

***THE USE OF PROBABILISTIC RISK  
MODELLING TO GUIDE  
VULNERABILITY REDUCTION:  
THE CASE OF BOGOTA***

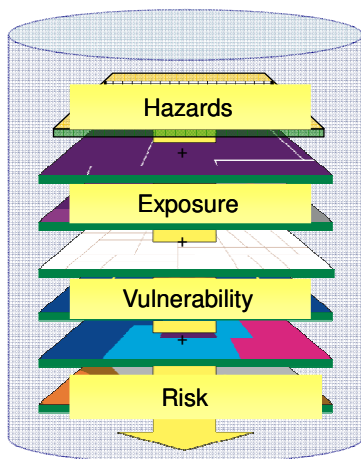
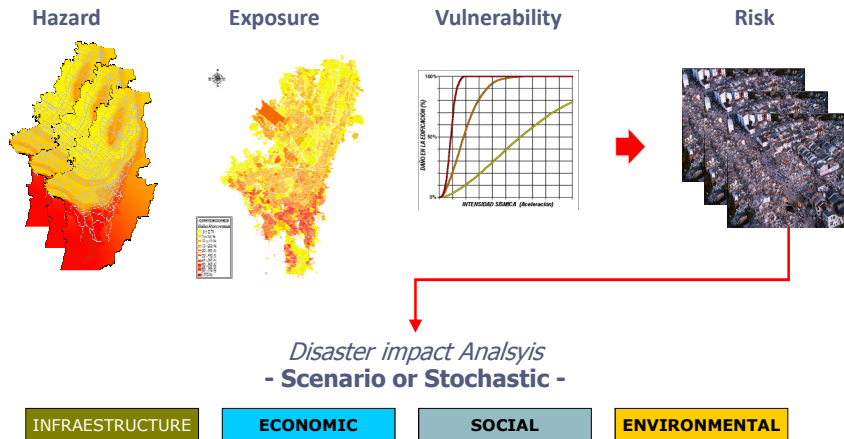
Francis Ghesquiere, The World Bank  
Asian Conference on Disaster Reduction , Colombo June 13, 2011

***Bogotá District***



- Colombia's capital and main economic center
- 750,000 residential buildings
- 200 hospitals and health centers
- 3,500 schools and Universities
- Population: Over 7,000,000 (High concentration of pop.)
- Exposed value US\$40 Billion only building constructions + infrastructure

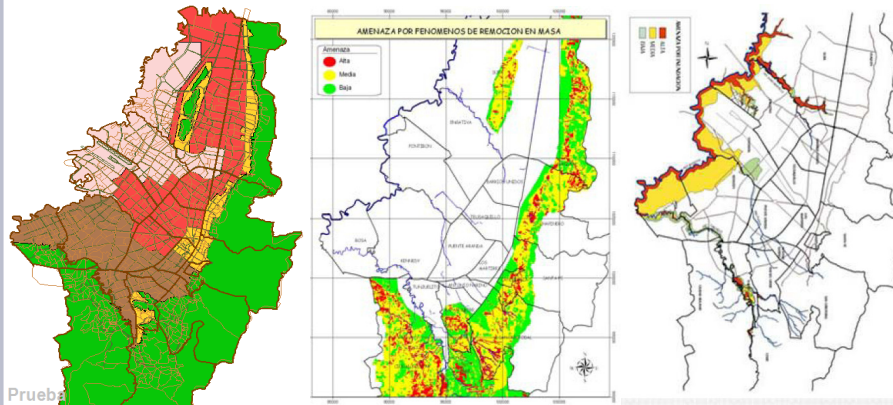
# PROBABILISTIC RISK MODELING



## Applications

- Visualization of hazard and risk / DRM indicators
- Territorial planning
- Infrastructure design
- Cost Benefit analysis for mitigation and prevention investments
- Scenario analysis for emergency preparedness
- Immediate damage assessment
- Analysis of financial exposure

## Hazard Mapping



Seismic

Landslides

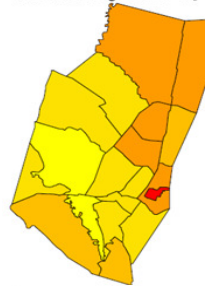
Floods

## INDICATORS FOR RISK MANAGEMENT

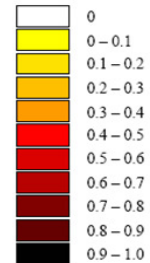
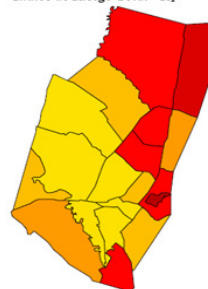
Riesgo total para la ciudad de Bogotá

