

2007 Summer Academy

Megacities: Social vulnerability and resilience building



REVEALING THE IMPACT OF SMALL DISASTERS TO THE ECONOMIC AND SOCIAL DEVELOPMENT

The need of a proposal to cover the losses of low-income people and a framework to measure and reduce the vulnerability

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IMPACT OF SMALL SCALE DISASTERS

- Small and frequent disasters, that rarely enter in the international or even national disaster databases, usually affect the livelihoods of poor people, perpetuating their level of poverty and human insecurity.
- In urban centers, small scale and chronic disasters have allowed having a light of the city zones that historically have presented the greatest vulnerability levels.
- These events, usually as result of the climate variability, increase difficulties for the local development and entail a serious problem for the development of a country as a whole.

Small disasters are related to persistent hazard events such as flash floods...



debris flows...



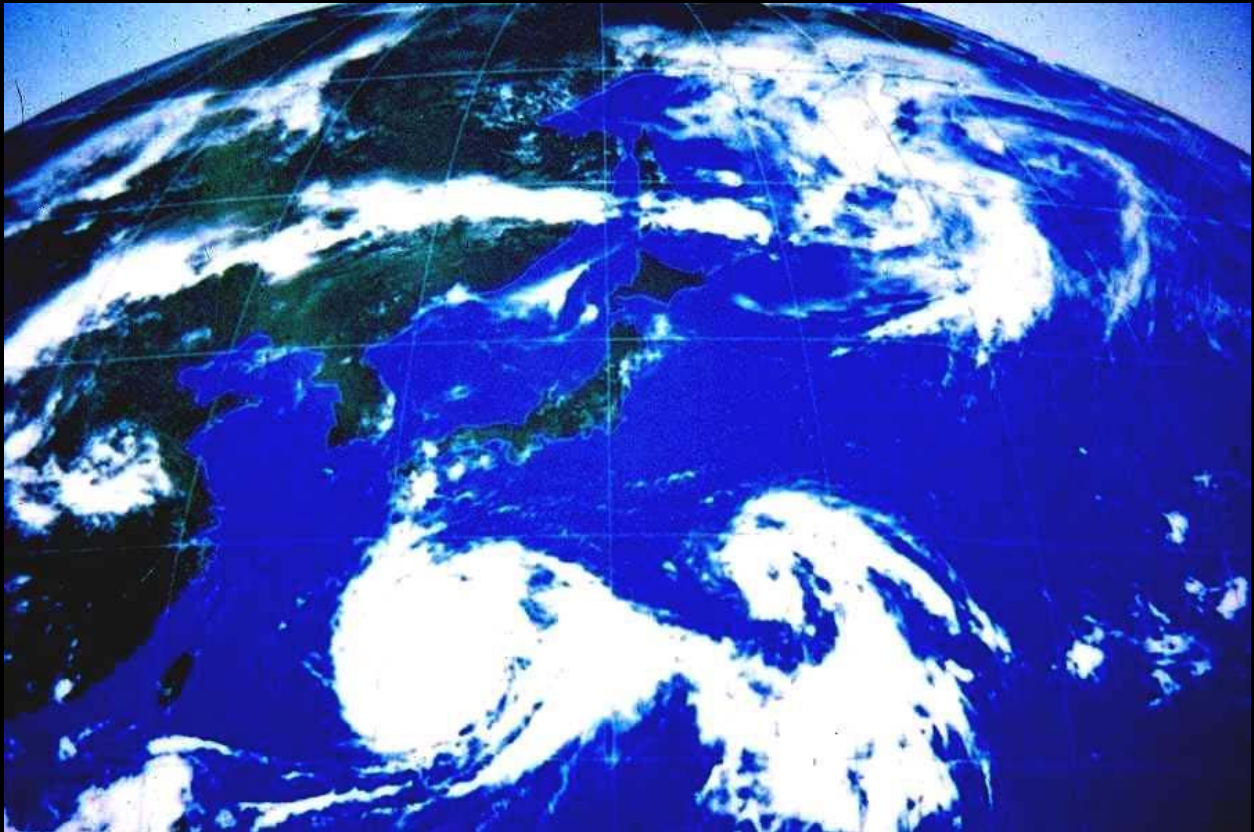
... landslides...



Some hazard events are assumed as natural but they may be considered as socio-natural due to the environmental degradation



Many events are generated by the climate variability and due to environmental global change processes



Example of outlier identification for death people records

Location estimates

Sample mean	17.7297
Sample median	2.0

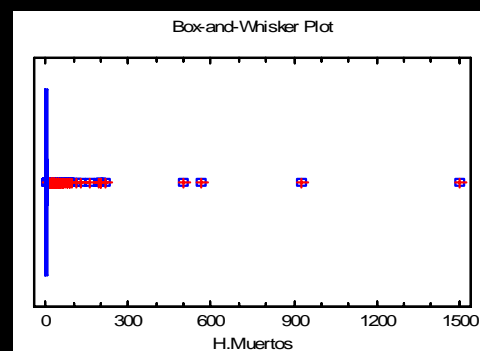
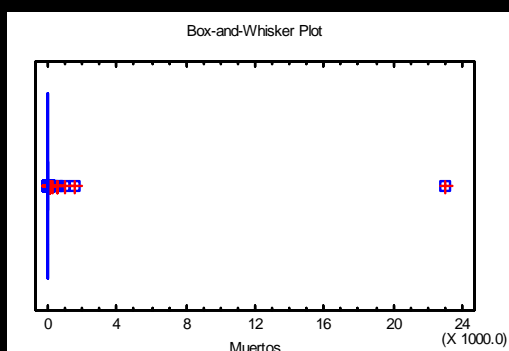
Scale estimates

