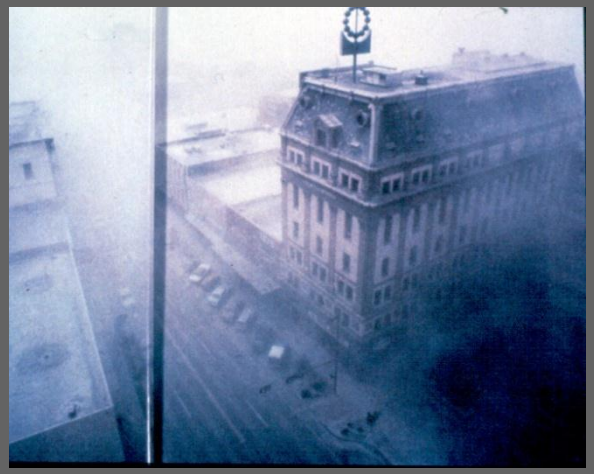
The role of multidisciplinary research and collaboration for improving the resilience of communities to volcanic hazards

MASSEY UNIVERSITY

David Johnston
Joint Centre for Disaster Research
GNS Science / Massey University

GNS SCIENCE
TE PŪ AO

Policy



Practice ⟷ Research


VOLCANO HAZARD MANAGEMENT
NON CRISIS
CRISIS
Risk Reduction
Readiness
Crisis Management
Risk analysis
Land-use planning
Volcano monitoring
Emergency preparedness
Public education
Volcano monitoring
Warnings & public information
Emergency response
Recovery

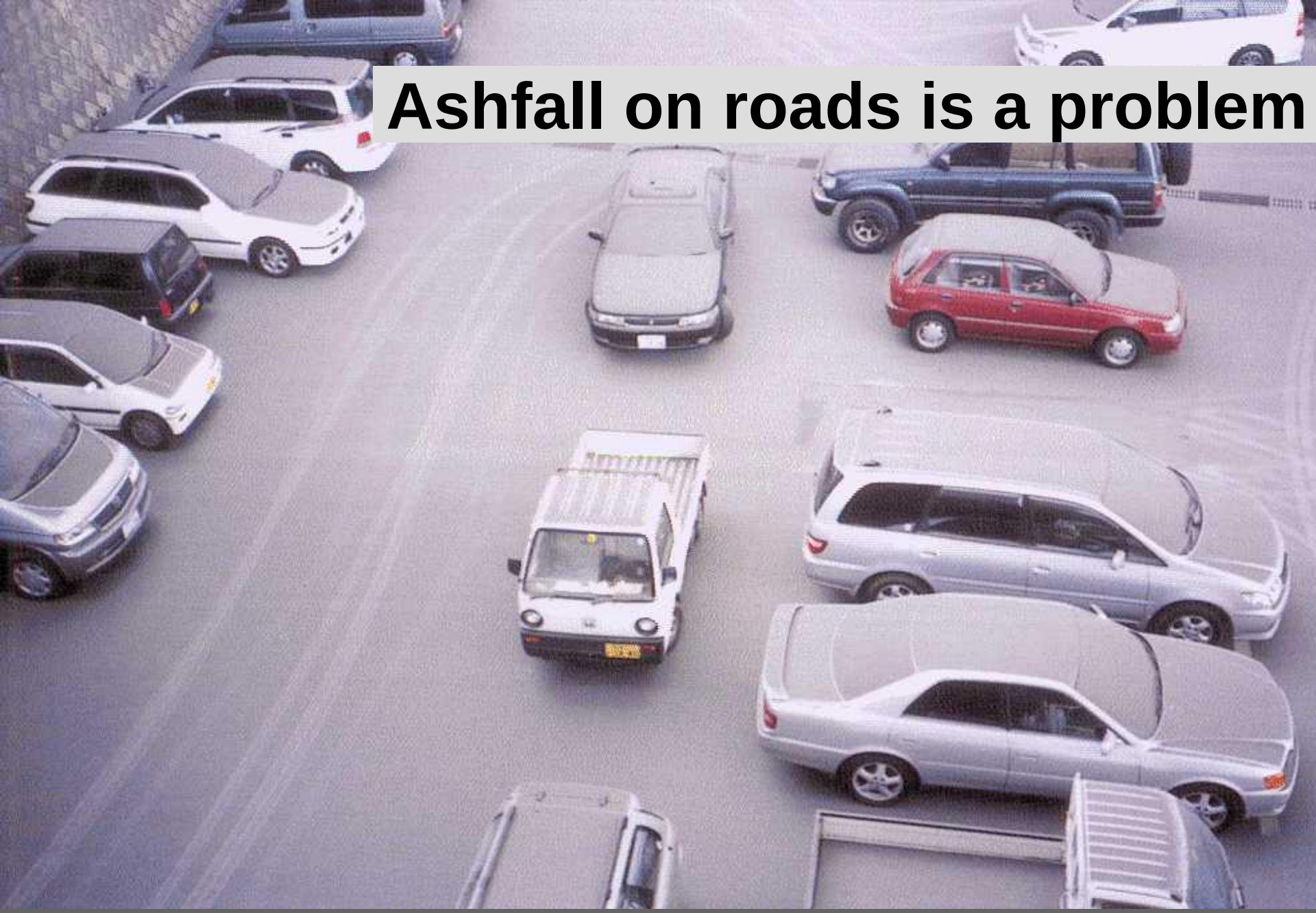
Eruption Events: what has shaped our understanding?

