

Disaster Risk Modeling

Technical Workshop MHEWS
Barbados Nov 2-5, 2010

Sahar Safaie, World Bank



- Risk Model & it's Components
- Scenario vs. Probabilistic Modeling
- Risk Modeling Applications
- Disaster Risk Modeling in the Caribbean



Risk Model is a Tool Box

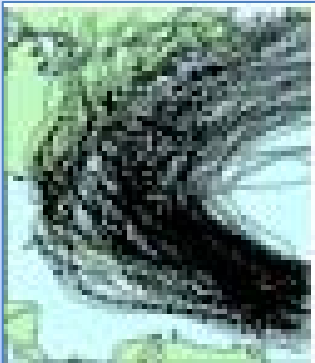


- There are various applications
- Some complex outputs and applications
- But choosing the appropriate tool will extensively facilitate the desired operation

Risk Models provide a representation of a complex physical phenomena

$$\text{Hazard} \times \text{Exposure/Vulnerability} = \text{Risk}$$

Hazard



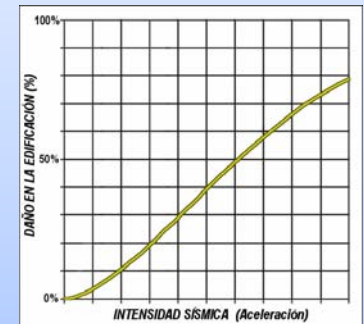
Exposure



Vulnerability

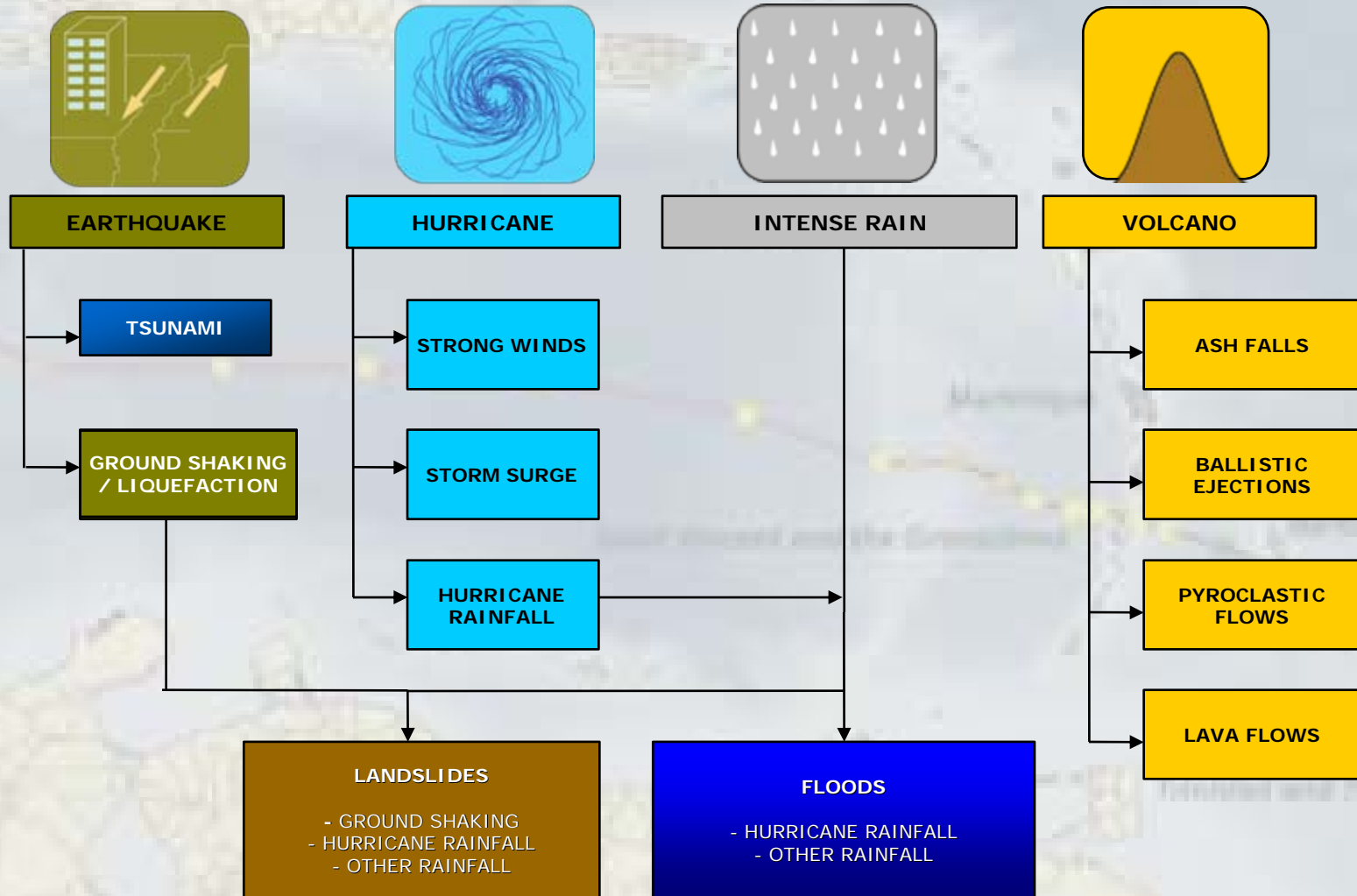


Loss

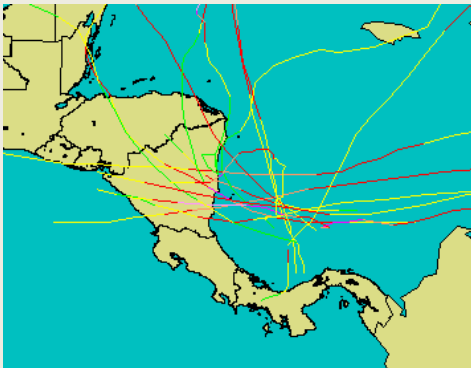
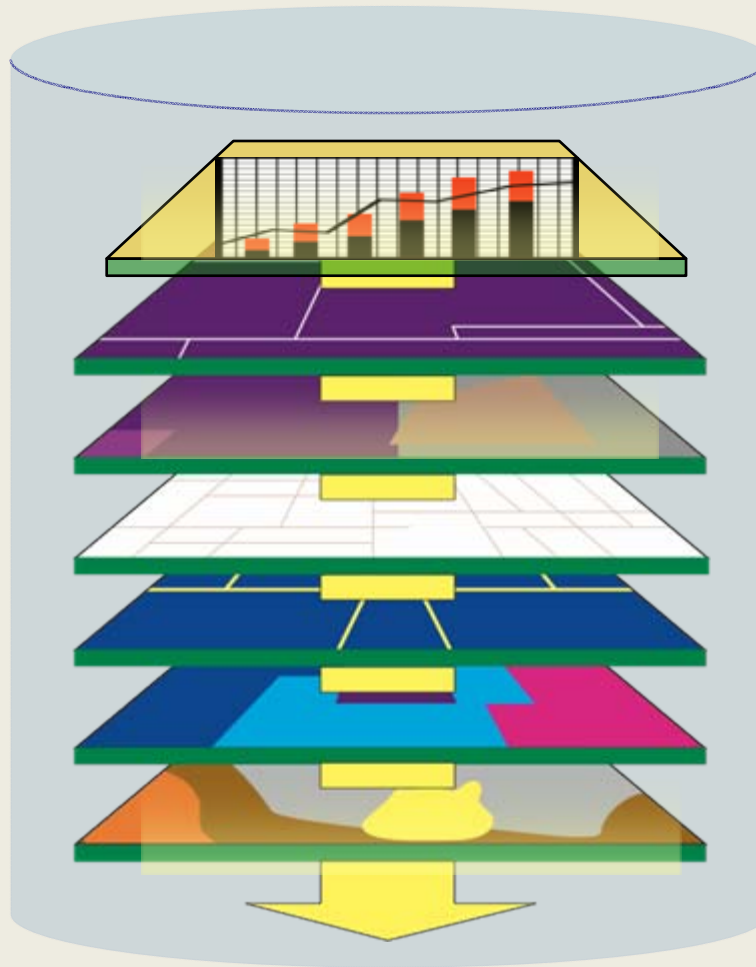
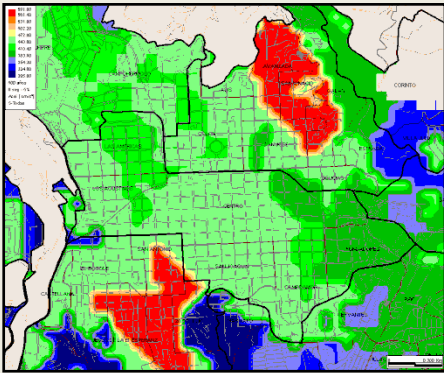


\$ or %

Multi-hazard Models



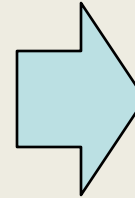
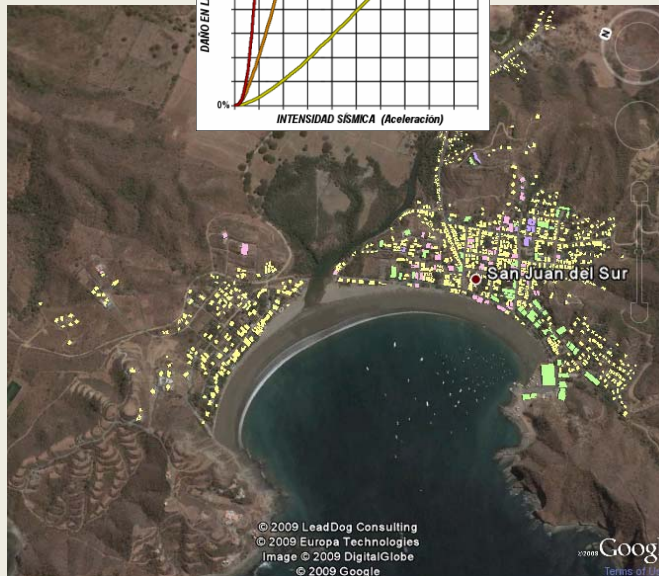
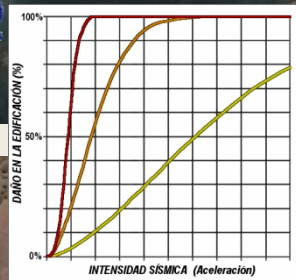
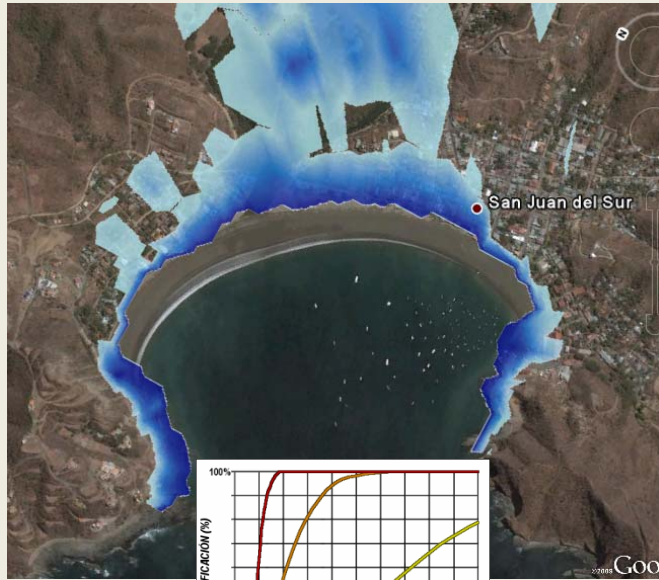
Powerful reliable models need extensive amount of DATA



