Eruption and lahar warnings at Pinatubo Volcano: a comparison

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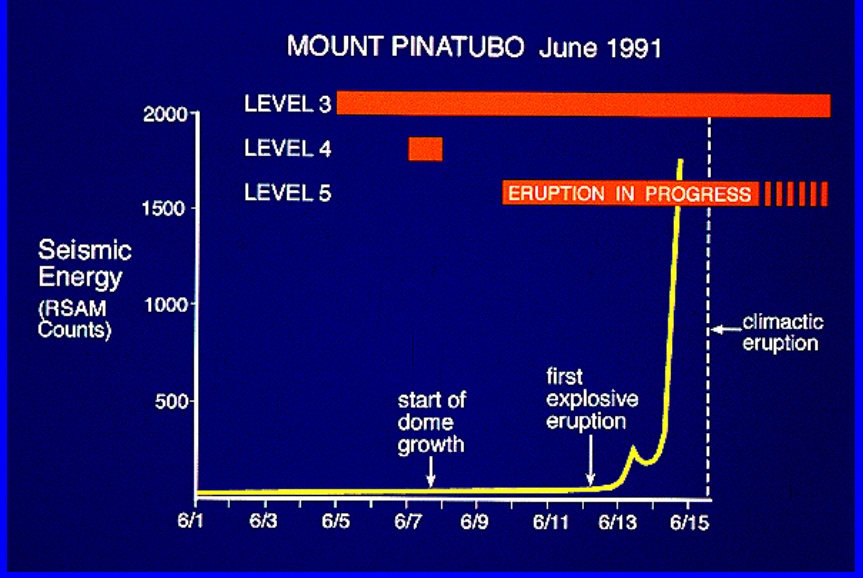
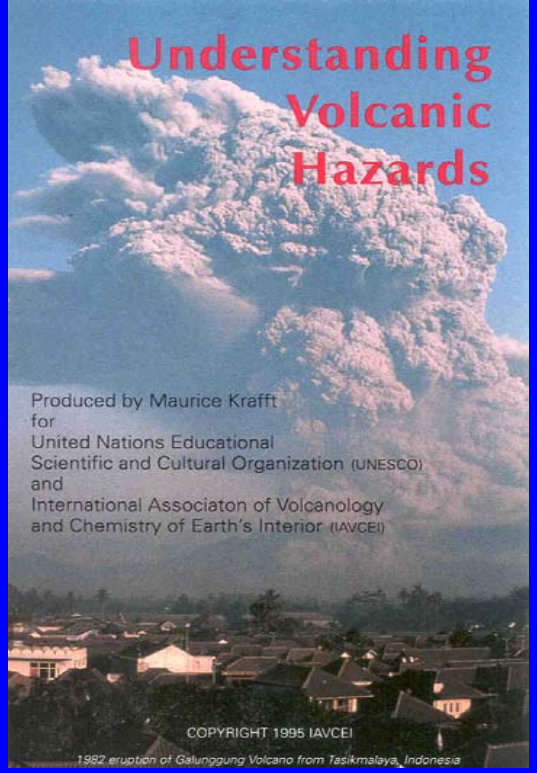
Eruption warnings

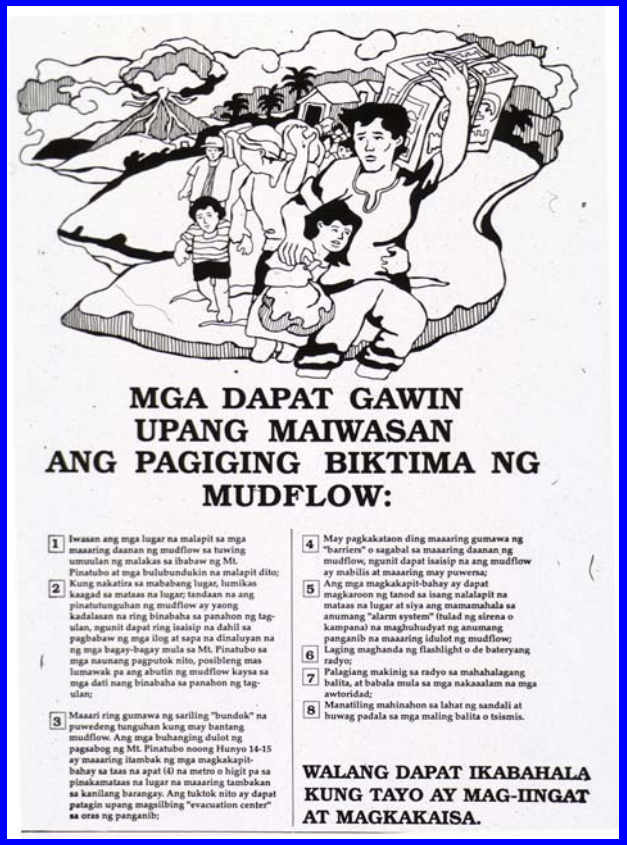
- Scientific situation: No prior monitoring, minimal funding, and no experience w/ this scale of eruption, but good int'l collaboration and 2 months of progressive notice from the volcano itself
- Public Situation: Unfamiliar hazard, urgent public education, serious skepticism to overcome
- Tools: "worst-case map," 5-level warnings, graphic video, week(s)-long evacuation by order & example
- Single source for warnings (PHIVOLCS), w/ good liaison to civil defense and news media.
- Largely successful, up to 20,000 saved