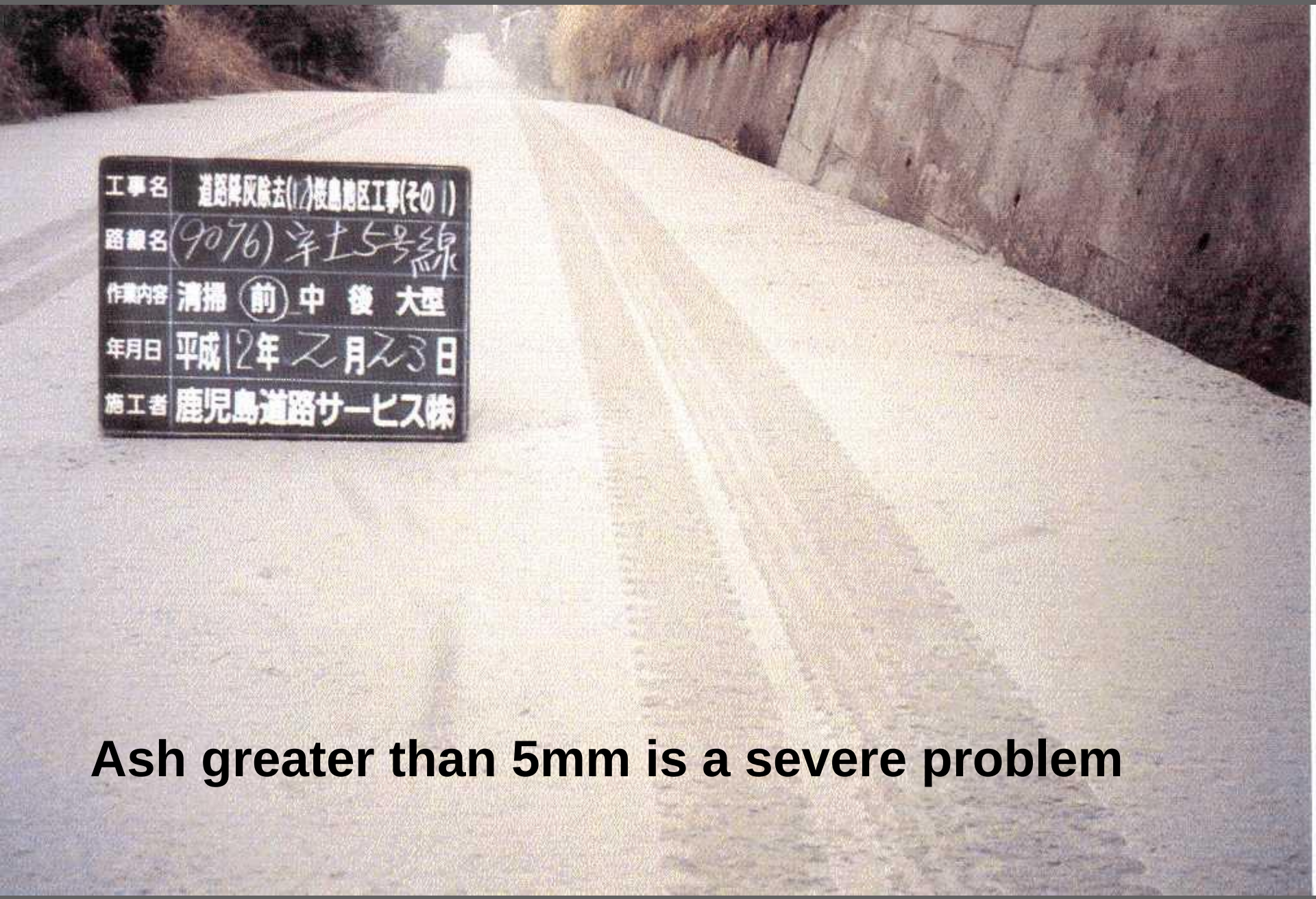
- Research has been hampered by a lack of systematic impact assessment
- Series of reconnaissance trips made overseas to assess impacts, along with local observations

Cities Coping with Volcanic Ash

Lessons learned from the visit of a 7 person party to Kagoshima City and Sakurajima Volcano 11-19 June 2001

