

**PMapping and PGIS for
Participatory Hazard-Risk Management (CRA)**
M.K. McCall, ITC, Enschede

“Use of GIS and RS in Disaster Risk Management”
APDC - ITC - AIT
Bangkok, May 2008

Two cases:
Naga City
Hangberg, Cape Town



Case study I

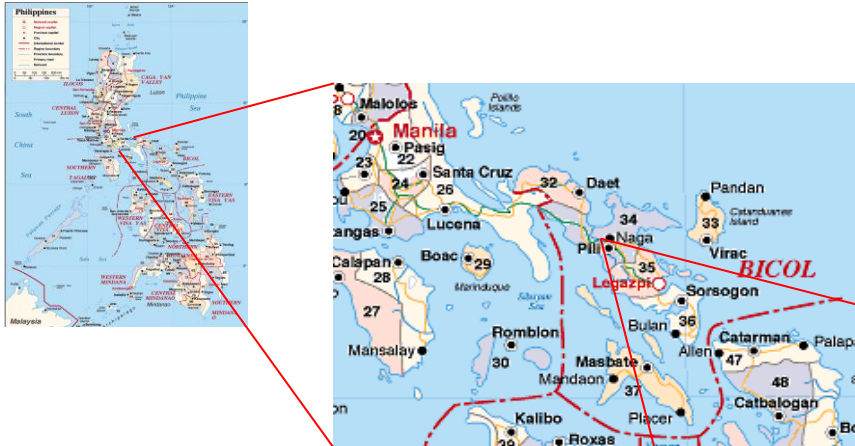
Naga City, Philippines
Participatory Flood Risk Assessment

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Participatory Flood Risk identification

Case study: **NAGA CITY** (Phil.)



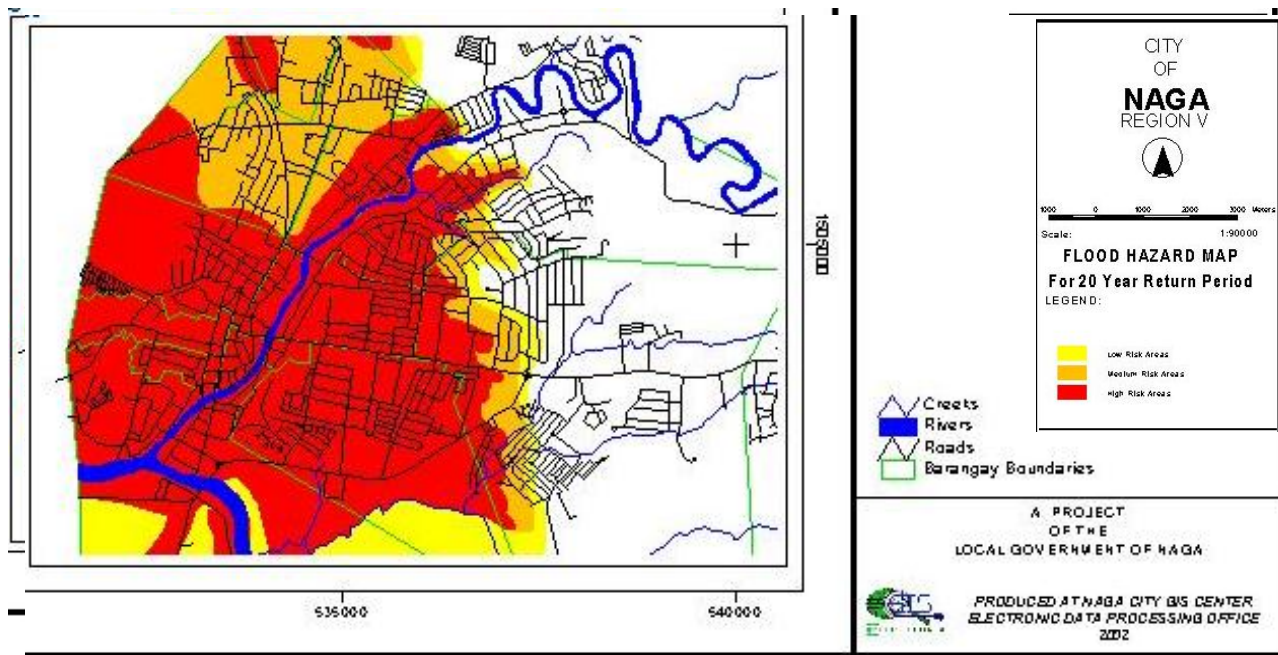
- **Floodplains** of Bicol River, in the Philippines **typhoon belt**, experience 2 to 5 typhoons annually and **extremely** intense rainfall (OIDC, 1999)