Sample std. deviation	506.739
MAD/0.6745	1.48258
Sbi	1.80384
Winsorized sigma	3.07213

Sorted values

	Studentized Values	Studentized Values	Modified
Value	Without Deletion	With Deletion	MAD Z-Score
500.0	0.951713	0.952153	335.901
566.0	1.08196	1.08253	380.418
930.0	1.80028	1.80213	625.936
1,500.0	2.92512	2.93191	1,010.4
22,942.0	45.2388	522.746	15,473.0

Plots of the outliers of death people



Comparison between the effects due to small and extreme disasters

TYPE OF DAMAGES AND LOSSES	NEVADO DEL RUIZ ERUPTION (1985)	QUINDIO EARTHQUAKE (1999)	SMALL DISASTERS (1971-2002)
Death people	24,442	1,862	9,475
Affected people	232,546	160,336	1,745,531
Destroyed houses	5,402	35,949	93,160
Affected houses	NA	43,422	217,075
Damage crop hectares	11,000	NA	2,174,713

Effects caused as a result of small and moderate disasters

Close to 9 thousand and a half death people, almost 2 million affected people, 93 thousand destroyed houses and 217 thousand affected houses, as well as close to 2 million crop hectares destroyed have been the result of the accumulation of this type of disasters from 1970 in the country.

Comparison of losses of extreme hazard events and small and moderate hazard events, current million dollars and (%GDP)

EVENTS	ESTIMATED LOSSES	COSTS OF REHABILITATION
Eruption of Ruiz Volcano (1985) Armero	246.05 (0.70)	359.95 (1.02)
Coffee Region Earthquake (1999) Quindio	1,590.81 (1.88)	856.72 (1.01)
Small and moderate events (1971-2002)	1,652.89	NA

Source: Extreme events, ERN report on small disasters for National Department of Planning (2005)

Economic cost of small and moderate disasters

Considering two categories of economic losses (damaged houses and crop hectares), total amount accumulated for 32 years of study exceeds 1,650 million dollars according to the table. Of this total, 35.1% corresponds to amount of destroyed and affected houses and the other part (64.9%) corresponds to amount of damage in crop hectares.

Accumulated losses of small disasters in million dollars and %GDP of agricultural sector

Period	Losses in crops current (constant)	GDP agricultural sector current (constant)	Losses in sectoral GDP (%)
1971-1980	98,25 (172.64)	6,466 (11,352)	1,52
1981-1990	295,50 (689.50)	6,539 (15,257)	4,52
1991-2000	578,67 (758.38)	10,330 (13,358)	5.60
2001-2002	100,82 (138.80)	10,103 (13,909)	1.00
1971-2002	1,073.24 (1,759.32)	(13.909)	(12.65)

For estimation, it was taken GDP of the last year of each period using data of the Word Bank (2003).

Accumulated losses of small disasters in million dollars and %GDP of housing sector

Period	Losses in houses	GDP of construction sector* (constant prices)	Losses in sectoral GDP (%)
1971-1980	68.22 (119.87)	1,607.20 (2,824.11)	4.25
1981-1990	78,42 (182.98)	1,993.10 (4,650.58)	3.95
1991-2000	385.89 (505.73)	3,058.10 (4,007.80)	12.62
2001-2002	47.13 (64.88)	3,184.95 (4,354.89)	1.48
1971-2002	579.66 (873.47)	(4.354.89)	(19.92)

For estimation, it was taken GDP of the last year of each period using data of the Word Bank (2003).

Comparison between old and new LDI

Old LDI for death people (K), affected people (A) and losses (L)

Index	1981-1985	1986-1990	1991-1995	1996-2000
LDI _K	14,09	60,14	81,70	90,50
LDI _A	4,06	8,39	9,20	13,04
LDI _L	7,98	13,01	15,93	40,56
LDI	26,12	81,54	106,83	144,11
LDI'	0,97	0,91	0,91	0,91

Source: National University of Colombia – Manizales, Institute of Environmental Studies, Inter-American Development Bank. Indicators of Disaster Risk and Risk Management.2005.

New LDI for death people (K), affected people (A) and losses (L) without outliers

Index	1981-1985	1986-1990	1991-1995	1996-2000	2001-2002
LDI _K	70,63	83,21	75,22	76,20	82,15
LDI _A	67,69	8,62	62,12	78,00	62,15
LDI _L	5,44	28,54	11,26	14,81	1,07
LDI	143,75	120,38	148,61	169,01	145,37
LDI'	0,95	0,93	0,90	0,90	0,89