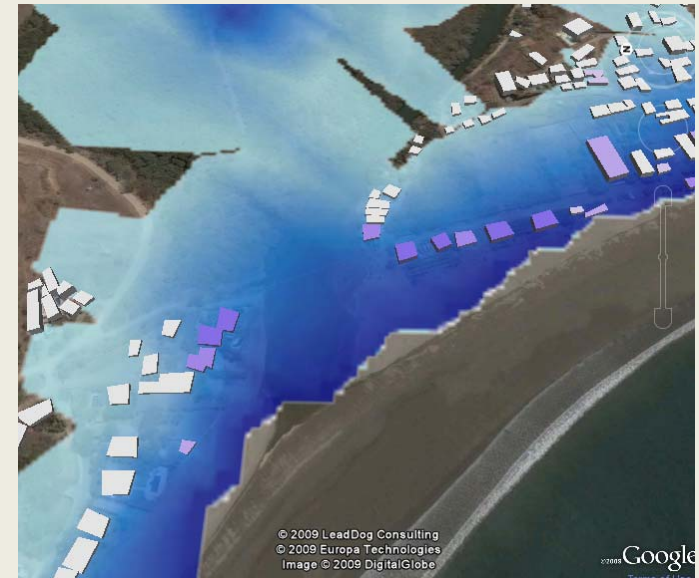


Scenario Risk Modeling

Exposure Vulnerability Hazard



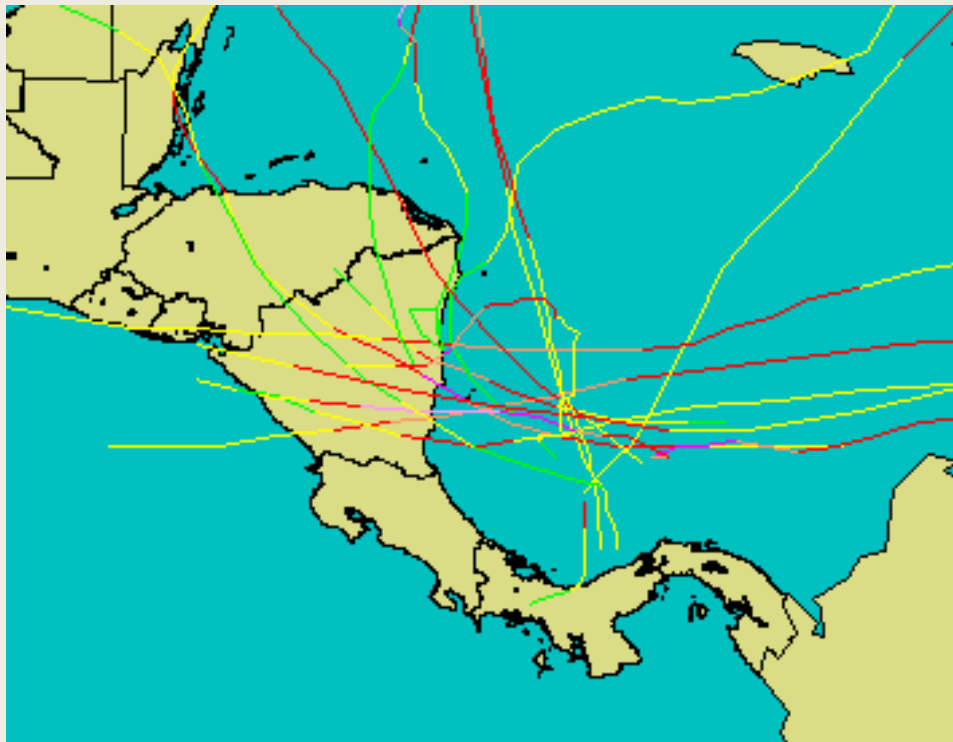
San Juan del Sur Nicaragua



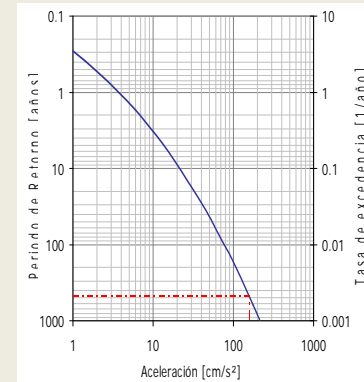
Risk:
Physical Damage, Loss \$

Probabilistic Hazard Modeling

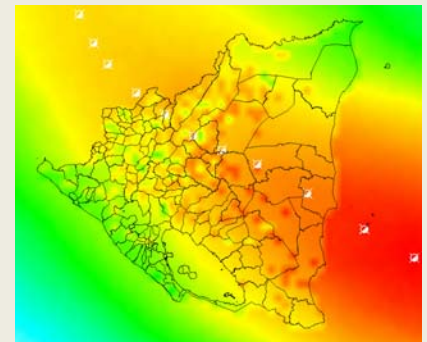
Stochastic Event Set = All events that could impact a region



Frequency :
How likely is this event?
Annual probability of occurrence (i.e. 1/ 100)



Severity :
How strong is the event?
Hurricane Cat 4