Ashfall on roads is a problem



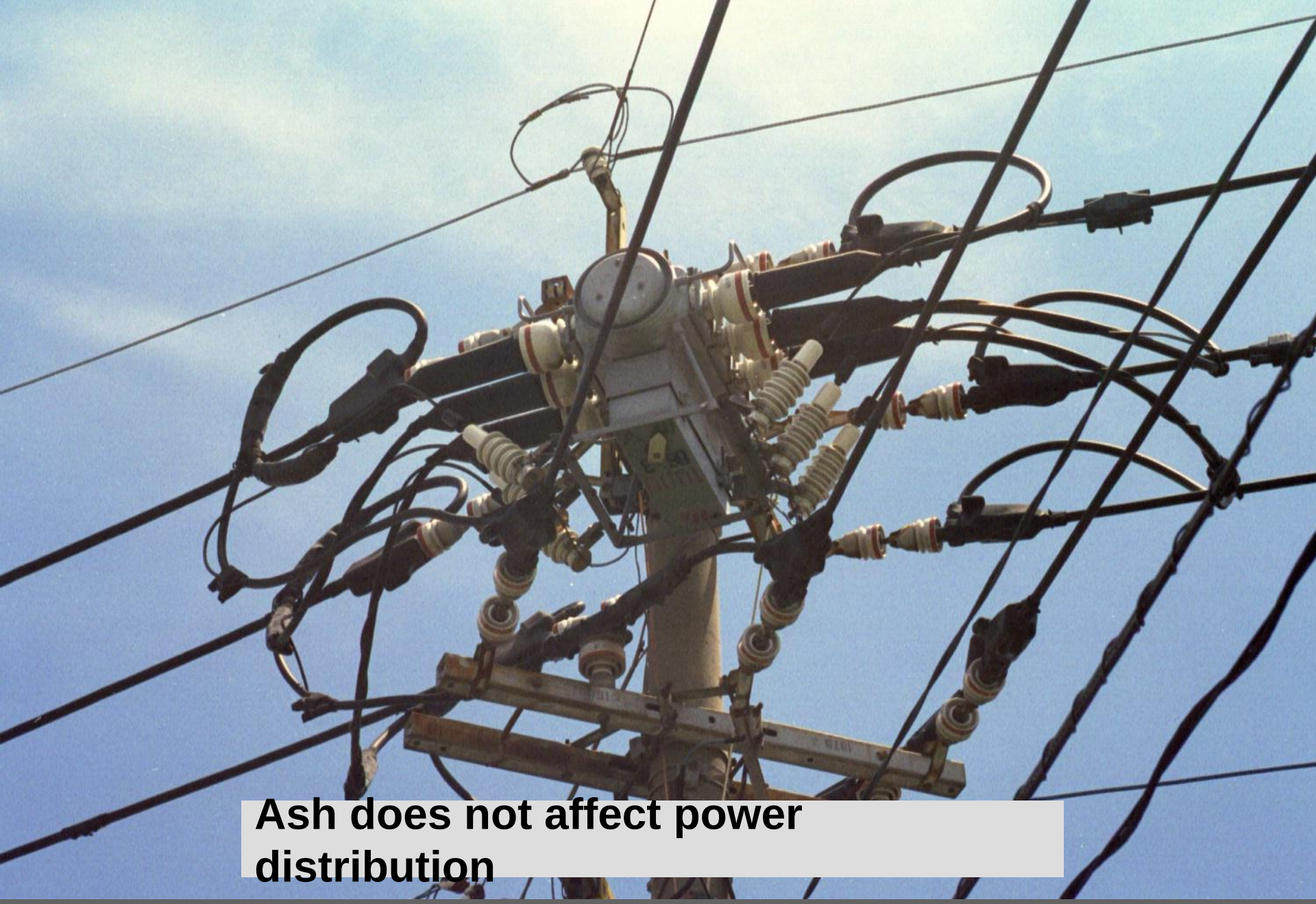


Ash greater than 5mm is a severe problem

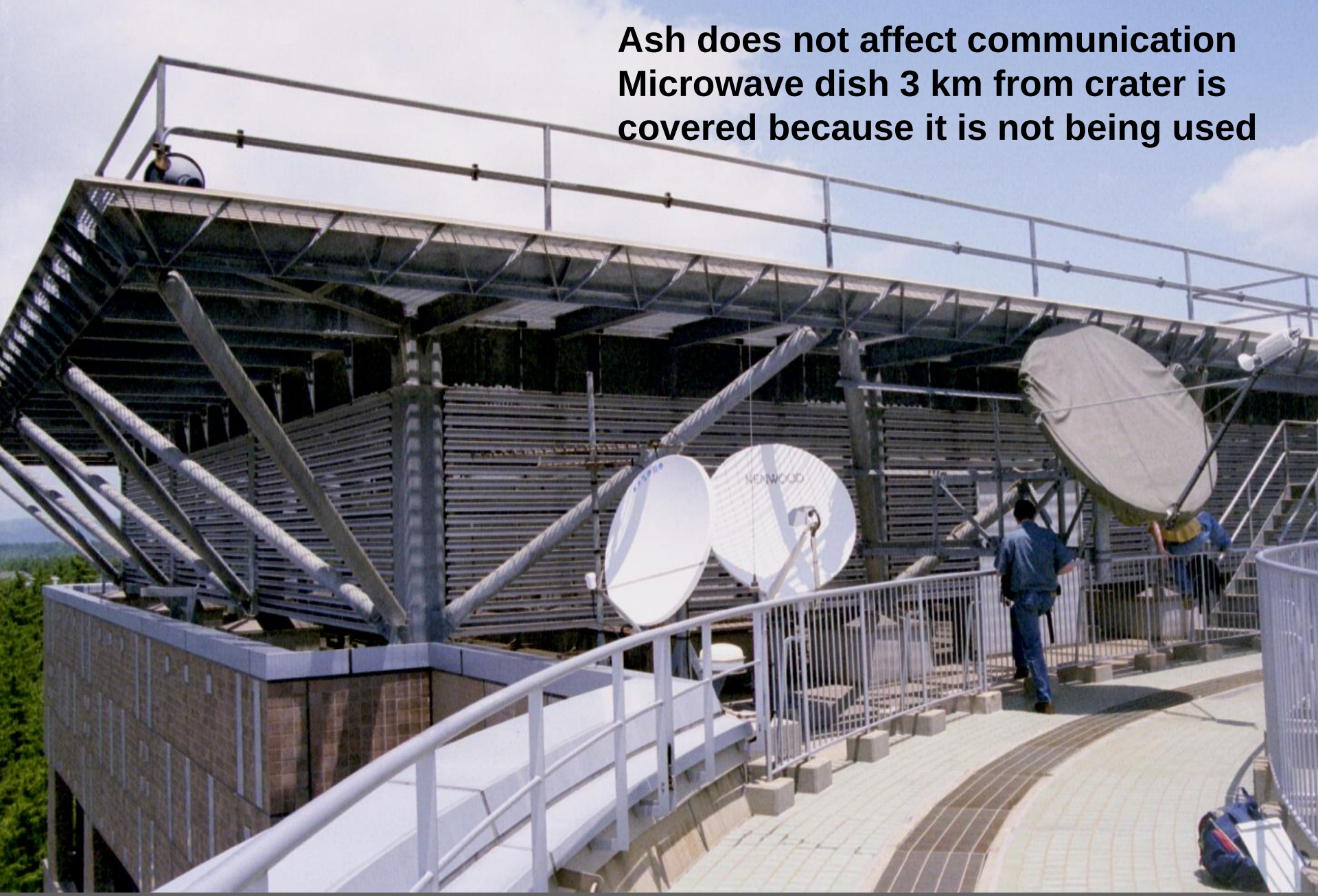
Ash is cleared within 3 days

Footpaths are cleaned with hand sweepers

