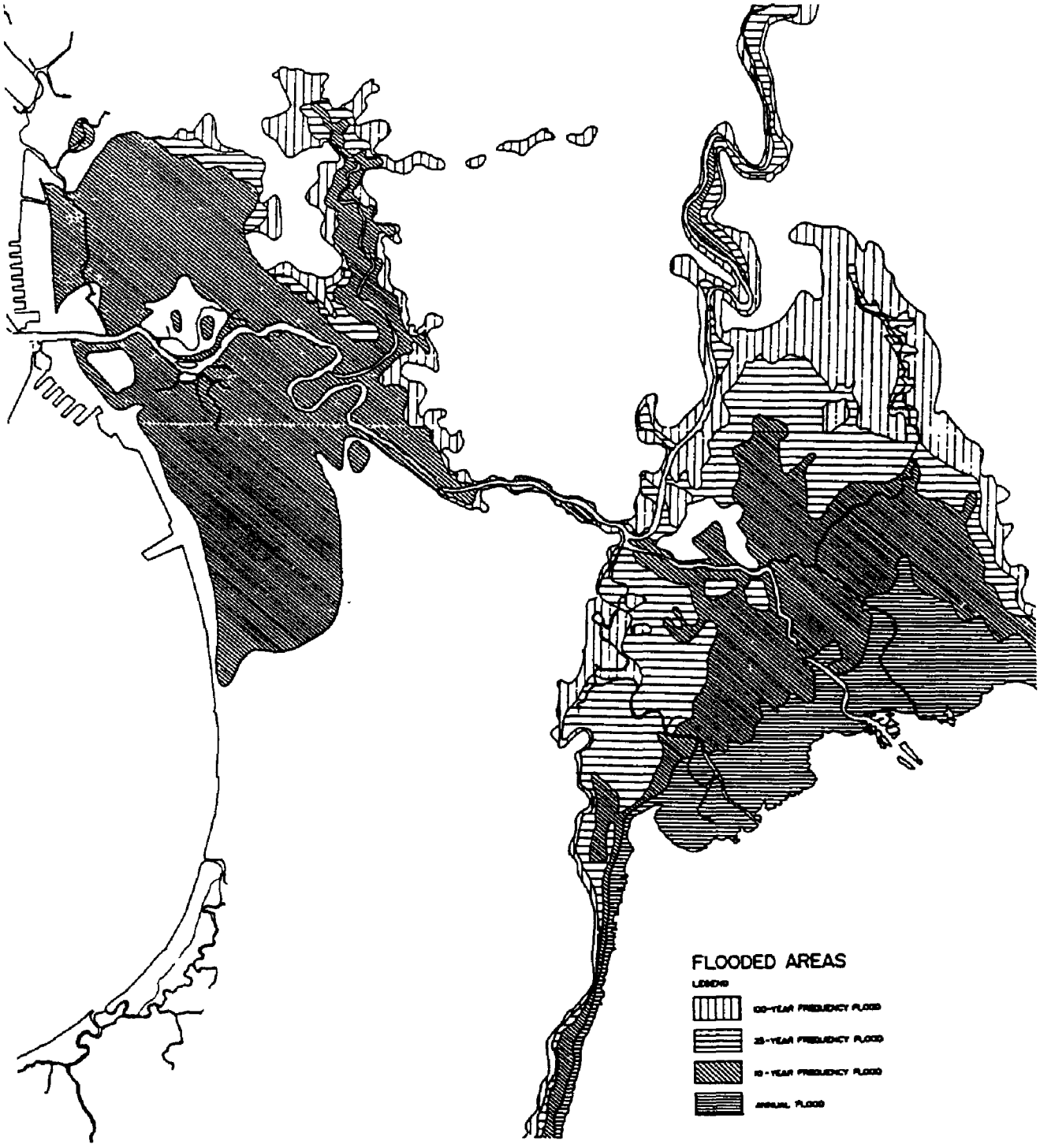