- Naga city is undergoing a very **fast expansion** process, considered the ‘heart of Bicol region’ center for commercial, educational and industrial sectors with an **economic growth** exceeding 6.5%

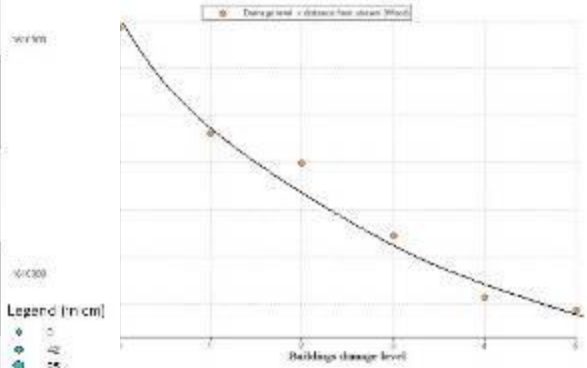
- Currently most of the low lying **agricultural** lands are been **converting** to residential and commercial land use **without** a proper expansion plan

- The flood-prone area includes **17** out of 27 barangays, **10** barangays are threatened by strong winds and flash floods

- It is inhabited by **85%** of the city’s aggregate population and holds **most** of the main **economic** activities

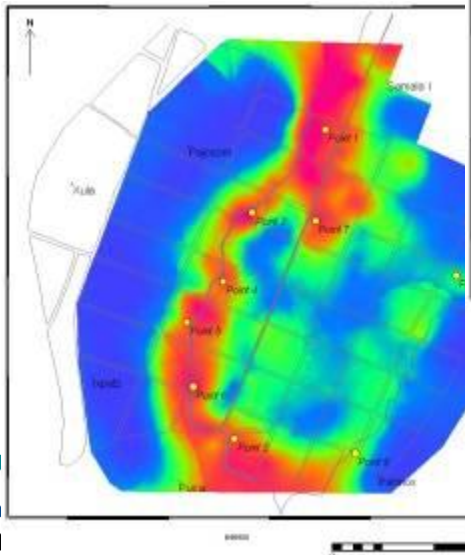
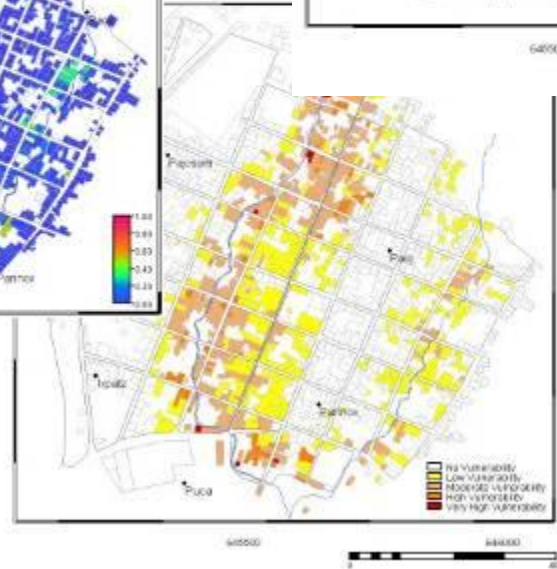
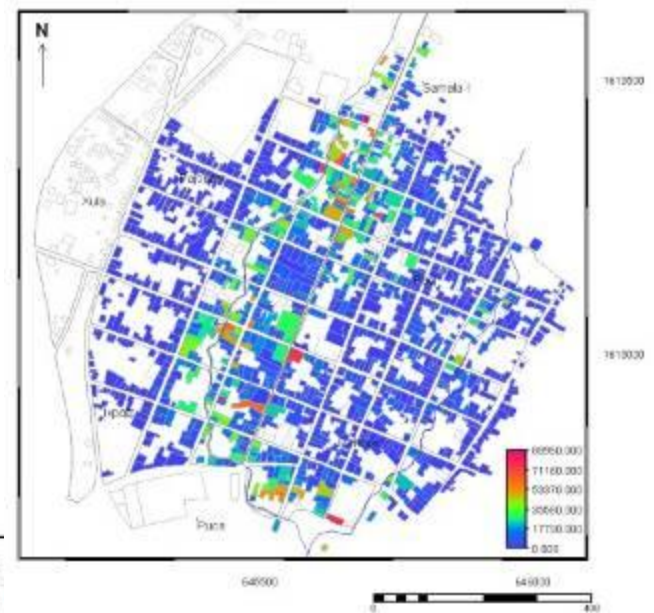