Localidad	$R_F$	$F$	$R_T$
Usaquen	0.386	0.309	0.505
Chapinero	0.264	0.245	0.329
Santafé	0.314	0.478	0.464
San Cristóbal	0.175	0.707	0.298
Usme	0.253	0.797	0.454
Tunjuelito	0.076	0.587	0.121
Bosa	0.152	0.701	0.258
Ciudad Kennedy	0.092	0.643	0.150
Fontibón	0.105	0.358	0.142
Engativa	0.139	0.521	0.211
Suba	0.326	0.369	0.446
Barrios Unidos	0.350	0.302	0.456
Teusaquillo	0.366	0.193	0.436
Mártires	0.186	0.325	0.246
Antonio Nariño	0.116	0.407	0.163
Puente Aranda	0.126	0.391	0.175
Candelaria	0.426	0.631	0.694
Rafael Uribe Uribe	0.103	0.635	0.169
Ciudad Bolívar	0.206	0.700	0.350
Boqotá	0.225	0.663	0.374

Índice de Riesgo Físico -  $R_F$

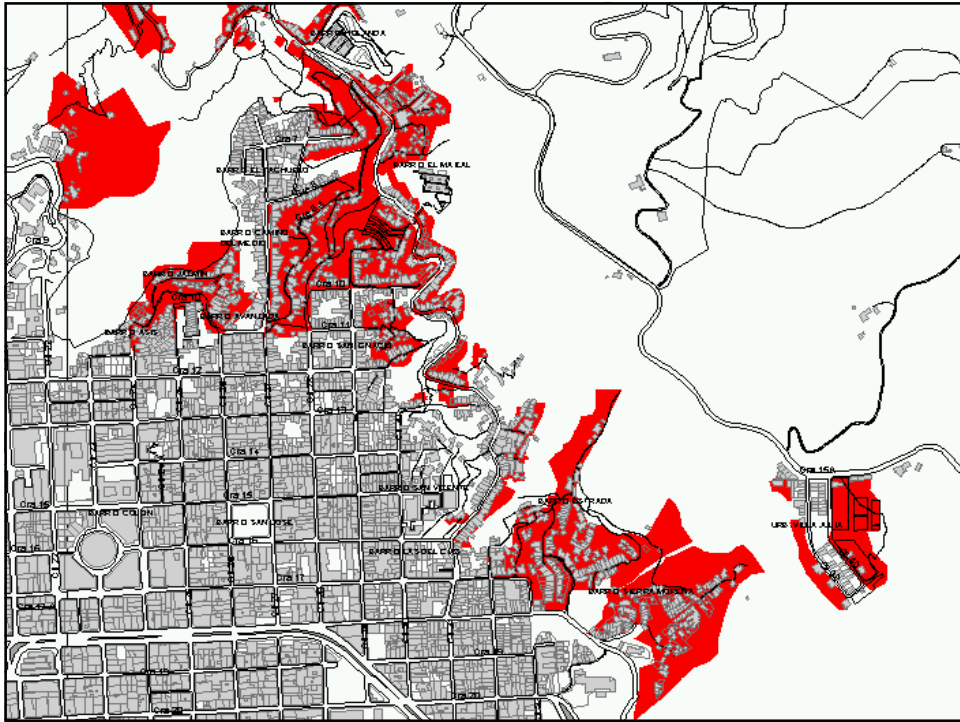


Índice de Riesgo Total -  $R_T$



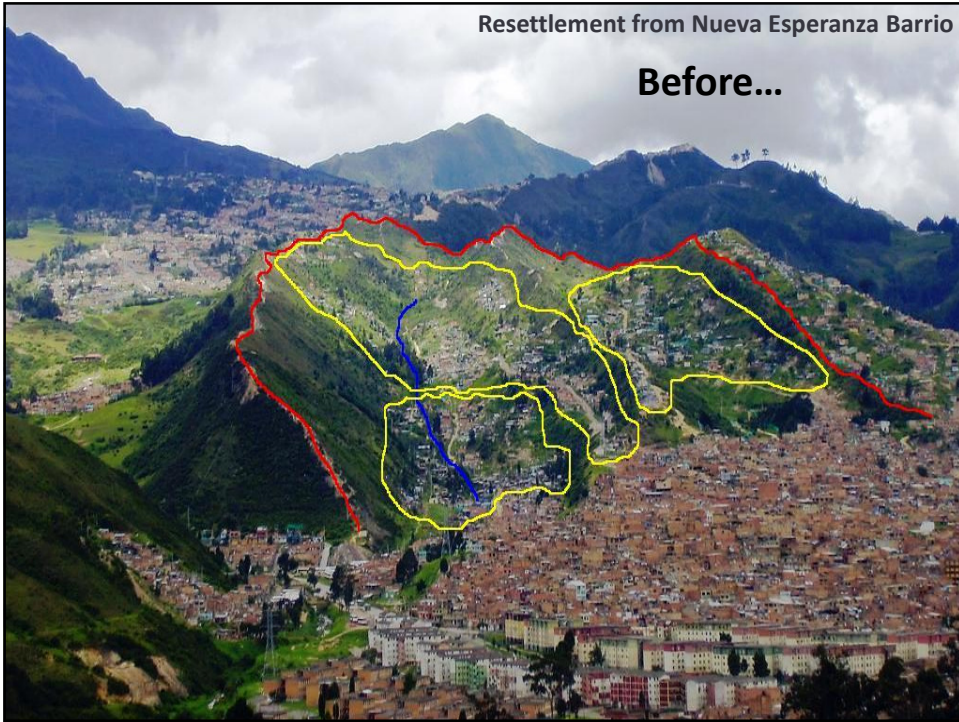






Resettlement from Nueva Esperanza Barrio

**Before...**

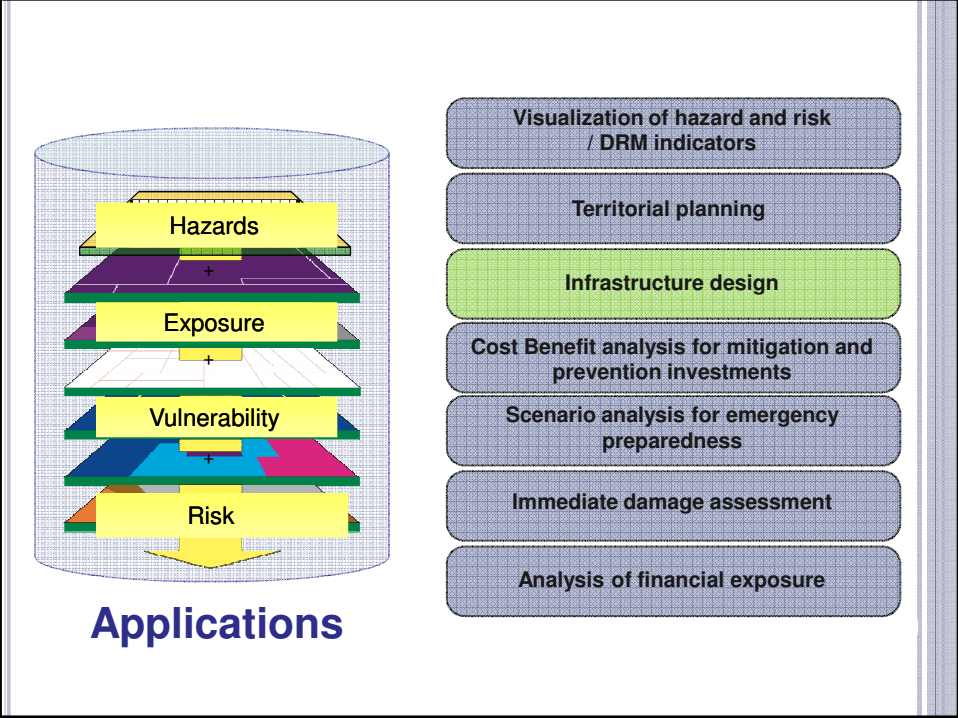


Resettlement from Nueva Esperanza Barrio

**... after**







### DESIGN SPECIFICATIONS FOR INFRASTRUCTURE DESIGN

Prueba

**Vista preliminar**

Pag. 1    Pag. 2

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**MUNICIPIO DE IBAGUÉ**

PARA 112

**1. INFORMACION GENERAL DEL PROYECTO**

PROYECTO: [ ]    OBJETIVO: [ ]