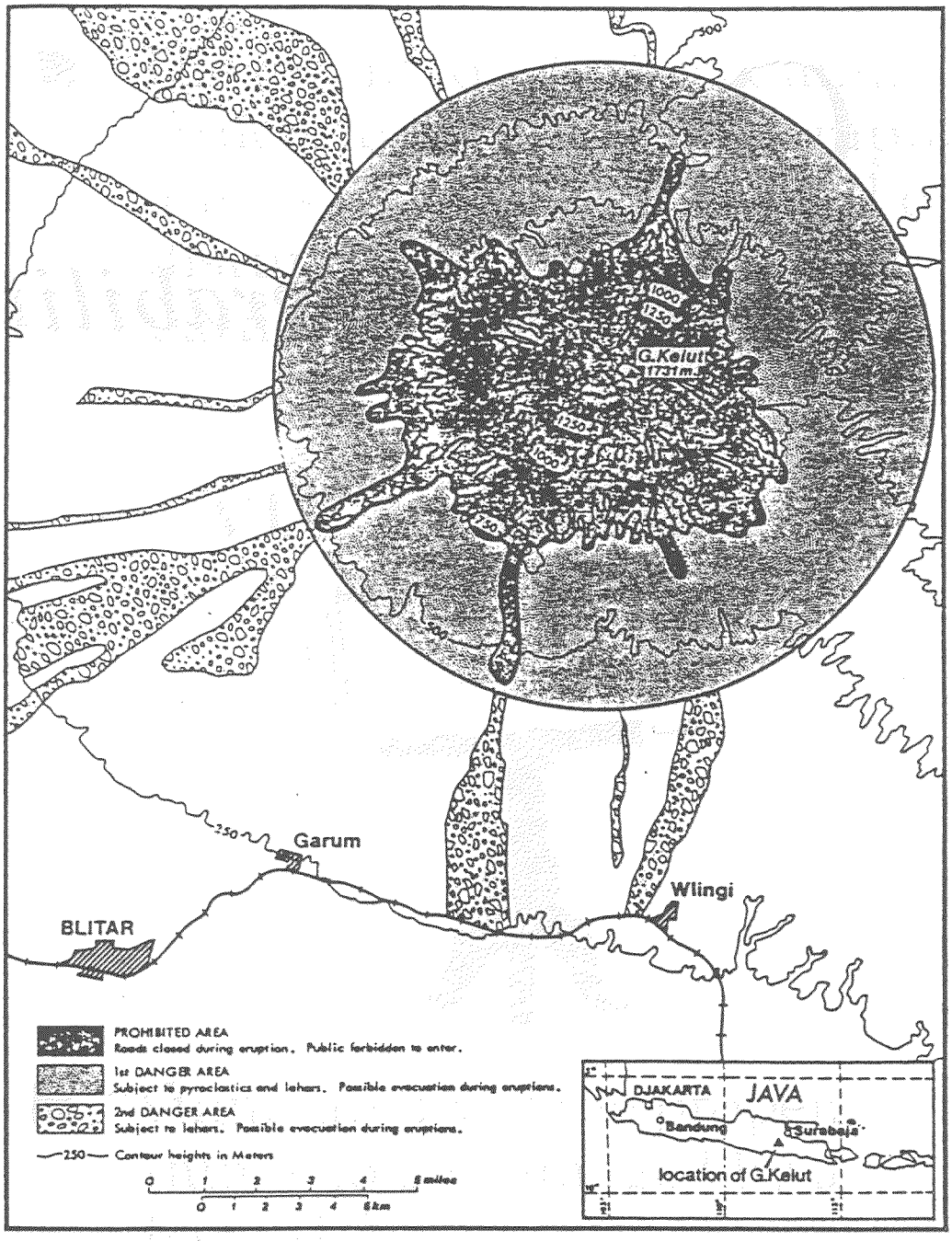
HAZARD MAP 1