Source: based on DesInventar without outliers

Local and national development impact

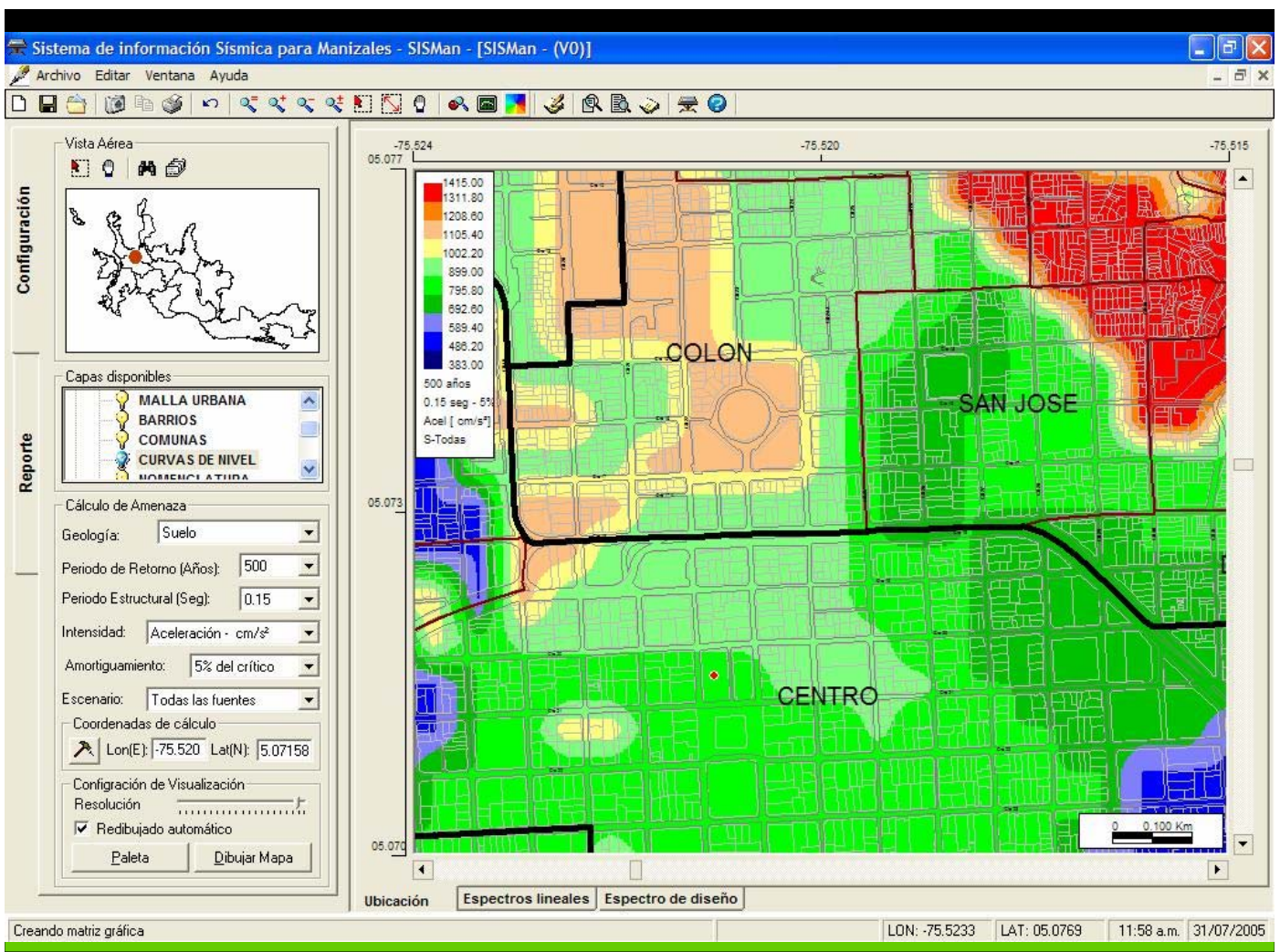
- Within the results it is possible to emphasize and demystify that extreme disasters are not necessarily which determine the history of disasters in the countries. The small disasters do affect the population and the diverse economic sectors as result of their frequency and their accumulated impact over time.
- The new Local Disaster Index reveals and measures the susceptibility of the country to small scale and recurrent disasters. This index illustrates the accumulative impact may be highly significant at the local level and, consequently, at national level from social point of view.