LOCALIDAD: [ ]    MUNICIPIO: [ ]

PROYECTADO POR: [ ]    APROBADO POR: [ ]

FECHA: [ ]    ESCALA: [ ]

**2. DATOS DE LOCALIZACIÓN**

COORDENADAS UTM: [ ]    ALTITUD: [ ]

**3. DATOS DEL SUELO**

TIPO DE SUELO: [ ]    CAPAS: [ ]

**4. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**5. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**6. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**7. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**MUNICIPIO DE IBAGUÉ**

PARA 212

**8. ESPECTRO DE SUELO**

**9. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**10. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**11. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**12. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**13. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**14. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**15. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**16. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

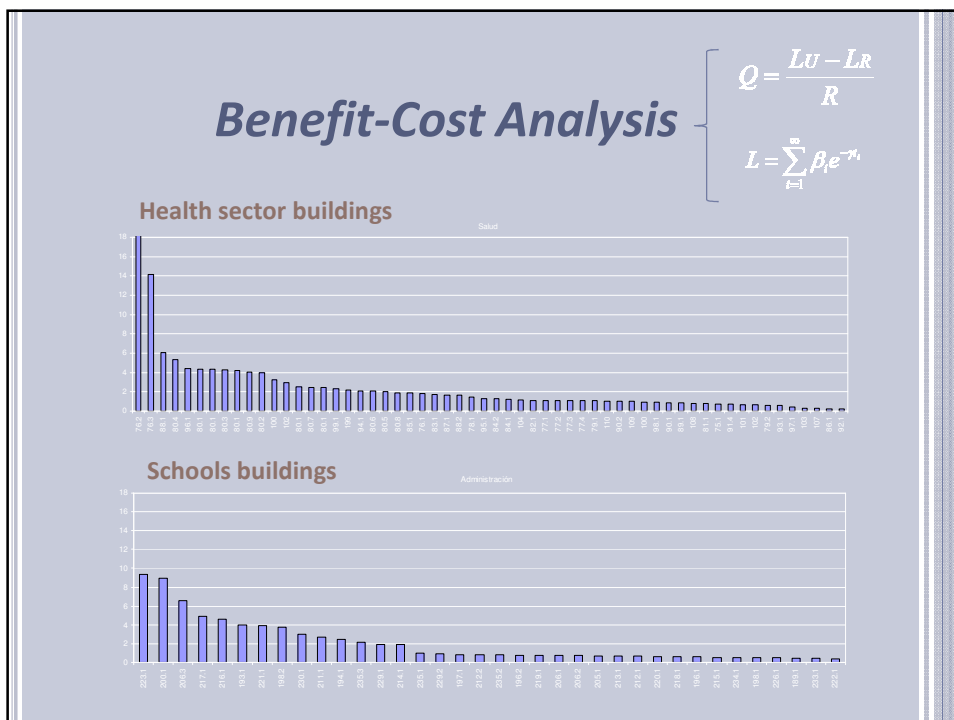
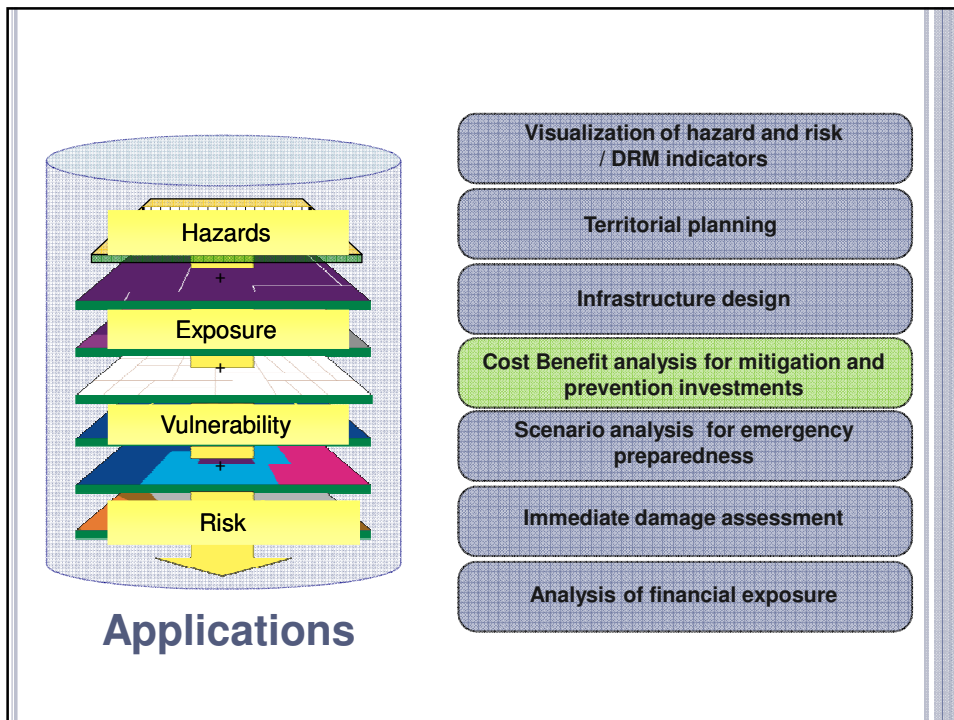
**17. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