Flood hazard in the Metro Manila region, Philippines

HAZARD MAP 2



Volcanic hazards at Gunung Kelat in Java

Q.

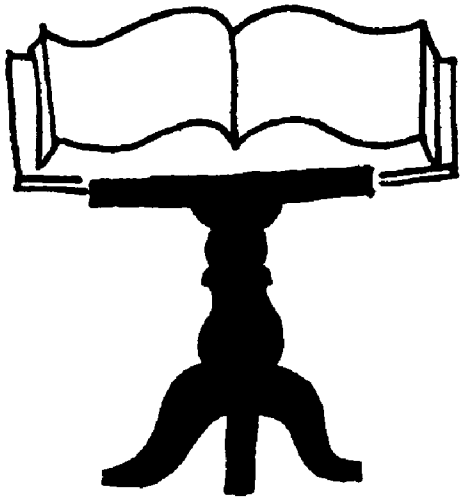
What is vulnerability?

DEFINITIONS OF VULNERABILITY

- "The extent to which a community, structure, service or geographic area is likely to be damaged or disrupted by the impact of a particular disaster hazard. . ."

UNDP/UNDRO DMTP Manual

"VULNERABILITY"



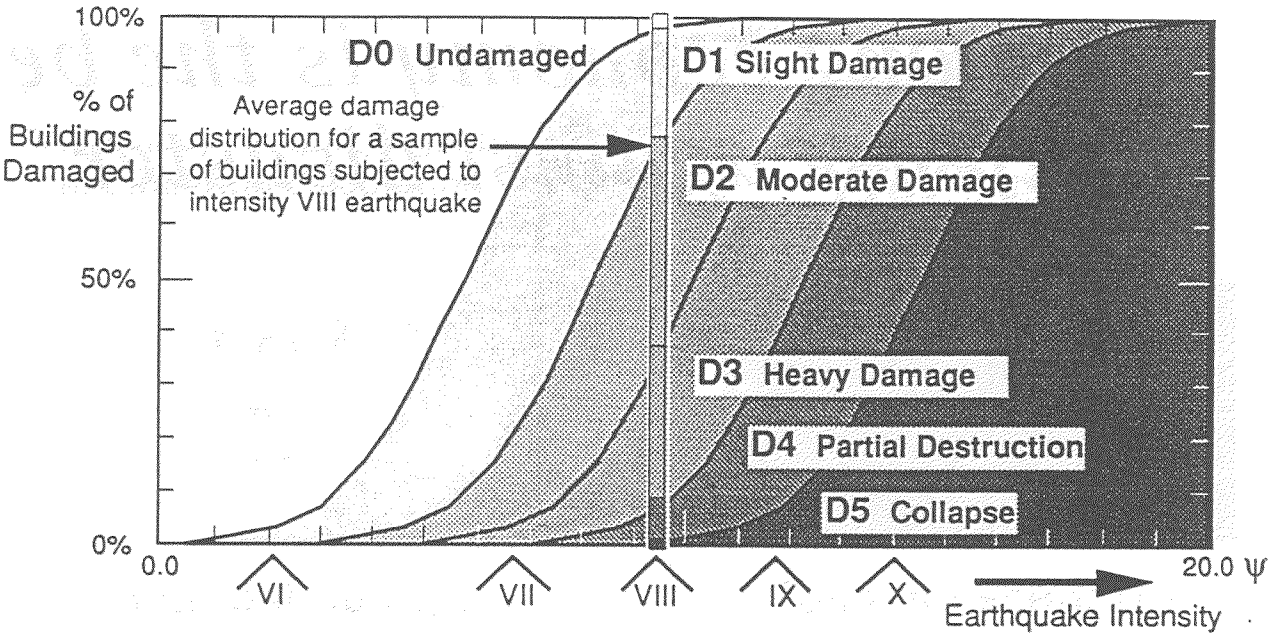
- "Vulnerability is the propensity of things to be damaged by a hazard."