What does the event look like?
Track, Point of landfall, wind field, etc



Risk Assessment

Visualization of hazard and risk

Infrastructure design

Climate Change Adaptation



Cost Benefit analysis for mitigation and prevention investments

Territorial planning

Tools to Assist Decision Making

Analysis of financial exposure

Scenario analysis for emergency preparedness

Immediate damage assessment

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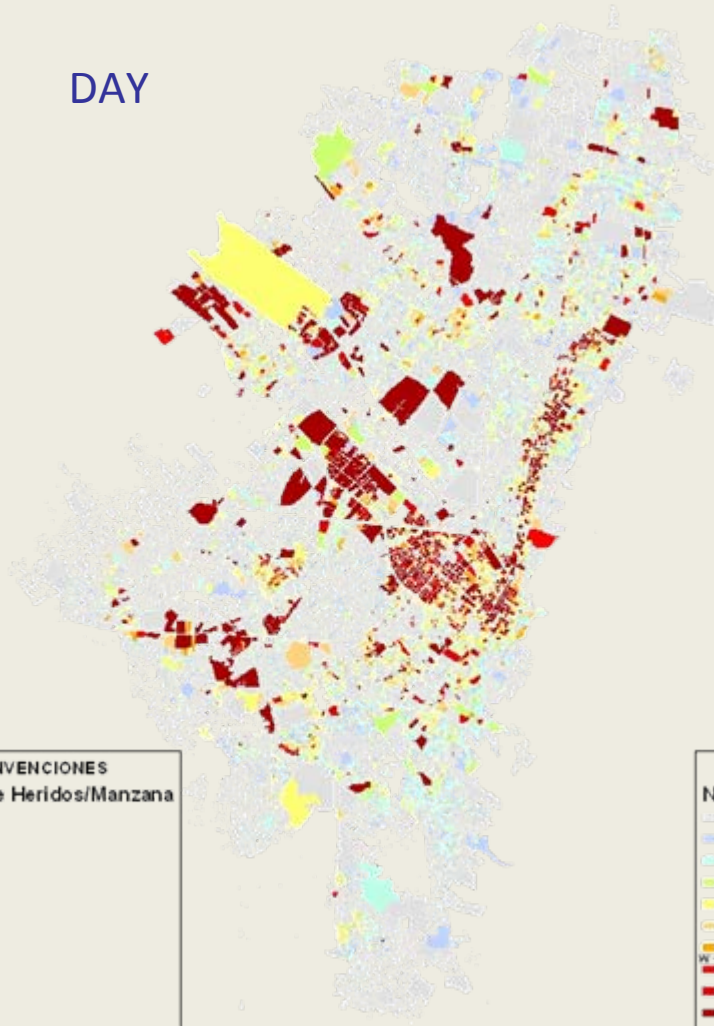
Scenario analysis for emergency preparedness