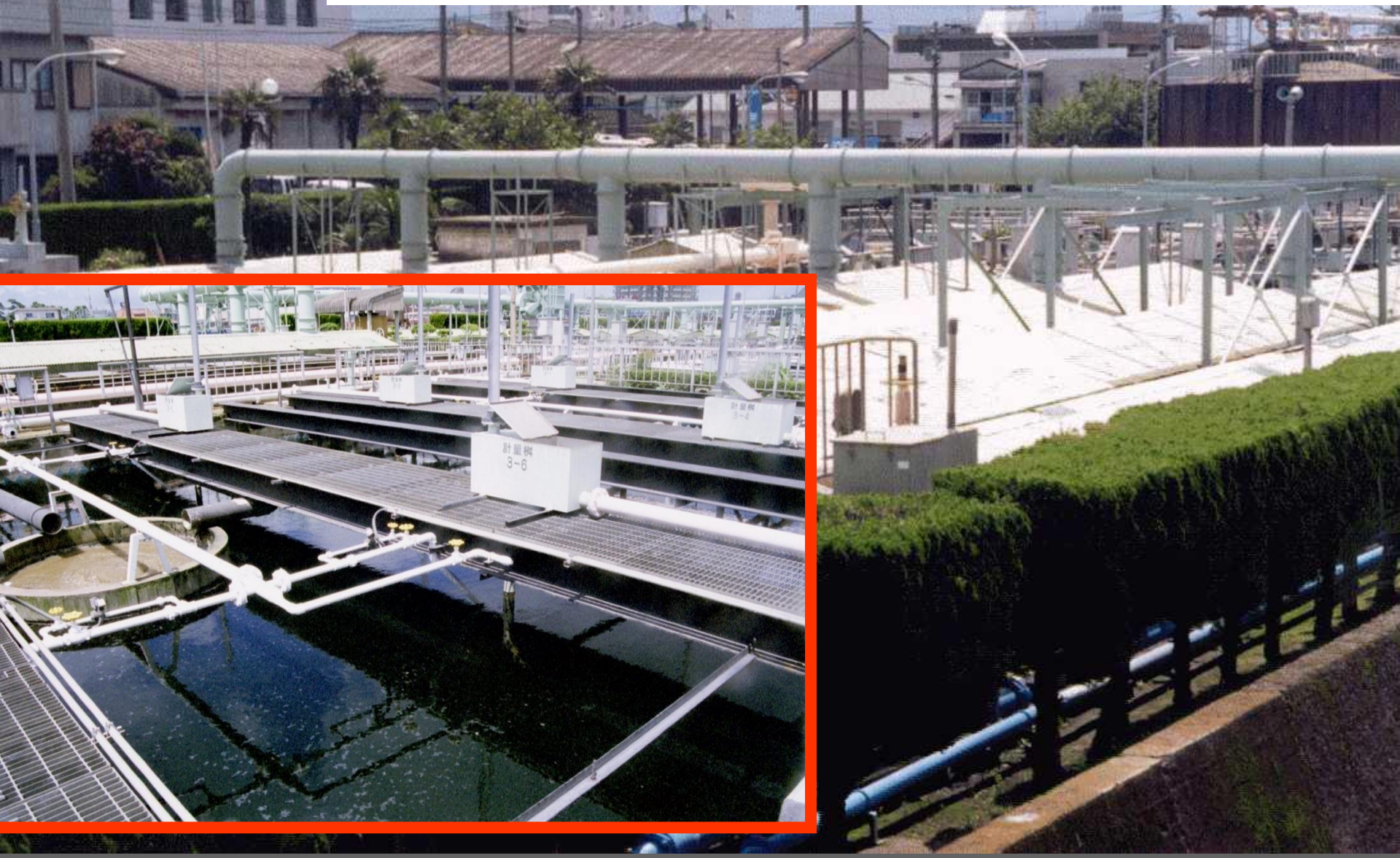
- Note facemasks, goggles and hats



Ash does not affect power distribution


Ash does not affect communication
Microwave dish 3 km from crater is covered because it is not being used