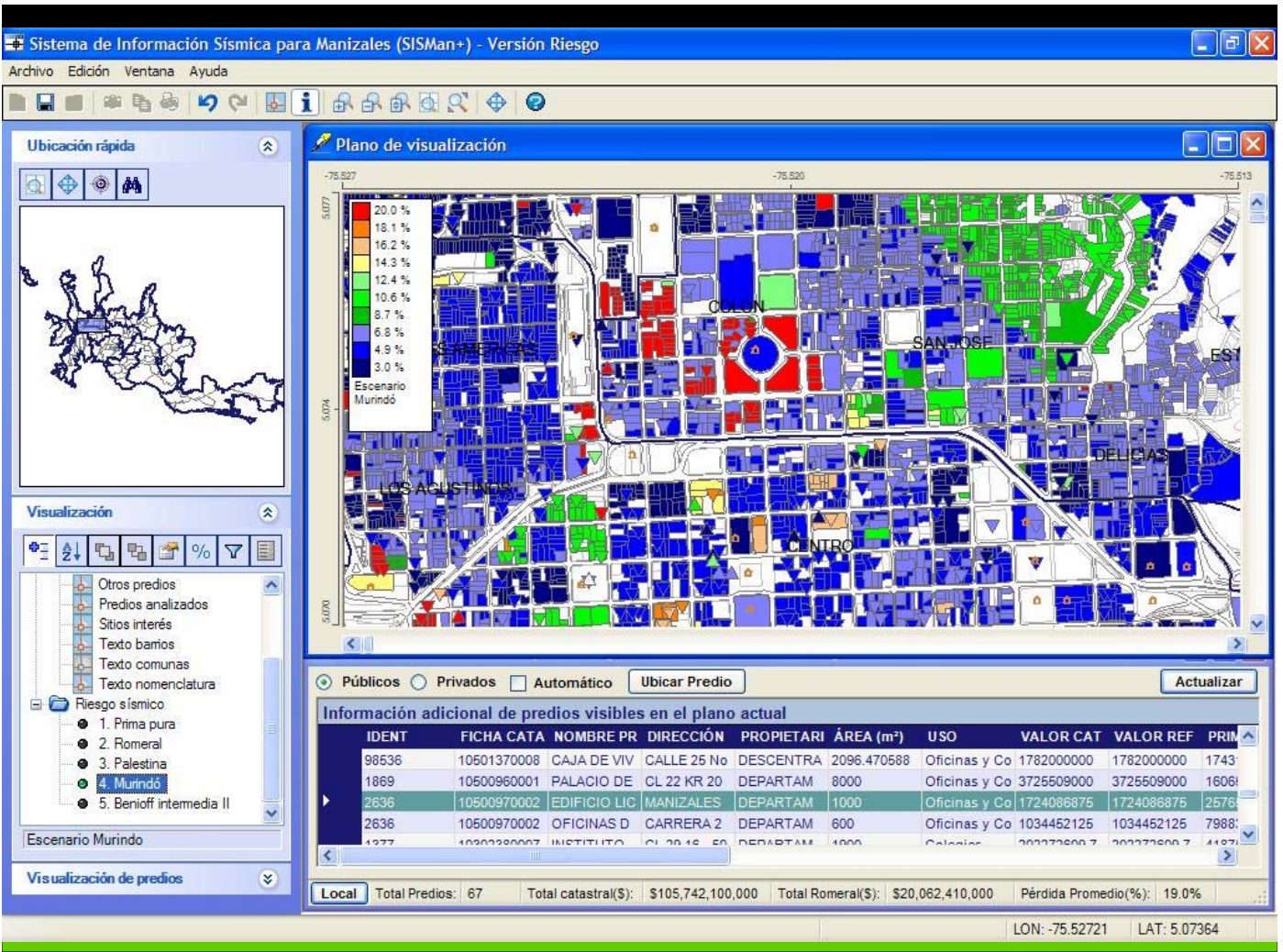
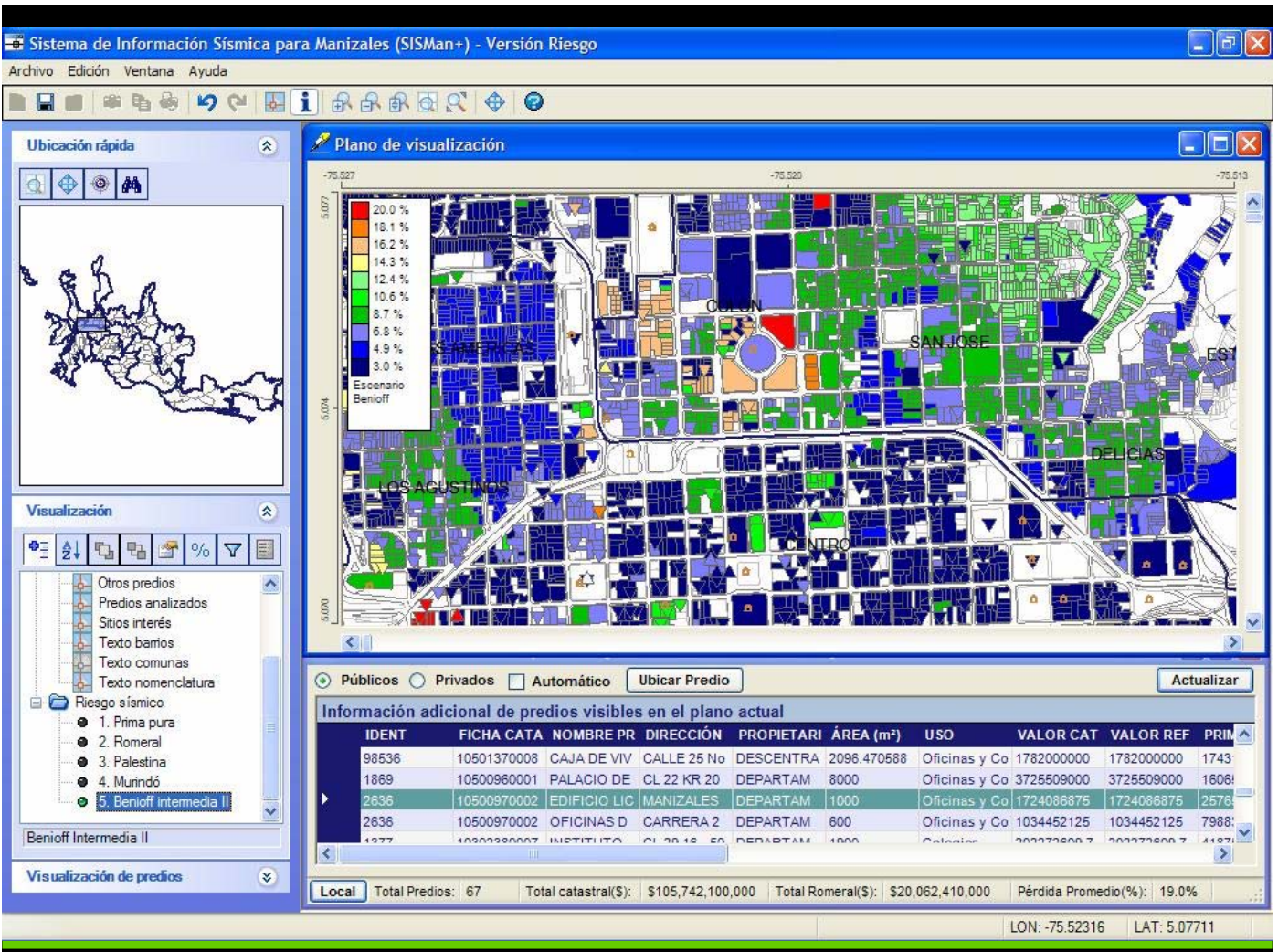
The need of a proposal to cover the losses of low-income people