Immediate damage assessment

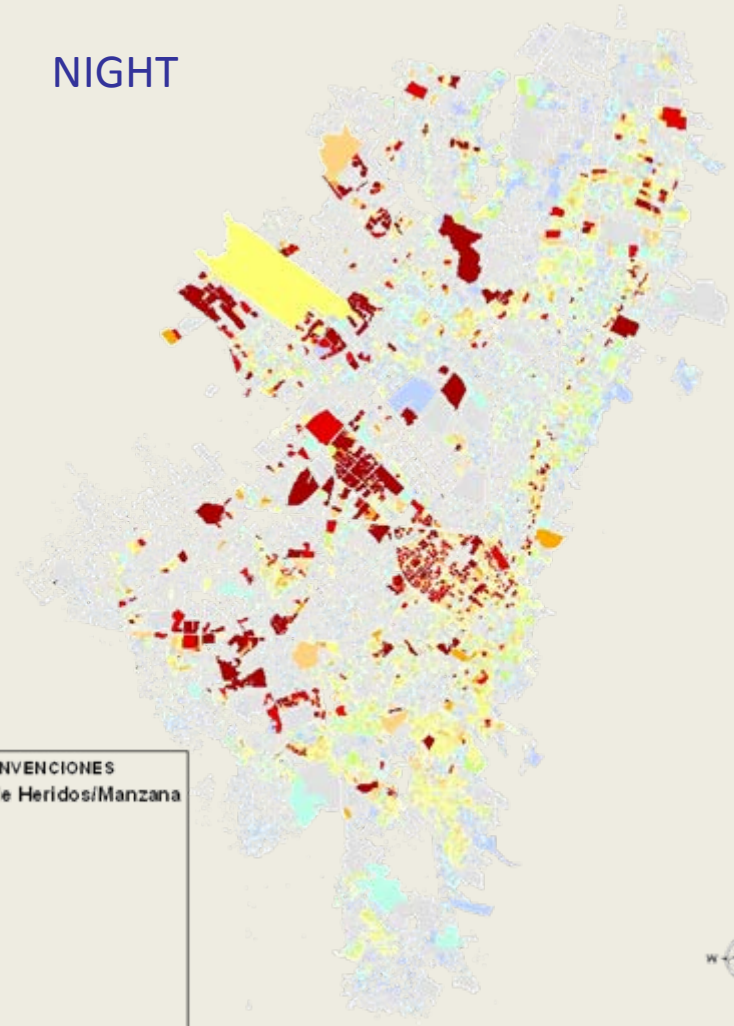


Scenario Analysis - # of injured

DAY



NIGHT



CONVENCIONES

Número de Heridos/Manzana

0
1
2 - 3
4 - 5
6 - 10
11 - 20
21 - 25
26 - 30
31 - 50
> 50

CONVENCIONES

Número de Heridos/Manzana

0
1
2 - 3
4 - 5
6 - 10
11 - 20
21 - 25
26 - 30
31 - 50
> 50



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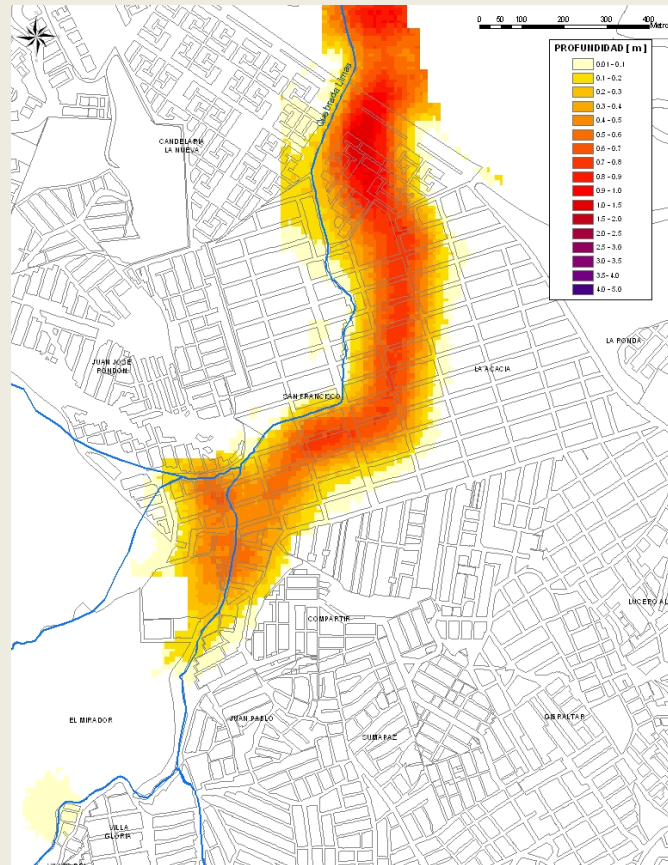
Analysis of financial exposure