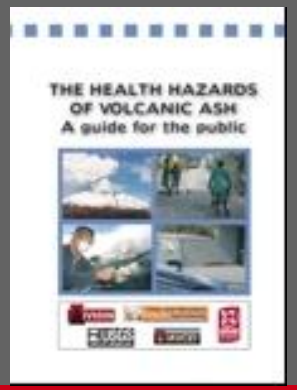
Treatment plant tanks covered because of smell not because of ash



Ecuador 2005

NEW Ash-Impacts Website

http://volcanoes.usgs.gov/ash/

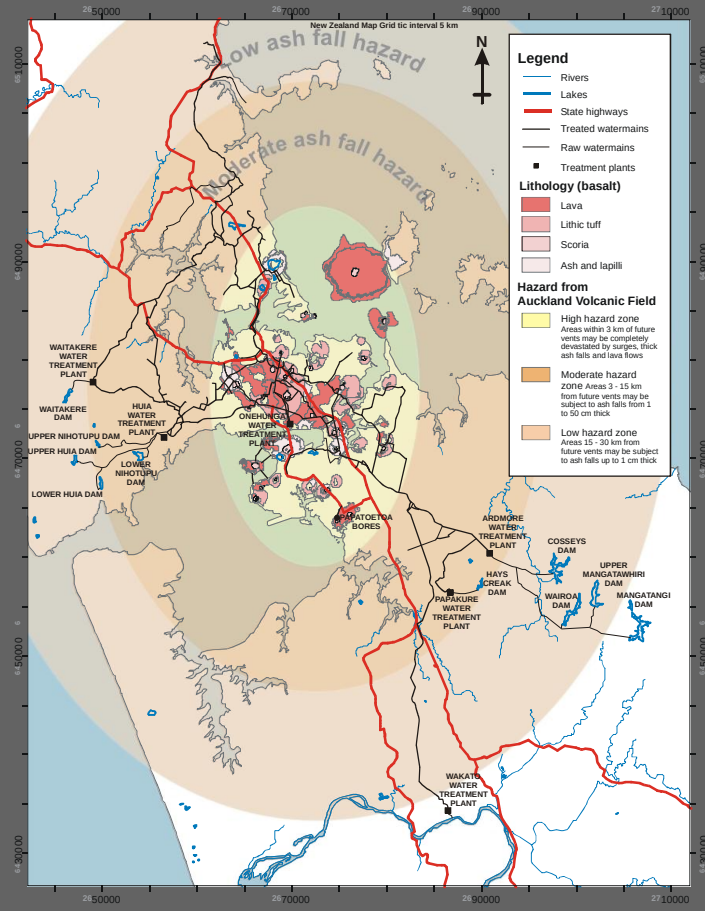


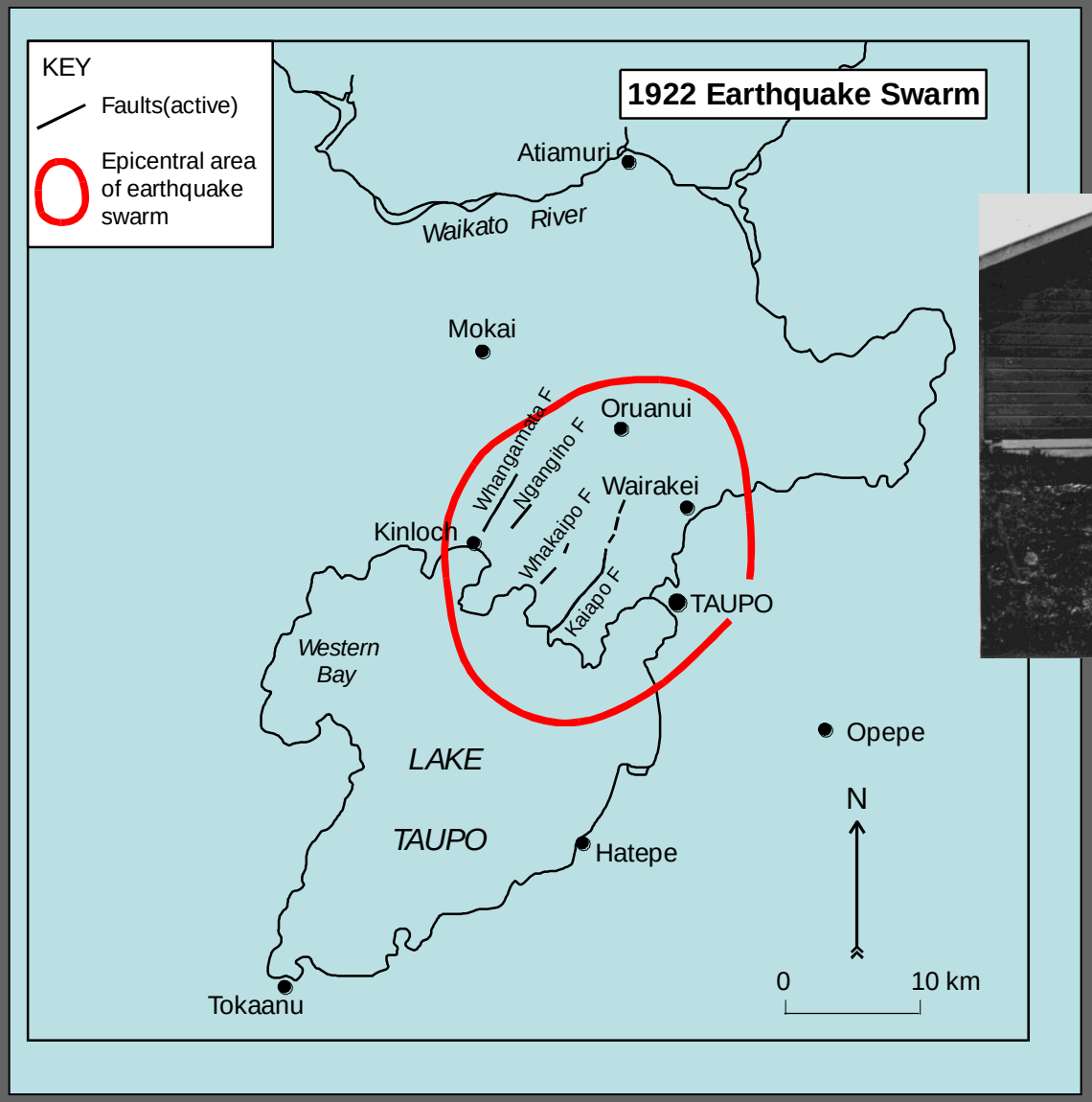
Community behaviour and response to escalating volcanic crisis