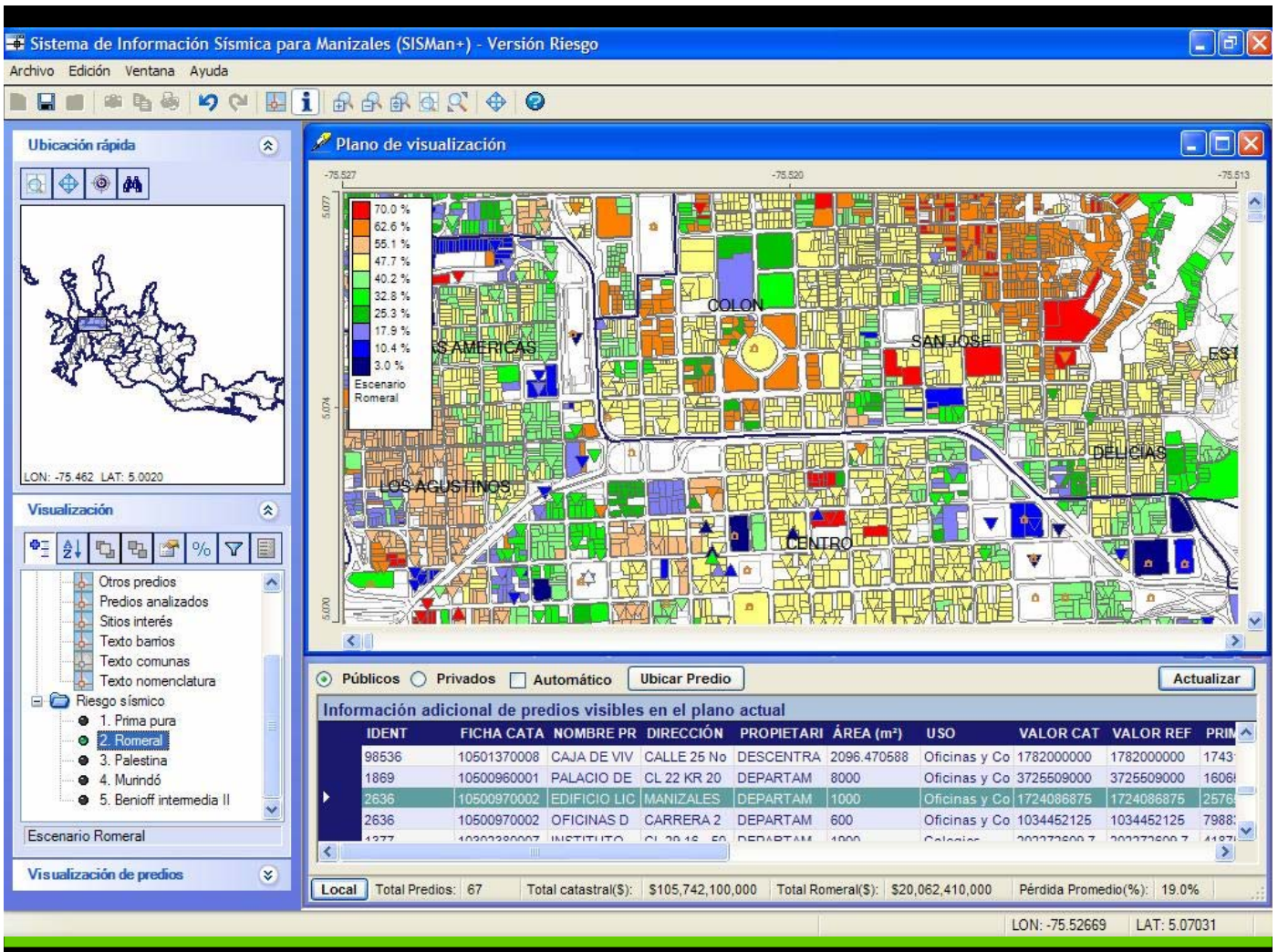
- Many municipalities have not recovered from previous events when they are affected by another event; this signifies a constant erosion of local development gains and opportunities.
- It is important to evaluate the fiscal exposure of government and its contingent liabilities to compensate housing and recovering of the livelihoods of poorest people.
- In order to face this problem an innovative risk transfer instrument at urban level has been developed to cover the low-income socio-economic population losses by cross-subsides.