**18. DATOS DEL PROYECTO**

TIPO DE OBRERA: [ ]    VALORES: [ ]

7



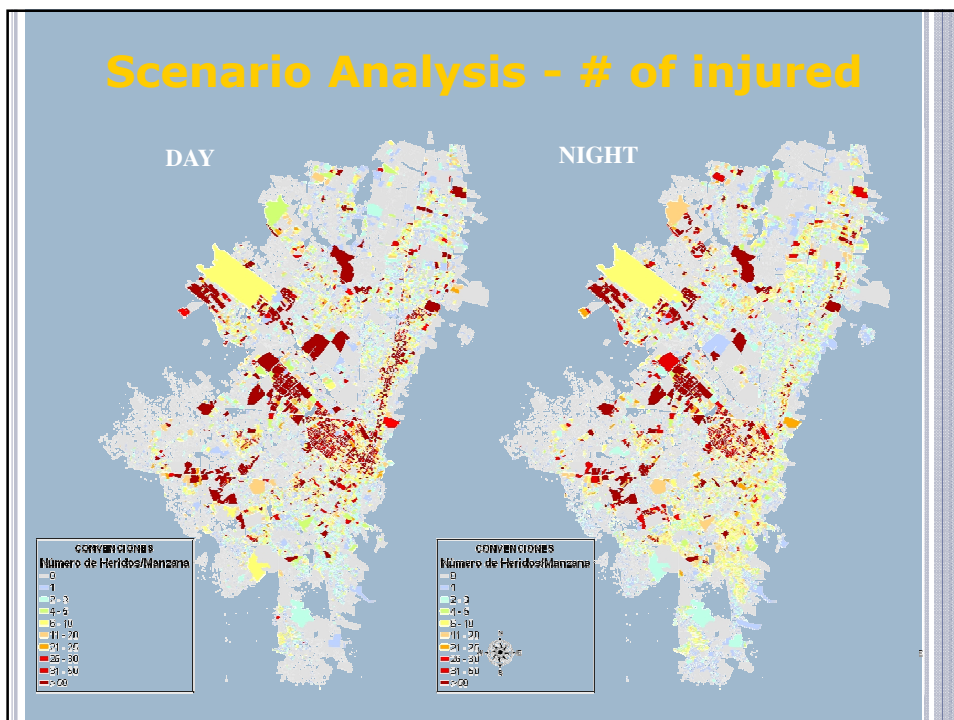
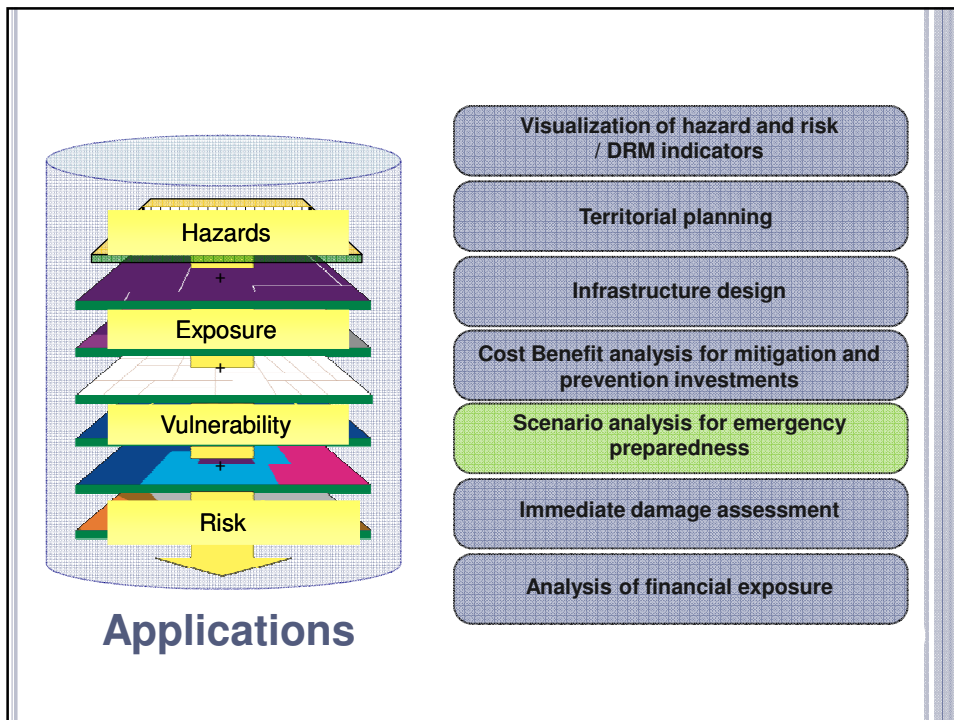


