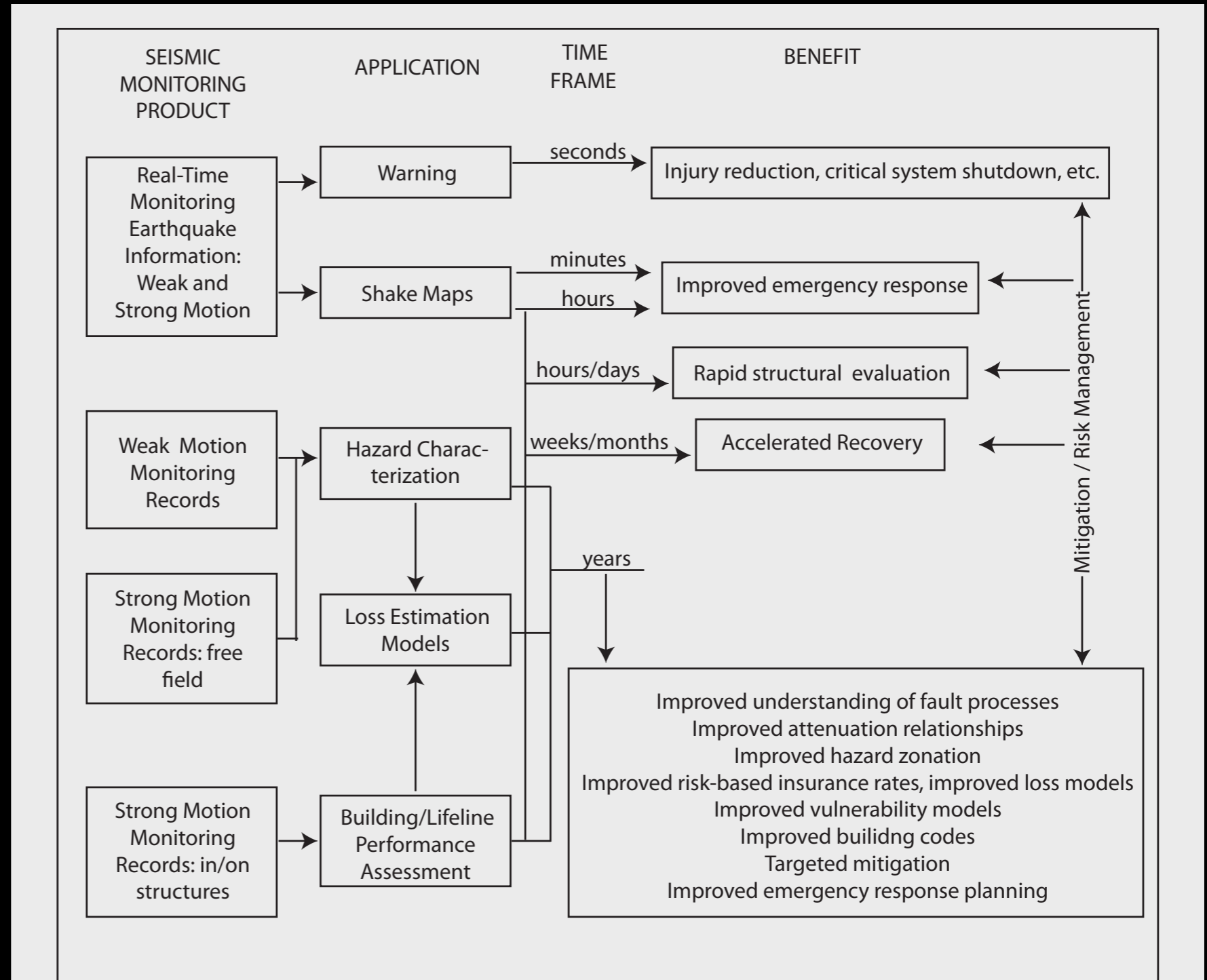


Figure 5. Information path from seismic monitoring to hazard mitigation and risk management. From: Improved Seismic Monitoring – Improved Decision-Making Assessing the Value of Reduced Uncertainty. National Research Council of the National Academies, 2006.