The need of a proposal to cover the losses of low-income people

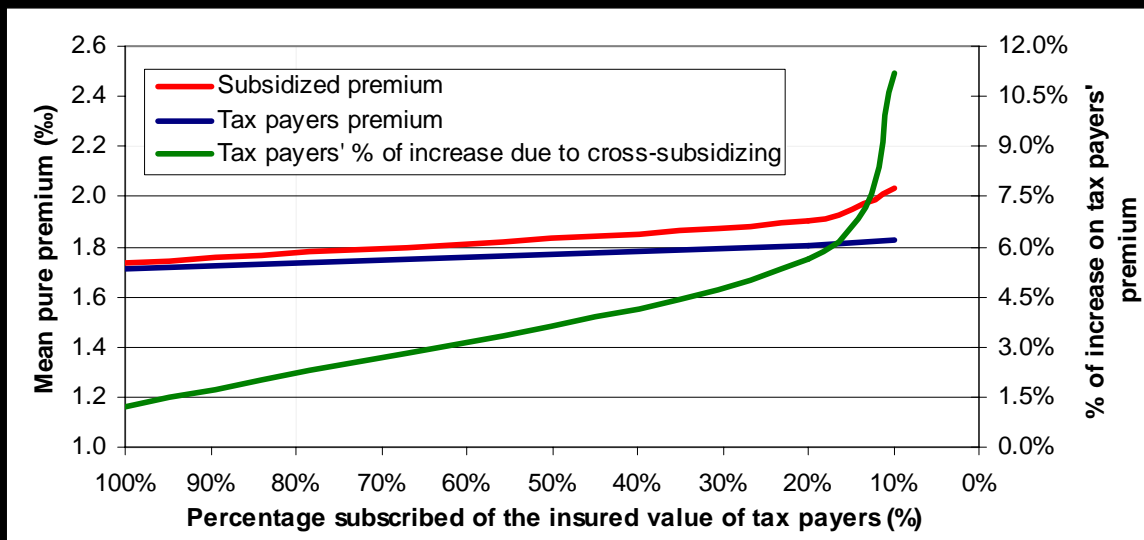
- Nowadays, Manizales city counts with a voluntary collective insurance city policy. It covers not only the estate-tax payers that subscribe the insurance but also the legal buildings of non estate-tax payers, which correspond to the city's poor people.
- This instrument considers a cross-subsidizing strategy to cover risk of poor people's housing that, in case of disaster, depicts a city government's passive liability.