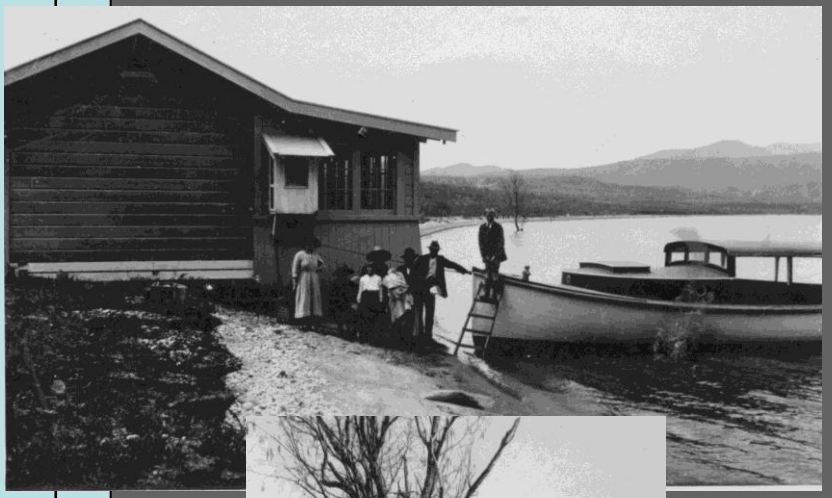
What do we know?

– Historic examples

- 1970 unrest at Campi Flegrei, Italy
- 1983-85 Rabaul crisis, PNG
- 1982 Long Valley, USA
- 1895, 1922, 1964-1965 and 1983, Taupo, New Zealand
- Many other examples from actual eruptions