# sustainable networks challenges and opportunities

what does it take? **making the case** moving forward

**expected benefits**

relevant hazards are  
recognized and understood

communities at risk know when  
a hazard event is imminent

property losses and lives at risk  
in future earthquakes are  
minimized

disaster resilient communities  
experience minimum disruption  
to life and economy after a  
hazardous event has passed

## Grand Challenges for Disaster Reduction

National Science and Technology Council  
Committee on Environment and Natural Resources



A Report of the  
Subcommittee on Disaster Reduction

June 2005

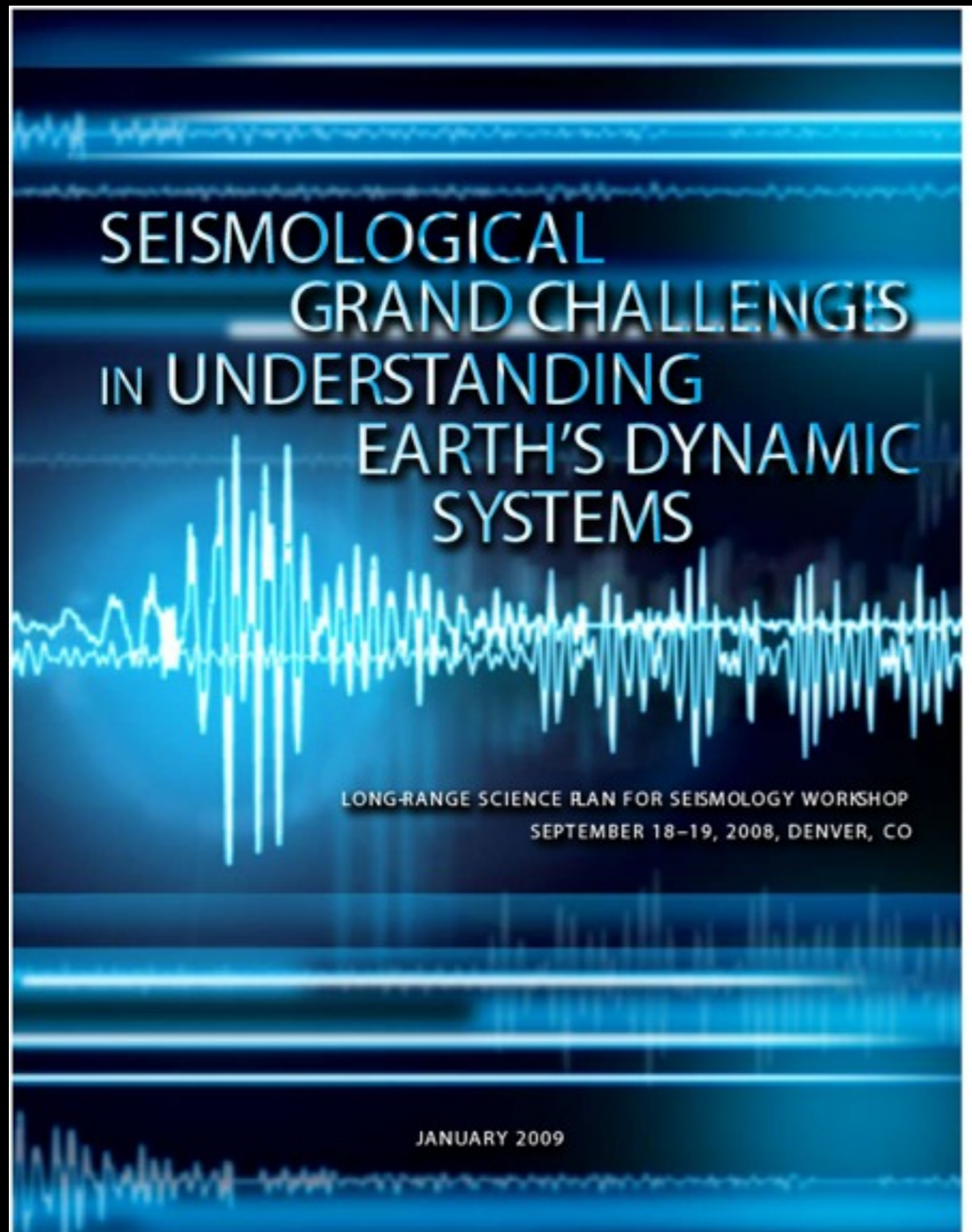
 sdr  
subcommittee on disaster reduction