Scenario analysis for emergency preparedness

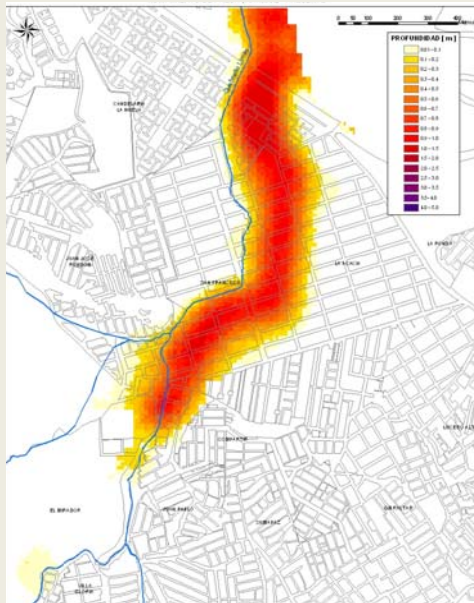
Immediate damage assessment

Flood Risk: Explore climate change scenarios

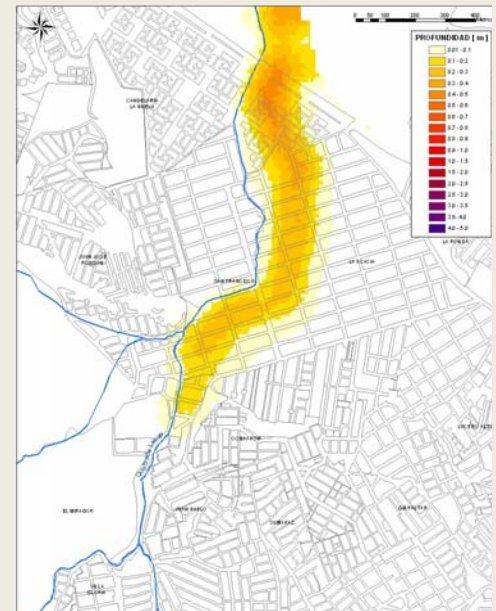
Base Model



Model A: Higher Intensity

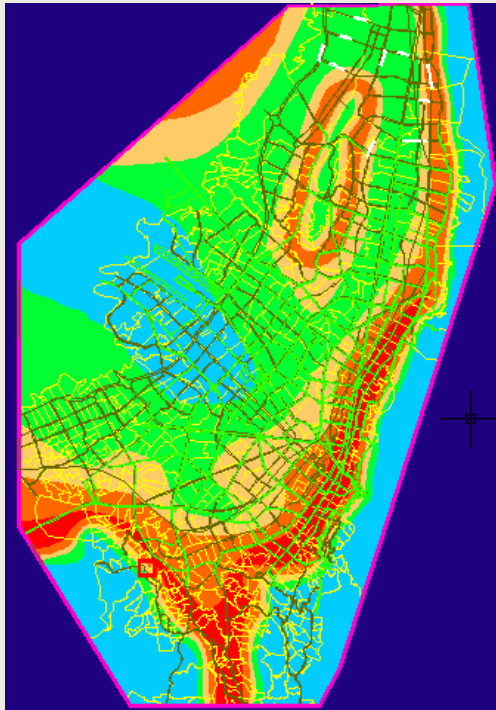


Model B: Lower Intensity

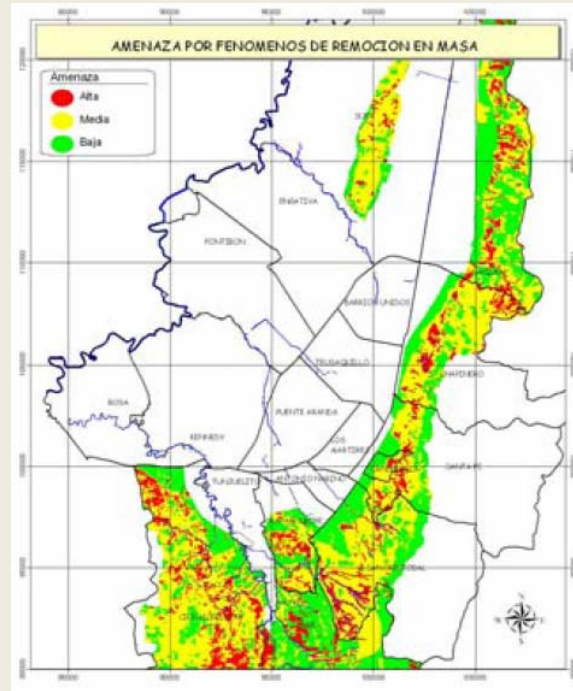


Land Use Planning and Zoning

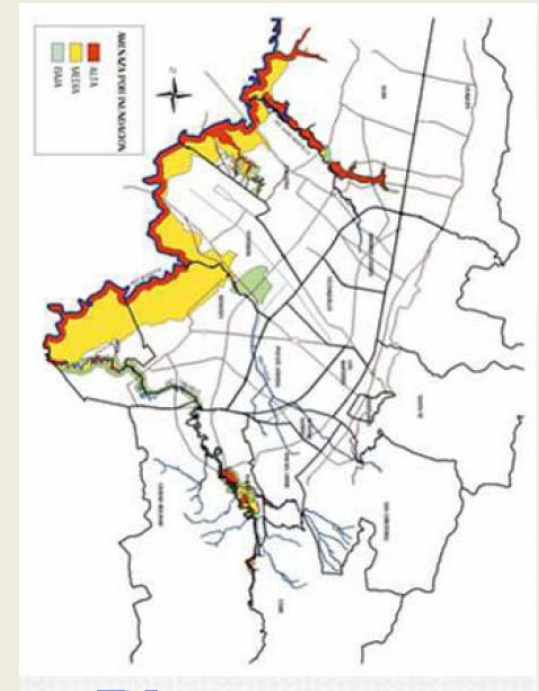
Identificacion of main hazards



Seismic hazard map

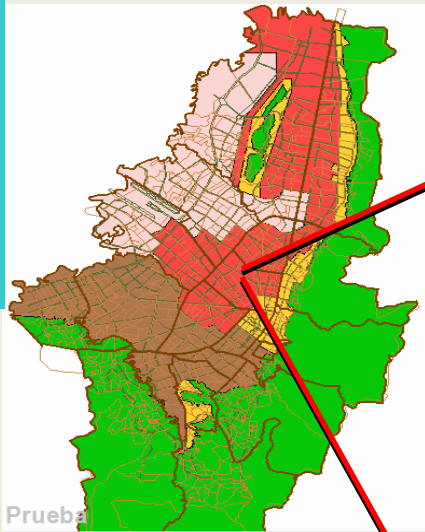


Landslide hazard map



Flood hazard map

Design Specifications For Infrastructure Design



Pruebas

Vista preliminar
Pag. 1 Pag. 2

MUNICIPIO DE IBAGUÉ
PÁGINA 112

1. INFORMACIÓN GENERAL DEL PROYECTO

NOMBRE DEL PROYECTO:	
COMUNA:	BARRIO:
DIRECCIÓN:	FECHA CATASTRAL:
PROPIETARIO:	CÉDULA NIT:
TELÉFONO:	CUIDAD:
ARCHIVO INFORME: INFORME GUARDADO	