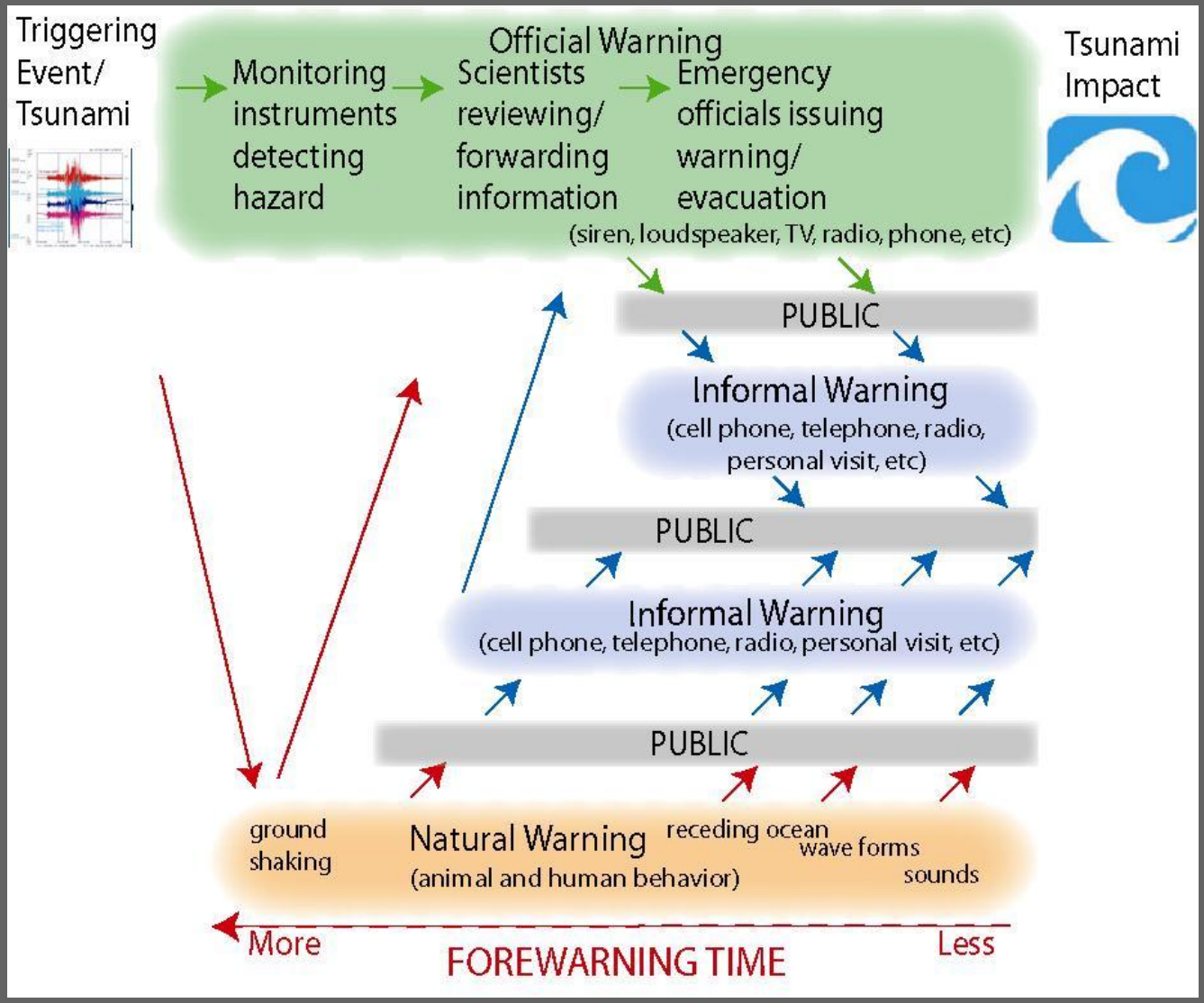



KEY
Faults(active)
Epicentral area of earthquake swarm
1922 Earthquake Swarm
Atiamuri
Waikato River
Mokai
Oruanui
Whangamata F
Ngangiho F
Wairakei
Whakaipo F
Kinloch
Kaiapo F
TAUPO
Western Bay
LAKE
TAUPO
Opepe
Hatepe
Tokaanu
N
0
10 km