# sustainable networks challenges and opportunities

what does it take?    making the case    moving forward

science and discovery



A Foundation for Innovation:



Grand Challenges in Geodesy



# sustainable networks challenges and opportunities

what does it take? **making the case** moving forward



Heredia, Costa Rica, October 2010

81 Participants 21 Countries

## regional priorities:

- disaster risk reduction a priority with a strong institutional basis for implementation
- identify, assess, and monitor earthquake risks and enhance rapid notification
- use knowledge, innovation, and education to establish a culture of security and resilience make at all levels
- reduce the underlying risk factors
- strengthen earthquake preparedness for effective response at all levels

## working groups with broad regional representation

- hazards and risks
- preparedness and response
- monitoring and data management
- education and outreach
- research



# sustainable networks challenges and opportunities

what does it take?

making the case

moving forward

## making the value proposition

hazards



poverty  
clean water  
food security  
health  
education

healthy and safe communities  
economic development and security  
networks as national assets

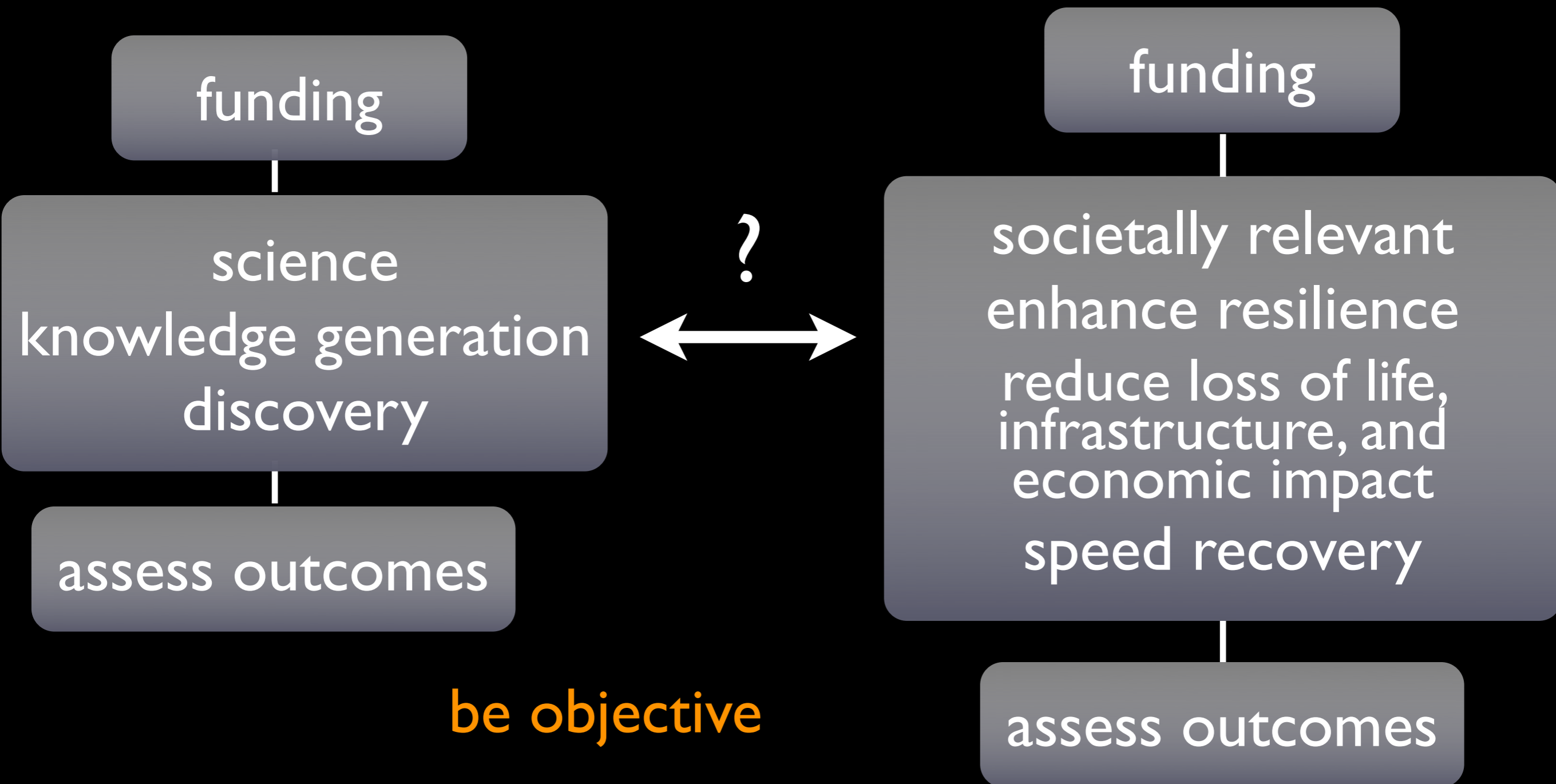
# sustainable networks challenges and opportunities