2. PUNTO DE UBICACIÓN

PUNTO DE ANÁLISIS		COORDENADAS LÍMITES DE REALIZACIÓN	
LONGITUD (°W):	275646.6	LONGITUD (°W):	274462.4
LATITUD (°N):	846033.3	LATITUD (°N):	846247.9

SISTEMA DE CÁLCULO DE ESPECTROS DE DISEÑO PARA IBAGUÉ SISIBagué V1.1

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PÁGINA 212

3. ESPECTRO DE DISEÑO

GEOLÓGICA:	SILO:	INTENSIDAD:	ACELERACIÓN ESPECTRAL:
PERIODO DE RETORNO:	475 AÑOS	AMORTIGUAMIENTO:	5% (VAL. CRÍTICO)
ESCENARIO SÍSMICO: TODAS LAS FUENTES			

PERIODO (seg)	ACELERACIÓN (cm/s²)
0.05	252
0.10	277
0.15	485
0.20	432
0.30	442
1.00	255
1.50	176
2.00	158
2.50	111
3.00	82

4. FIRMA DEL PROFESIONAL RESPONSABLE

NOMBRE:	CÉDULA:
FECHA:	FECHA: 00/00/0000
MATRÍCULA PROFESIONAL:	V1.1

BAJO LA GRADUAD DE JURAMENTO CÍVIL QUE LA INFORMACIÓN CONSIGNADA EN ESTE FORMULARIO CORRESPONDE AL RESULTADO FINALIZADO DEL SISTEMA DE CÁLCULO DE ESPECTROS DE DISEÑO PARA LA CIUDAD DE IBAGUÉ (COLOMBIA) Y QUE NO HA SIDO MODIFICADO EN NINGUNA FORMA DICHO RESULTADO.

ESPACIO RESERVADO PARA USO EXCLUSIVO DE LA JURADURA URBANA

ENCARGADO:	CÉDULA:
FECHA:	
OBSERVACIONES:	

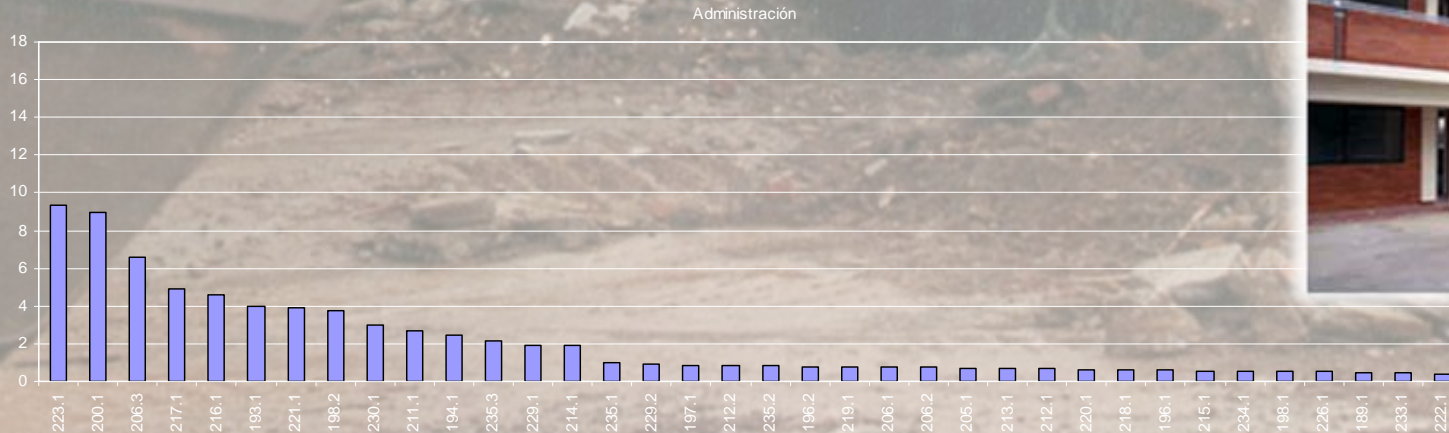
SISTEMA DE CÁLCULO DE ESPECTROS DE DISEÑO PARA IBAGUÉ SISIBagué V1.1