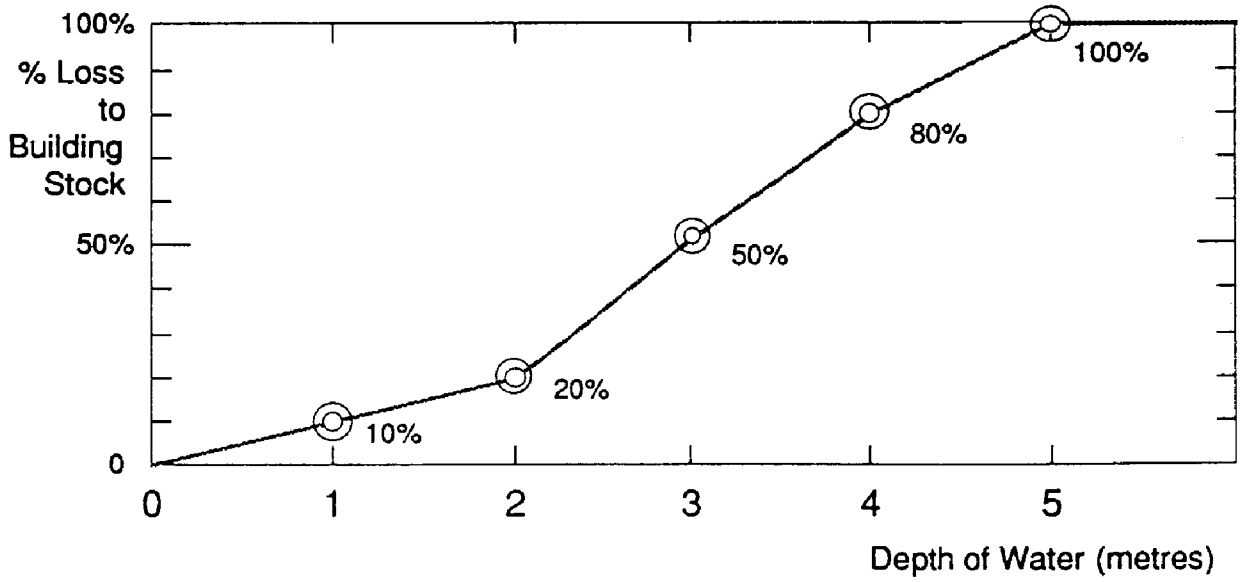
"Vulnerability and risk assessment manual"

VULNERABILITY EVALUATION

	Principal vulnerable elements	
	Tangibles	***Intangibles***
Floods	Everything located in flood plains or tsunami areas. Crops, livestock, machinery, equipment, infrastructure. Weak buildings	Social cohesion, community structures, cohesion, cultural artifacts
Earthquakes	Weak buildings and their occupants. Machinery and equipment, infrastructure. Livestock. Contents of weak buildings	Social cohesion, community structures, cohesion, cultural artifacts
Volcanic eruption	Anything close to volcano. Crops, livestock, people, combustible roofs, water supply.	Social cohesion, community structures, cohesion, cultural artifacts
Land instability	Anything located on or at base of steep slopes or cliff tops, roads and infrastructure, buildings on shallow foundations	Social cohesion, community structures, cohesion, cultural artifacts
Strong winds	Lightweight buildings and roofs. Fences, trees, signs; boats fishing and coastal industries	Social cohesion, community structures, cohesion, cultural artifacts
Drought/ desertification	Crops and livestock. Agricultural livelihoods. Peoples' health	Disruption of populations. Destruction of the environment. Cultural losses
Technological disasters	Lives and health of those involved or in the vicinity. Buildings, equipment, infrastructure, crops and livestock	Destruction of the environment. Cultural losses. Possible population disruption.