what does it take?

**making the case**

moving forward

## aligning resources with priorities



# sustainable networks challenges and opportunities

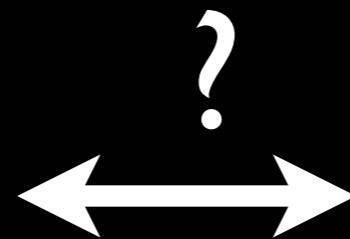
what does it take?

making the case

moving forward

## managing expectations

earthquake:  
forecasting/prediction  
early warning



earthquake monitoring  
hazard assessment  
risk reduction  
resilient communities

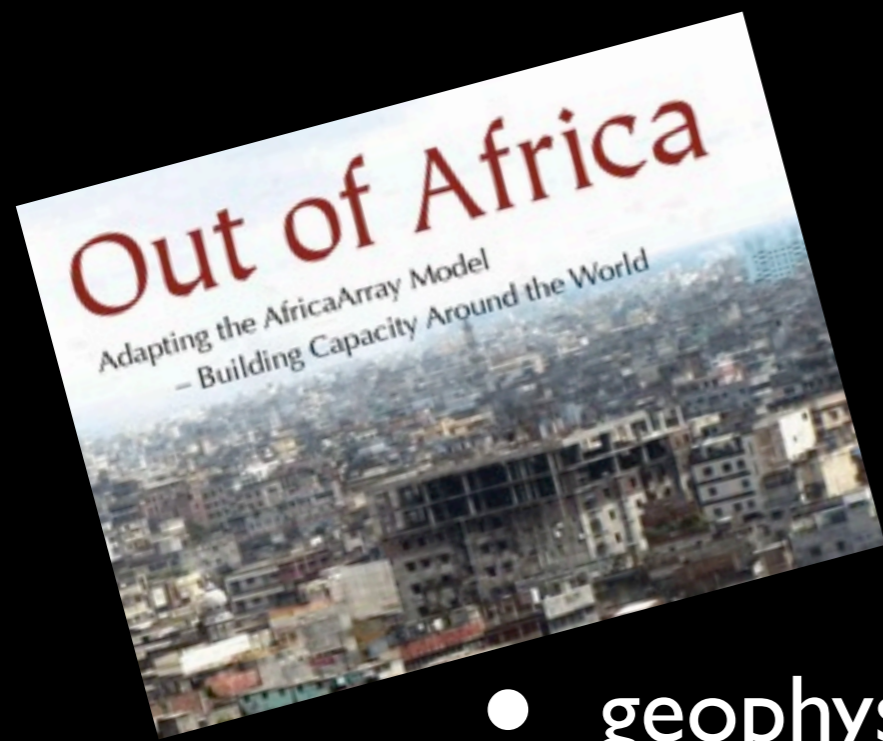
articulate clear goals and outcomes

# sustainable networks challenges and opportunities

what does it take?

making the case

moving forward



## workshop summary

- geophysicists must be “densified” through more education and training
- new instruments are needed, but must be coupled to **effective capacity building**
- software and instruments must be adapted for local requirements
- regional data centers and confidence building measures are needed to move towards open data

# sustainable networks challenges and opportunities

what does it take?

making the case

moving forward

## human resources

education...

community....

local

regional

international

collaboration...