Lahar (mudflow) warnings

- Scientific situation: Monitoring reinstalled and mapping completed quickly. Hazard easily predictable hours to days in advance but of an enormous scale and long duration (10 y)
- Public situation: Still in shock from eruption, couldn't grasp scale; lots of denial and NIMBY
- Tools: Hazard maps; raingages and lahar sensors; watchposts, multi-level warning system, temporary evacuations
- Multiple warning sources; competition; confusion
- Issues of long-term relocation vs. dike construction
- Warnings partly successful; much saved, but also unnecessary deaths and expense



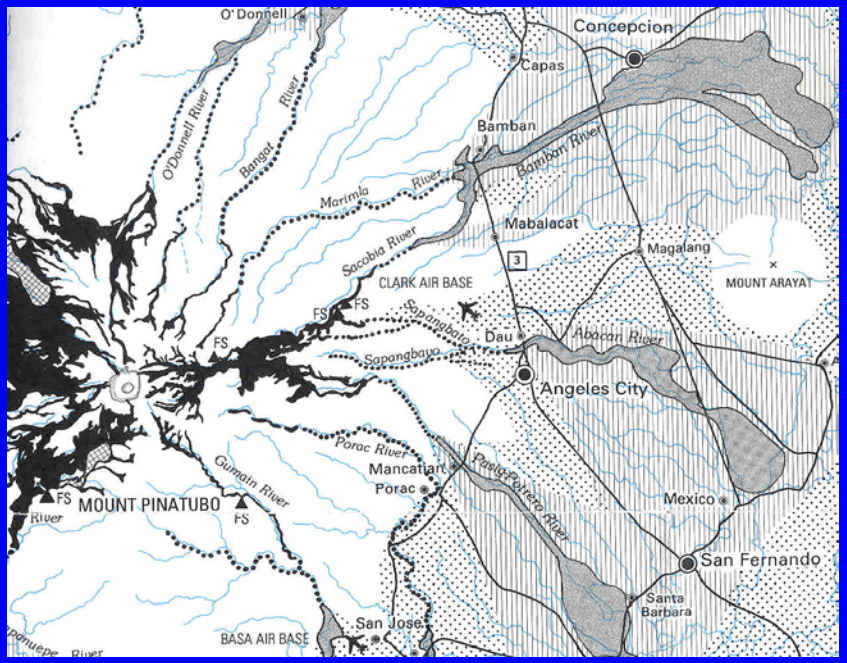




MGA DAPAT GAWIN UPANG MAIWASAN ANG PAGIGING BIKTIMA NG MUDFLOW:

1. Iwasan ang mga lugar na malapit sa mga maaaring daanan ng mudflow sa tuwing umuulan ng malakas sa lbabaw ng Mt. Pinatubo at mga bulubundukin na malapit dito;
2. Kung nakatira sa mababang lugar, lumikas kaagad sa mataas na lugar; tandaan na ang pinatutunguhan ng mudflow ay yaong kadalasan na ring binabaha sa panahon ng tag-ulan, ngunit dapat ring isaisip na dahil sa pagbabaw ng mga ilog at sapa na dinaluyan na ng mga bagay-bagay mula sa Mt. Pinatubo sa mga naunang pagputok nito, posibleng mas lumawak pa ang abutin ng mudflow kaysa sa mga dati nang binabaha sa panahon ng tag-ulan;
3. Maaari ring gumawa ng sariling "bundok" na puwedeng tunguhan kung may bantang mudflow. Ang mga buhanging dulot ng pagsabog ng Mt. Pinatubo noong Hunyo 14-15 ay maaaring itambak ng mga magkakapit-bahay sa taas na apat (4) na metro o higit pa sa pinakamataas na lugar na maaaring tambakan sa kanilang barangay. Ang tuktok nito ay dapat patagin upang magsilbing "evacuation center" sa oras ng panganib;
4. May pagkakataon ding maaaring gumawa ng "barriers" o sagabal sa maaaring daanan ng mudflow, ngunit dapat isaisip na ang mudflow ay mabilis at maaaring may puwersa;
5. Ang mga magkakapit-bahay ay dapat magkaroon ng tanod sa isang nalalapit na mataas na lugar at siya ang mamamahala sa anumang "alarm system" (tulad ng sirena o kampana) na maghuhudyat ng anumang panganib na maaaring idulot ng mudflow;
6. Laging maghanda ng flashlight o de bateryang radyo;
7. Palagiang makinig sa radyo sa mahahalagang balita, at babala mula sa mga nakaaalam na mga awtoridad;
8. Manatiling mahinahon sa lahat ng sandali at huwag padala sa mga maling balita o tsismis.

WALANG DAPAT IKABAHALA KUNG TAYO AY MAG-IINGAT AT MAGKAKAISA.



Lessons

- Ideally, have monitoring in place long before crisis. If not, have funding preauthorization and be ready to start.
- Expect skepticism and work urgently to overcome it
- Keep message simple, easily visualized (not just maps), consistent, and a consensus of scientific and engineering opinion
- Scientists and officials must be prepared to risk false alarms
- Encourage multi-level participation, but have a clear leader
- Invest in good communications infrastructure -- linking scientists, officials, and the public. Cell phone and other technologies now available.

Difficult issues

Before and during a crisis:

- Can local residents/stakeholders be involved in the warning process w/o creating conflicting messages? (yes… through public education *)
- How best to overcome skepticism? (videos, exchange visits? *)
- Can all scientists and engineers be heard but then speak with one voice? (yes, but may need strong facilitator)
- Can the news media be engaged to educate and promote constructive dialogue rather than sensationalism, friction? (yes, as leaders in the public education *)
- * All of these points apply to tsunami warnings as well.