QUANTIFYING VULNERABILITY



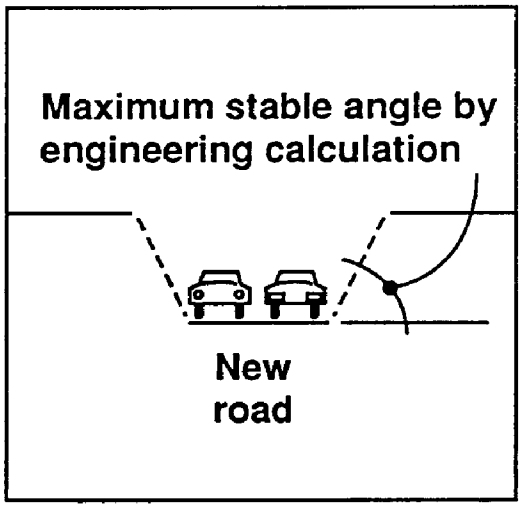


ROBUST SOCIETIES

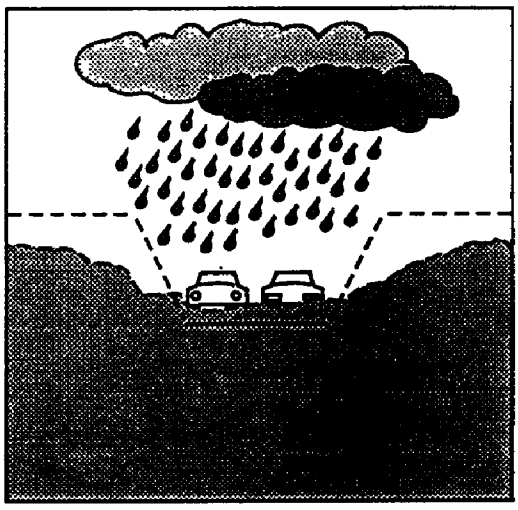
"A strong economy is the best defense against disaster"

HOW SAFE IS SAFE ENOUGH?