Cost Benefit Analysis

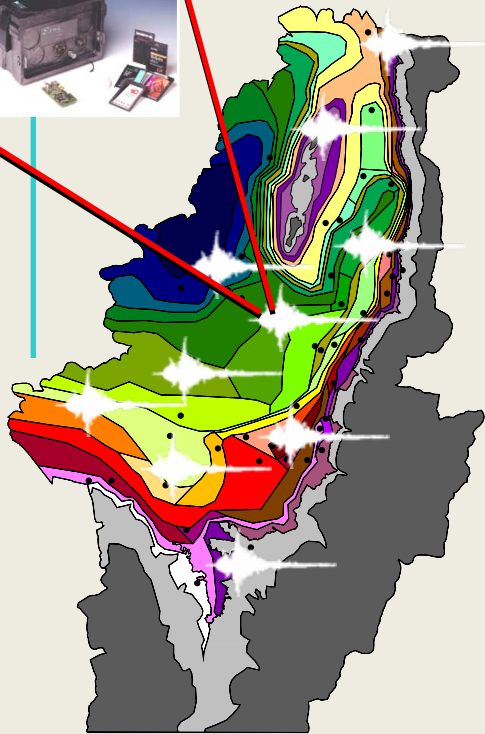
Retrofitting of Critical Infrastructure

Bogota Disaster Vulnerability Reduction program
Schools Retrofitted 2004-2008 : 201
Total Budget: \$80 Million

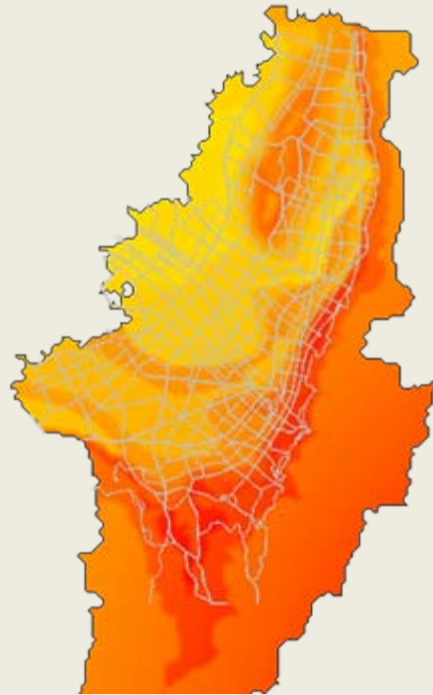
Schools and Administration



Immediate Damage Estimation



Surface Response
Spatial Distribution



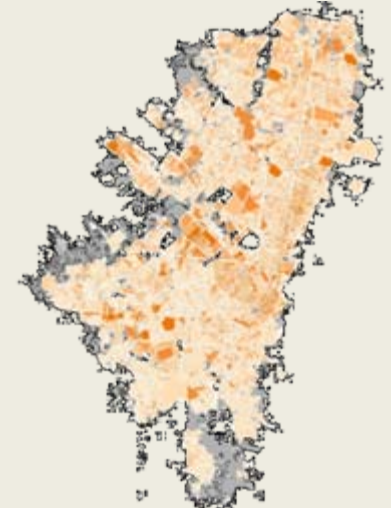
Damage Distribution
Calculation



Physical damage



Human losses

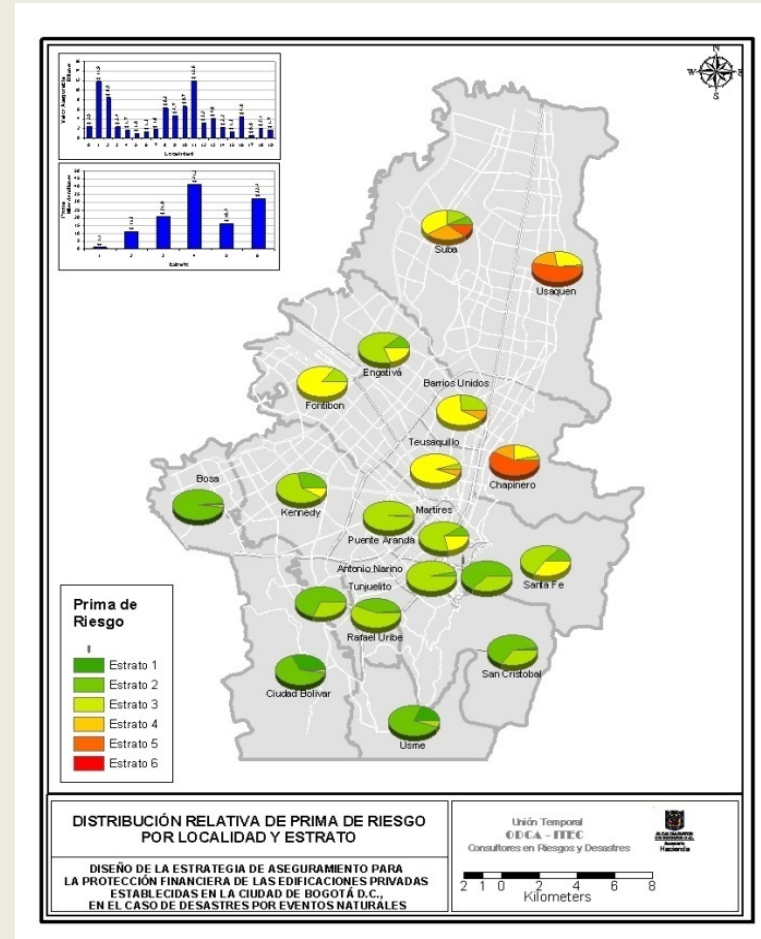





Financial Analysis of Risk

Insurance Premium Calculation

- Underwriting
- Reinsurance
- Reserve Calculations





What are the Potential Applications of Risk Modeling in the Caribbean region?

What is the Road Map to make risk modeling application part of DRM practice in the Caribbean?



All Hands at Work