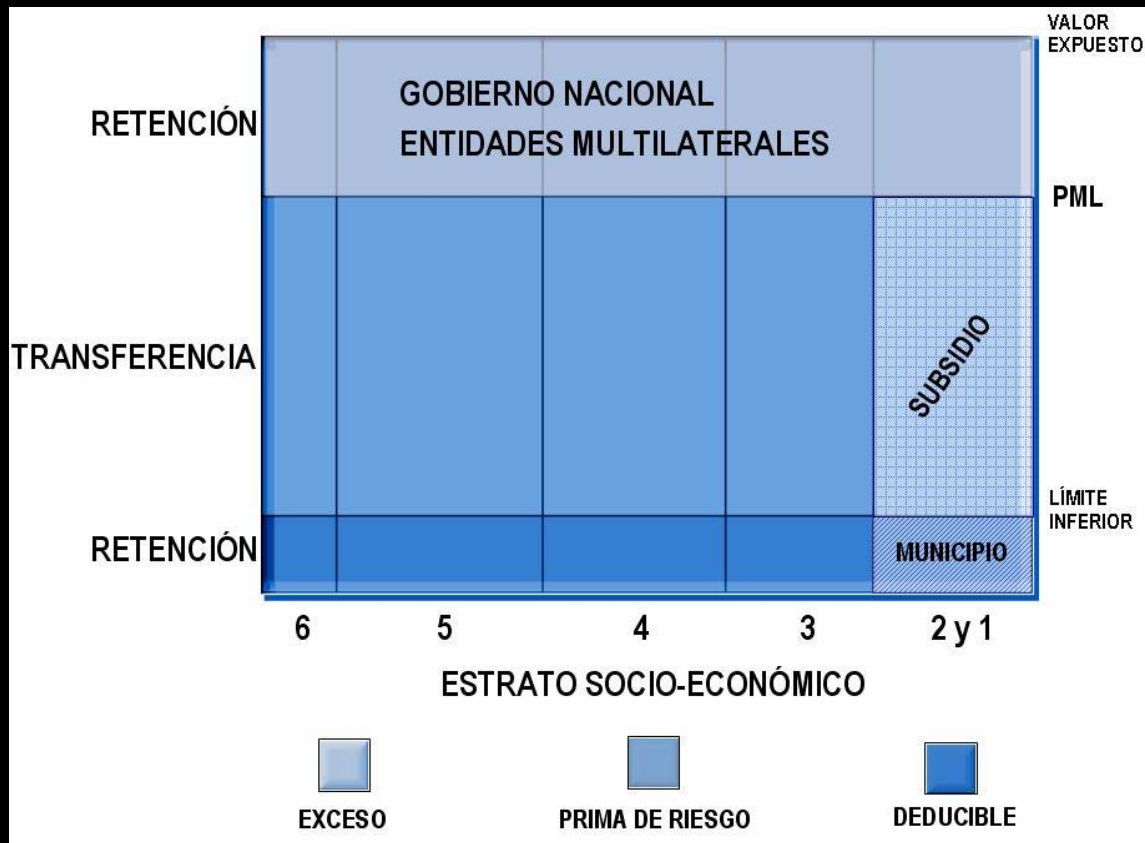




Pure premium results for private cross subsidizing in Manizales

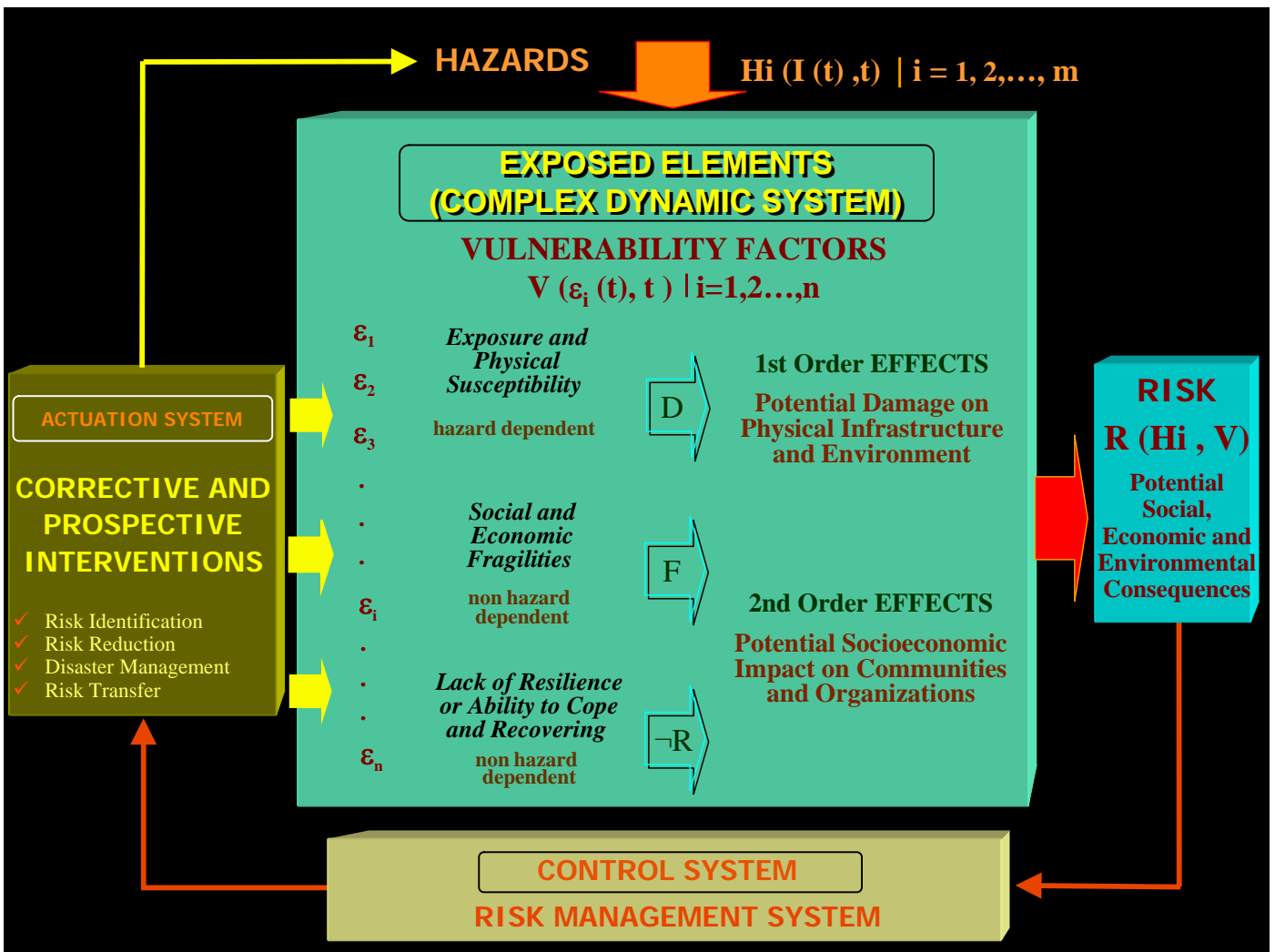


Collective insurance

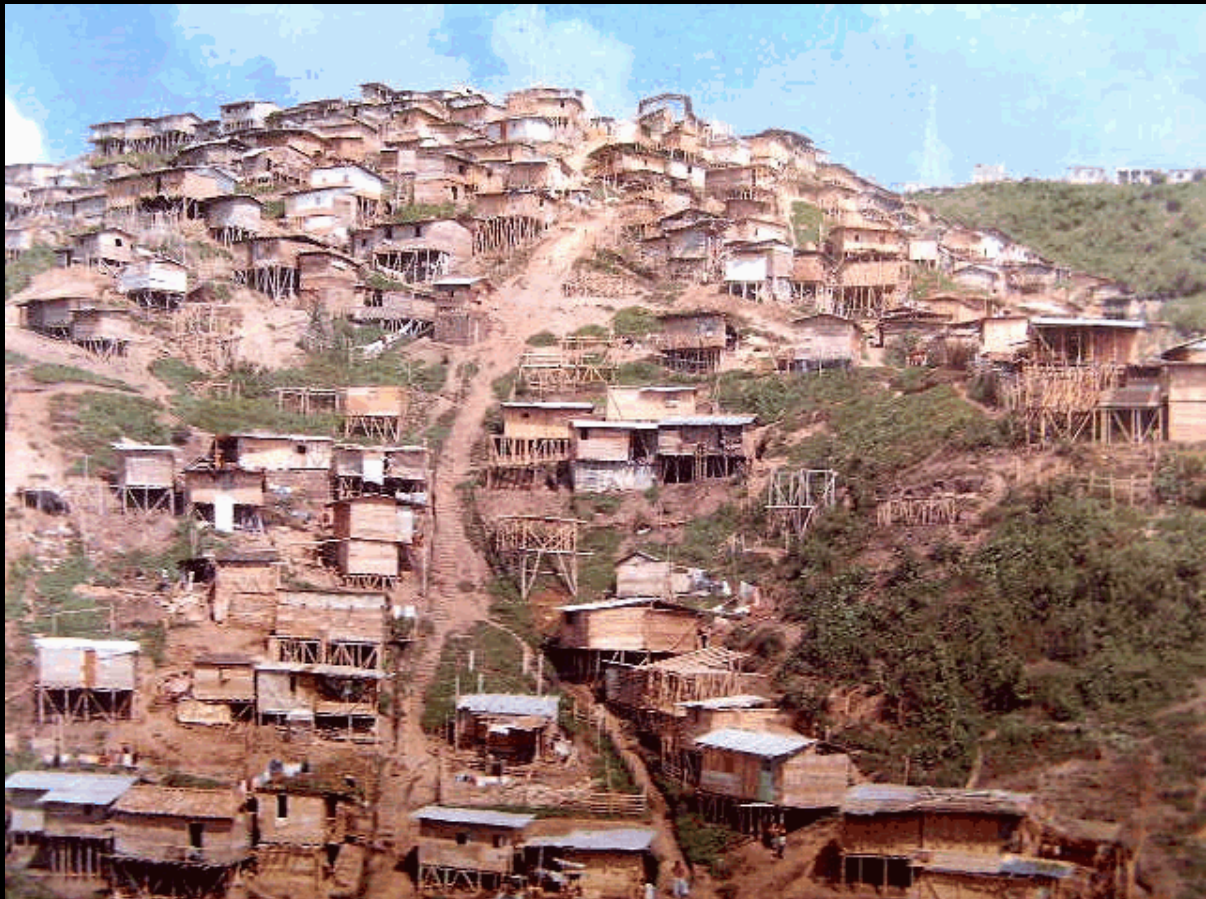


The need of a framework to measure and reduce the vulnerability

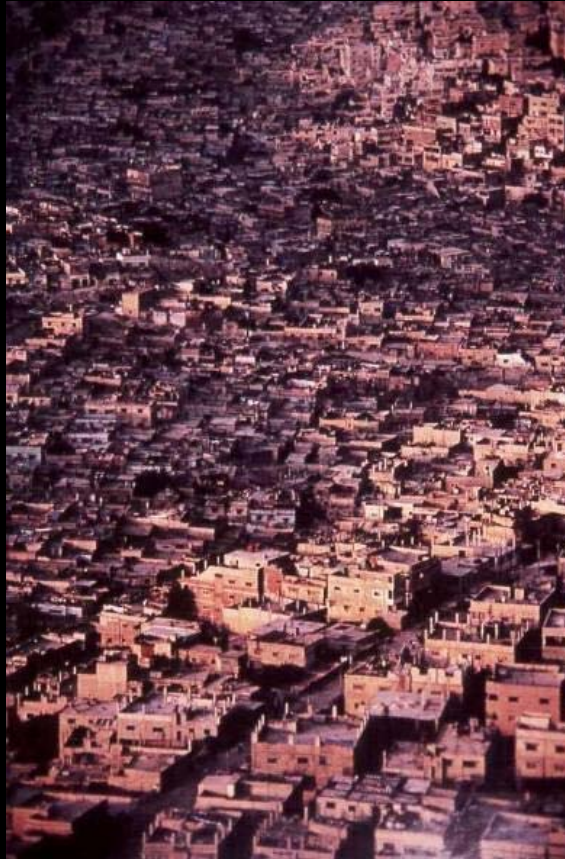
- Disasters are expressions of environmental problems and their materialization is a result of the social construction of risk.
- In order to analyze disaster risk it is necessary to identify the deep rooted and underlying causes of vulnerability and the mechanisms and dynamic processes that transform these into insecure conditions.
- It is fundamentally important to understand how vulnerability is generated, how it increases and how it accumulates.



Poverty and social segregation are factors of vulnerability



Inappropriate urban growth, without control, and densification of unsafe housing represent vulnerability conditions.



The need of a framework to measure and reduce the vulnerability

- Risk indicators or indices are feasible techniques for risk monitoring and may take into account both the harder aspects of risk as well as its softer aspects.
- An appropriate technique based on indicators can be a rational benchmark or common metric to rule the risk variables from a control point of view. The goal is not to reveal the truth, but rather to provide information and analyses that can improve decisions.