**etrofitting of Critical Infrastructure**



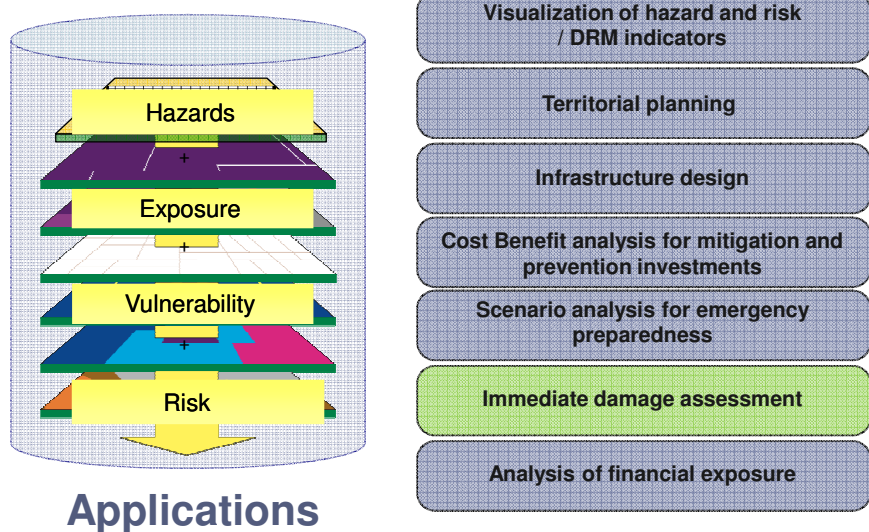
**Colegio Distrital Florida Blanca**





## Contingency and Emergency Planning

- Location of emergency units
- Functional vulnerability (emergency routes, etc.)
- Health services requirements
- Housing requirements
- Food requirements
- Utilities requirements (water, energy, etc.)
- Debris and construction materials
- Etc.



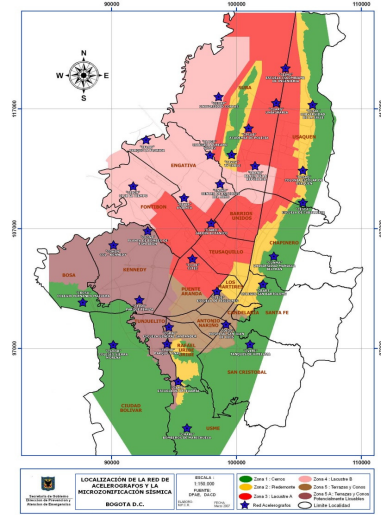
# Bogotá Accelerograph Network (RAB) Equipment and Net Coverage