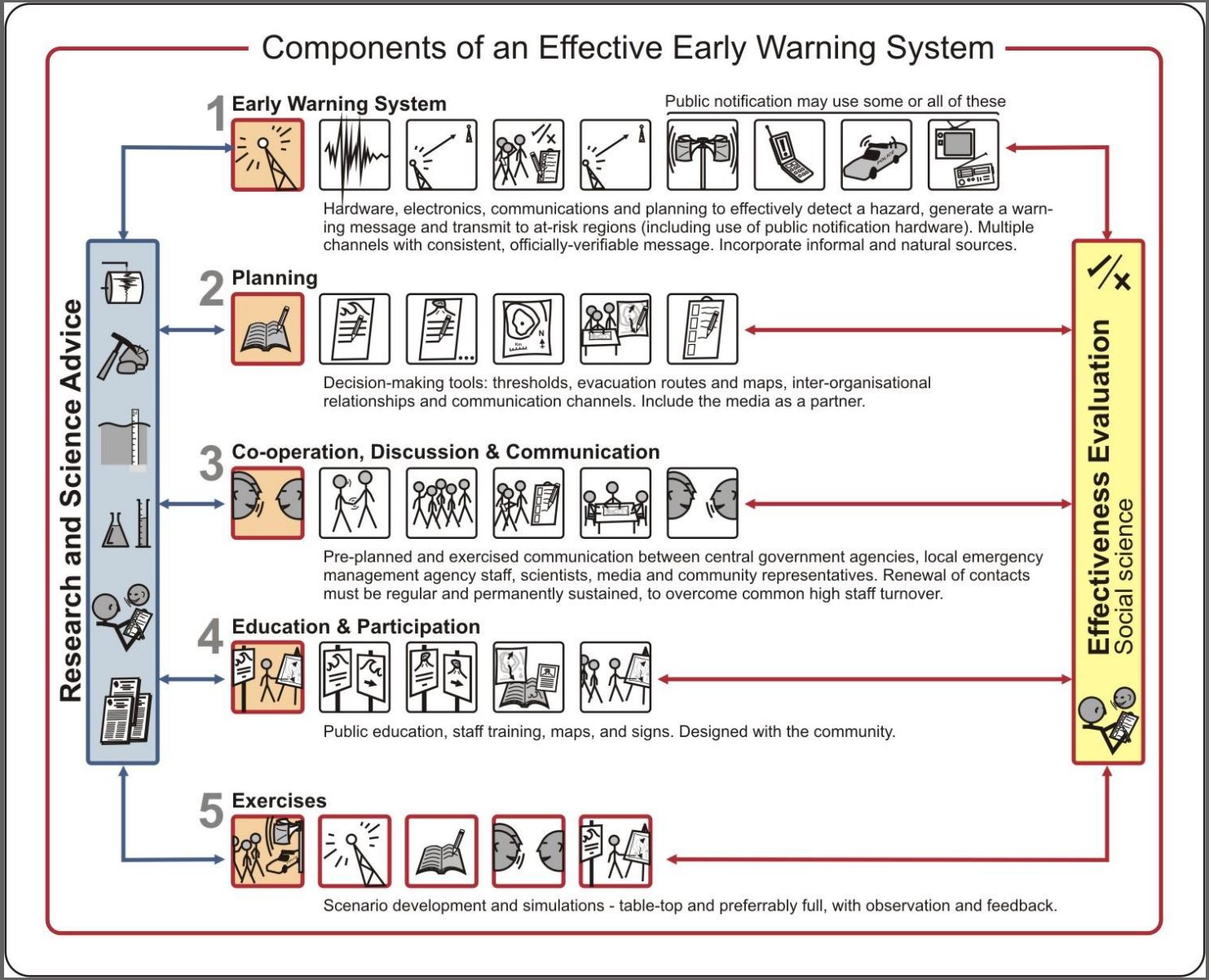


1982 Unrest at Long Valley, Mammoth Lakes, USA

Warning sources



Effective warnings – an evolving model



Leonard et al. (2008)

Building community resilience

What attributes does a resilient community have?

What can the EM agencies do to better influence community resilience?

How resilient is our community currently?

Can we measure the impact the agencies are having?

Future efforts must address factors at three levels:

Personal level –

Their belief in the benefits of hazard mitigation (*outcome expectancy*)

Their ability to confront hazards (*reduce negative outcome expectancy*)

Community level –

Encourage active involvement in community affairs (*community participation*)

Develop community ability to resolve collective issues (*articulating problems*)

Institutional level –

Develop an individual's ability to influence what happens in their community (*empowerment*)

The level of trust they have in organisations (*trust*)

http://cav.volcano.info/

IRDR
Integrated Research on Disaster Risk

Integrated Research on Disaster Risk

addressing the challenge of natural and human-induced environmental hazards

ICSU
International Council for Science

ISDR
International Strategy for Disaster Reduction

ISSC
international social science council

Issues

- **Globalization**
- **Population growth**
- **Widespread poverty**
- **Changing climate**

- **Urban areas**
  - **Complex infrastructure**
  - **Concentration and centralization of economic and political functions**
  - **Social segregation and**
  - **Complex spatial and functional inter-relationships**

Key question:

Why, despite advances in the natural and social science of hazards and disasters, do losses continue to increase?

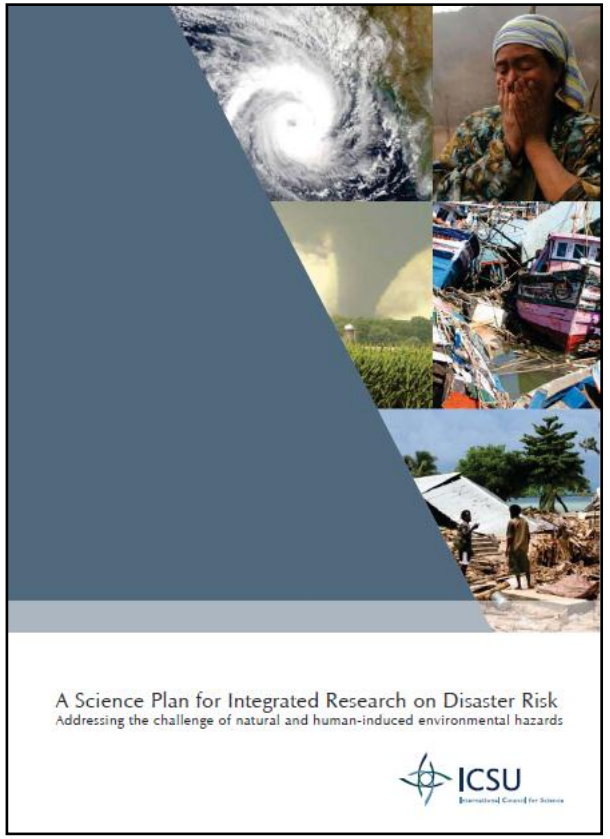
IRDR

Integrated Research on Disaster Risk

The Science Plan

Addressing the challenge of natural and human-induced environmental hazards

An integrated approach to research on disaster risk through: an international, multidisciplinary (natural, health, engineering and social sciences, including socio-economic analysis) collaborative research programme.



IRDR
Integrated Research on Disaster Risk

IRDR Science Plan at:

www.icsu.org/Gestion/img/ICSU_DOC_DOWNLOAD/2121_DD_FILE_Hazard_report.pdf

Partners

- National and international science institutions
- National and international development assistance agencies and funding bodies
- National IRDR

IRDR
Integrated Research on Disaster Risk

Sponsors

ICSU
International Council for Science

ISDR
International Strategy for Disaster Reduction

ISSC
international social science council