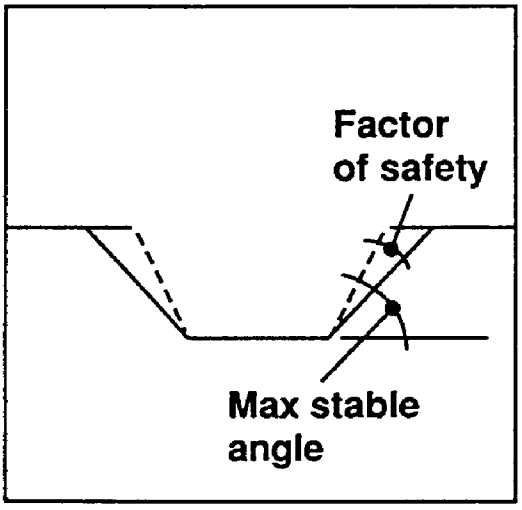
Cost vs. safety



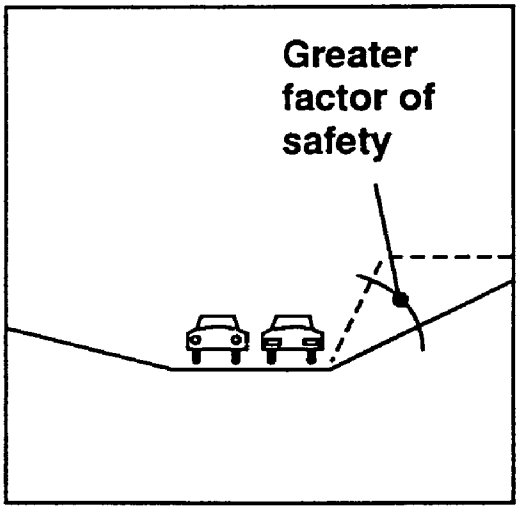
Cheapest design



Possible scenario

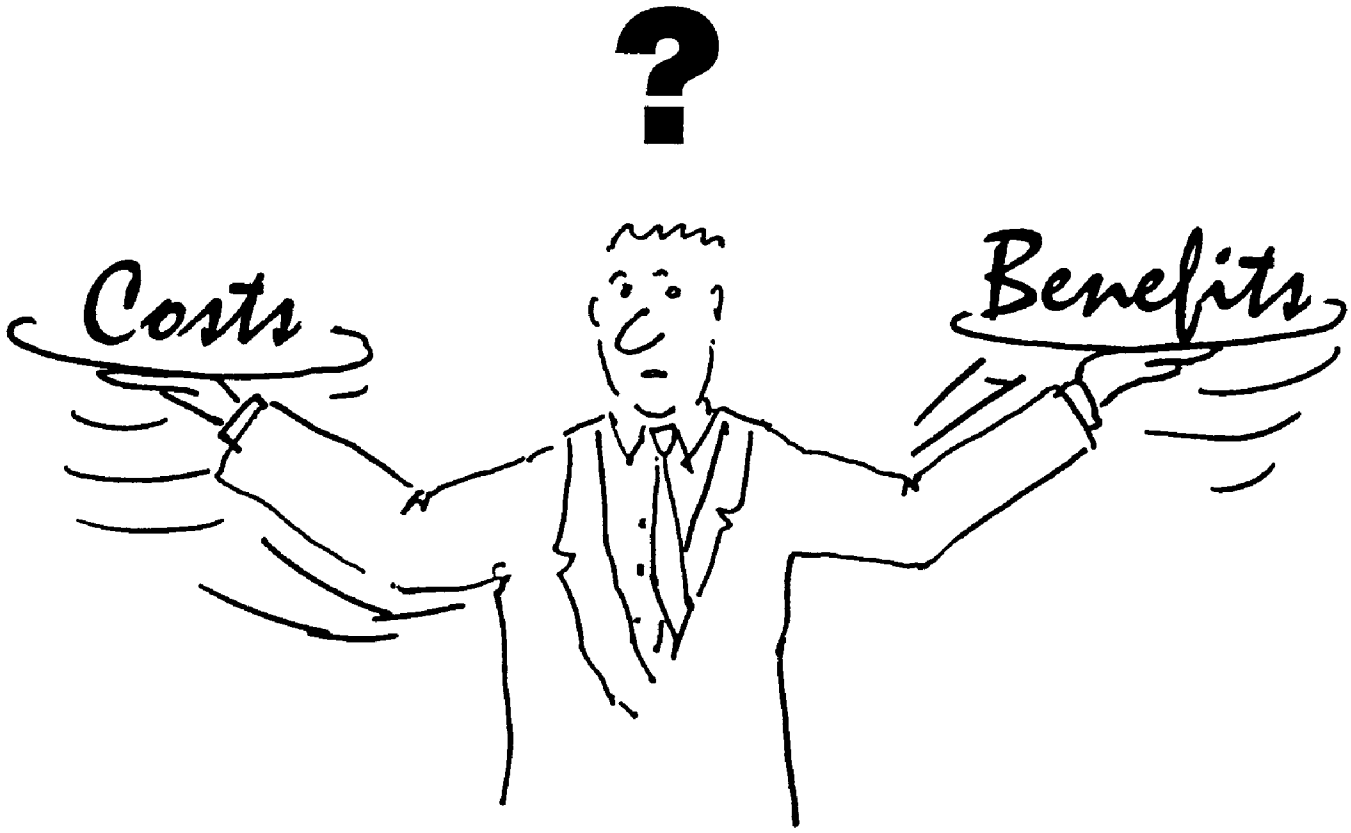


Safer, but more expensive



Very safe, very expensive

COST BENEFIT ANALYSIS



PROJECTED LOSSES

Hazard (1)	Projected total losses (2) $ x 10^9	Possible loss reduction (a) (3) $ x 10^9	Total cost of reduction (b) (4) $ x10^9	Benefit/cost ratio (3)/(4)
Earthquake shaking	21.0	10.5	2.1	5.0
Loss of mineral resources	17.0	15.0	0.09	167.0
Landslide	9.85	8.86	1.02	8.7
Flood	6.53	3.43	2.70	1.3
Erosion	0.57	0.38	0.25	1.5
Expansive soils	0.150	0.148	0.075	20.0
Fault displacement	0.076	0.013	0.075	1.7
Volcanic Hazards	0.049	0.008	0.0017	4.9
Tsunami Hazards	0.041	0.037	0.026	1.5
Subsidence	0.026	0.013	0.0088	1.5

a) applying all feasible methods b) applying all feasible methods at current state of the art

Projected losses due to natural hazards (geological)1970-2000 & costs of mitigation, California USA