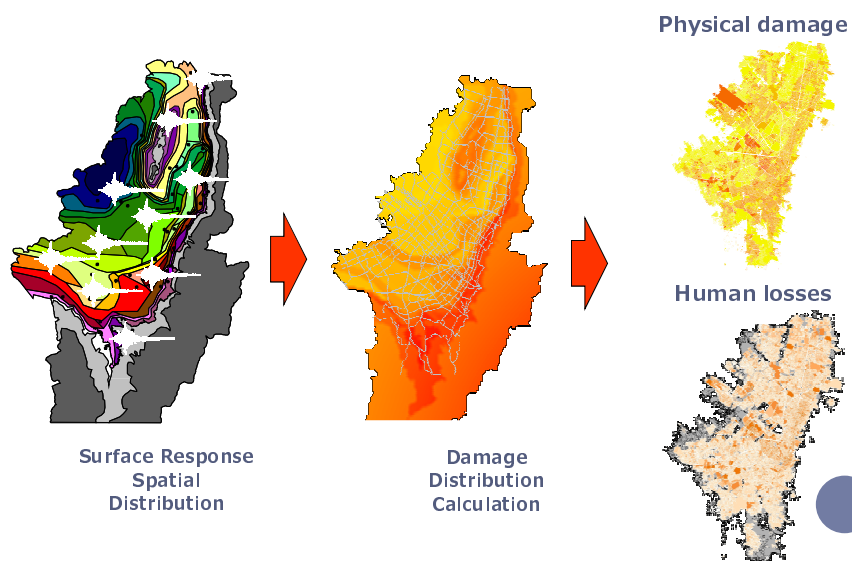
ETNA



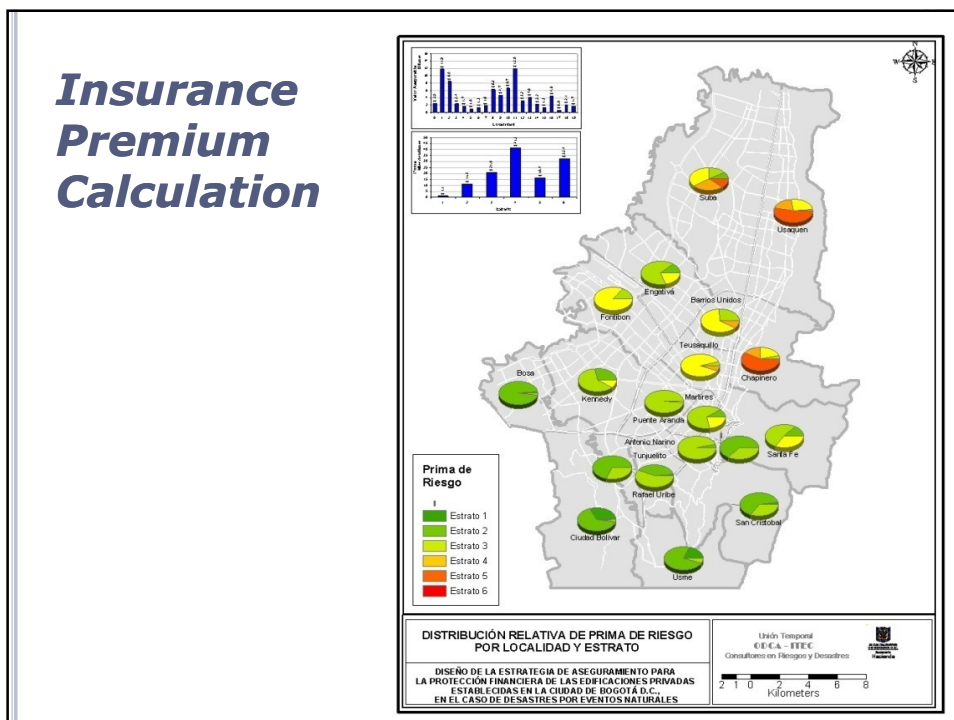
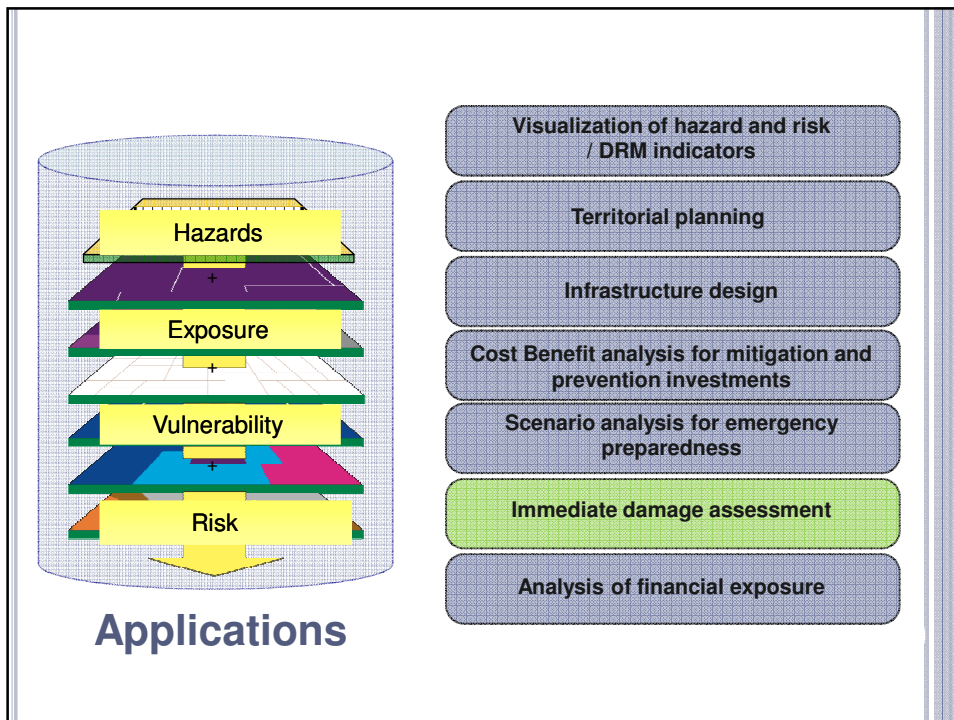
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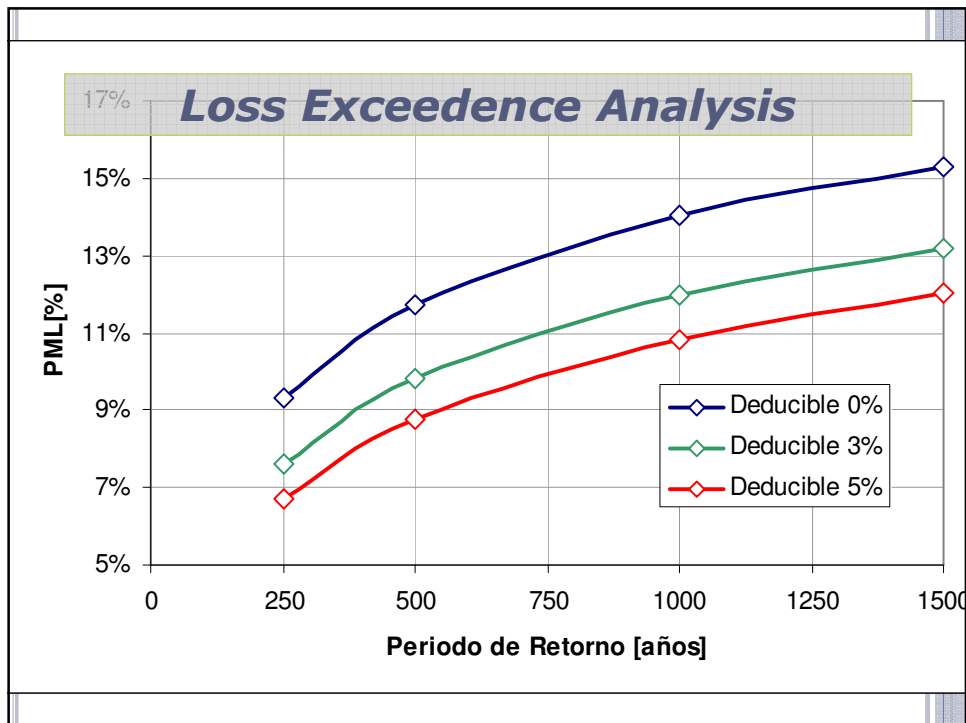


## IMMEDIATE DAMAGE ESTIMATION









## FINAL REMARKS

- ✓ One risks model can be used for a large number of applications
- ✓ Cost of modeling is going down:
  - geospatial technologies
  - open source models
- ✓ “Models remain models”



THANK YOU...



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