Flood Risk Assessment with Community Participation



Legend (m cm)

- 25
- 127
- 127
- 127



Risk map

Graciela Peters



Participatory Flood Risk identification

Component	Tools and Techniques
1. Flood Risk & Disaster Management – FRDM	<ul style="list-style-type: none"> - Workshop - Group discussion
2. Land use distribution	<ul style="list-style-type: none"> - Transects across the Barangay. Direct observation - Mobile GIS Mapping
3. Flood Hazard(Dec 2004)	<ul style="list-style-type: none"> - Questionnaires - Direct observation <ul style="list-style-type: none"> - Workshop - Mobile GIS
4. Physical Elements at Risk	<ul style="list-style-type: none"> - Pictures/video recording - Transects across the B'gay <ul style="list-style-type: none"> - Workshop - Mobile GIS
5. Household profiling	<ul style="list-style-type: none"> - Transects - Random questionnaires (min 60) - Mobile GIS Mapping - Identify vulnerability
7. Environment Quality - in B'gay context	<ul style="list-style-type: none"> - Transects across the B'gays - Pictures/video recording <ul style="list-style-type: none"> - Key informants - Mobile GIS Mapping
8. Flood risk assessment	<ul style="list-style-type: none"> - Workshop - Group discussion

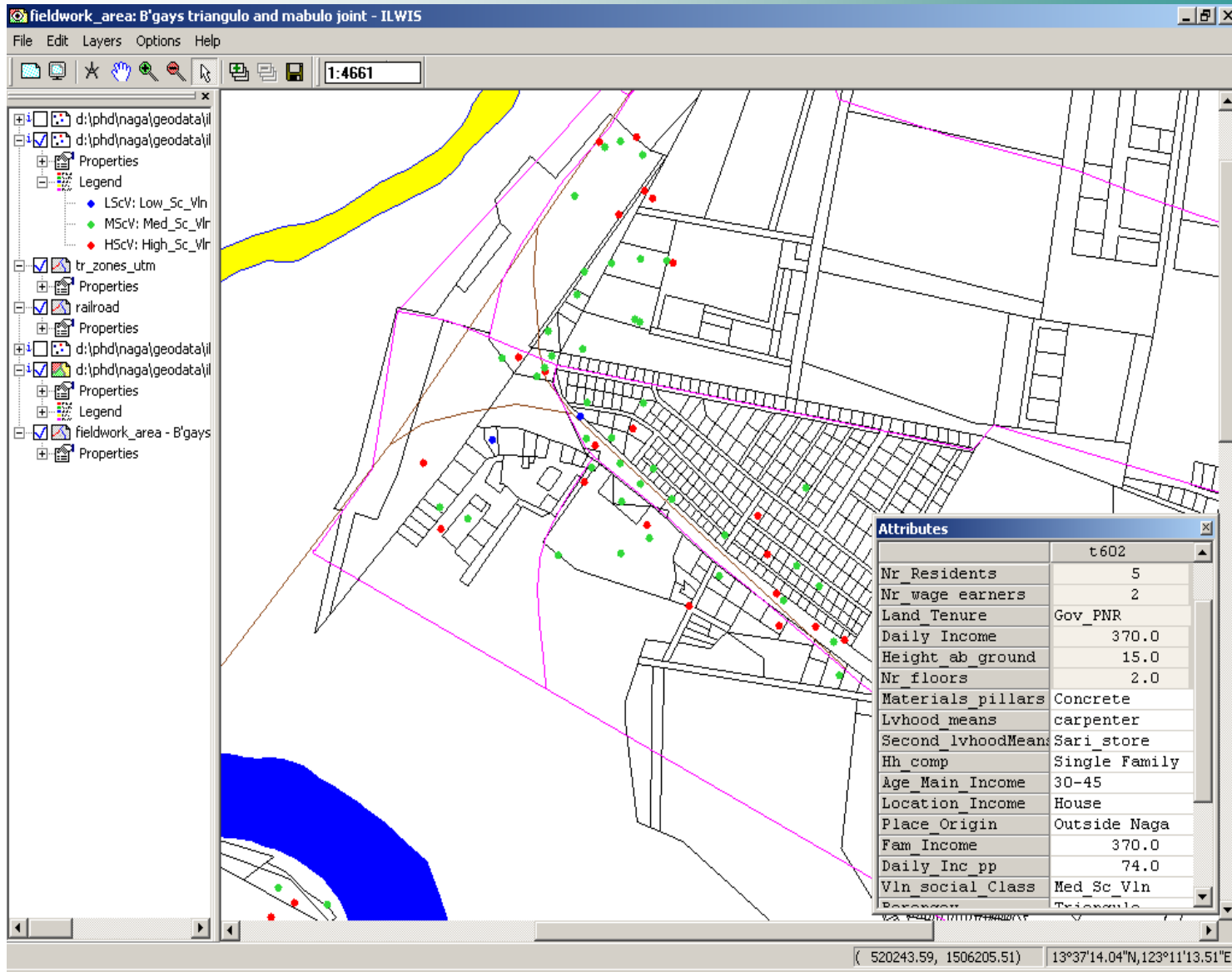


Community-based Identification of Flood Scenarios - B'gay Triangulo

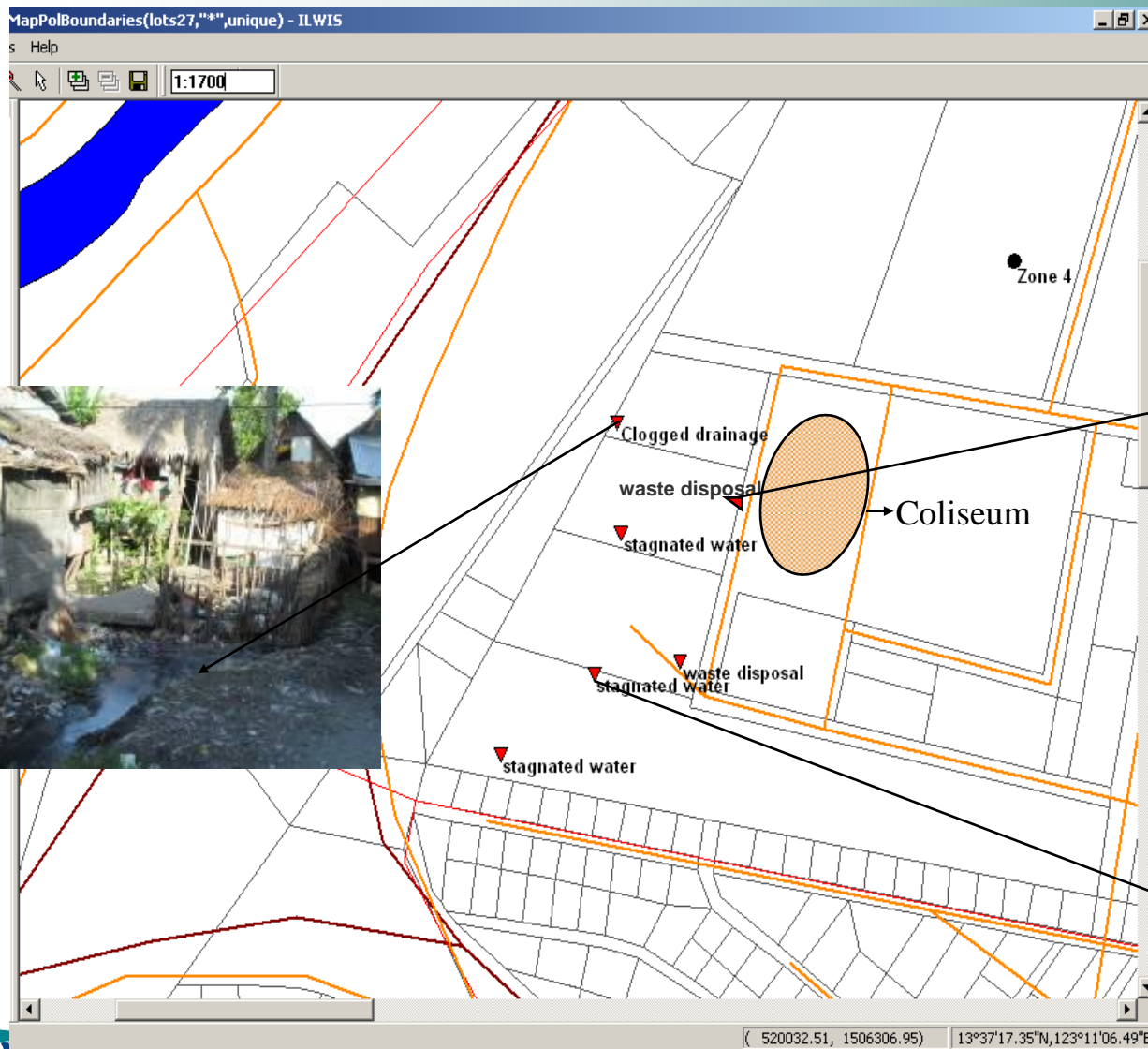


Type of flood	Zone	Depth	Duration	Frequency
Rain + Riverine (Naga + Bicol) flooding	6	Up waist (> 100 cm)	7 days	Last quarter of the year (Oct to Dec) sometimes during April 1 – 2 times in a year
	3	Up Waist (> 100 cm)		
	4	Waist (80 -100 cm)	2 -3 days	
	5	Waist (80 -100 cm)		
Flash flooding	6	Chest (140 cm)	2-3 days	No warning 2 events: the first on 1997 and last one on 2000 the whole Naga was flooded Muddy flood apparently related with opening of upstream Nabua dam gates
	3	Chest 140 cm)		
	4	Hips (80 cm)	1 day	
	5	Hips (80 cm)		
Rain + high tide	6	knee (<60 cm)	6 hours	Monthly (combination of heavy rains and high tide during full moon) zones are lower level than Naga river
	3	knee (<60 cm)		
Super typhoon	6	> 6 feet (> 180 cm)	3 weeks	Last quarter during rainy season (Oct to Dec) Super typhoon: Sinning /70 (240 kmph) Ruping/80's Onsang
	3	> 6 feet (> 180 cm)	3 weeks	
	4	5 feet (> 150 cm)	1 week	

Social Vulnerability Map– B'gay TRIANGULO



Mapping Environmental threats



Case study II

Hangberg, Cape Town
Community Risk Assessment

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Background



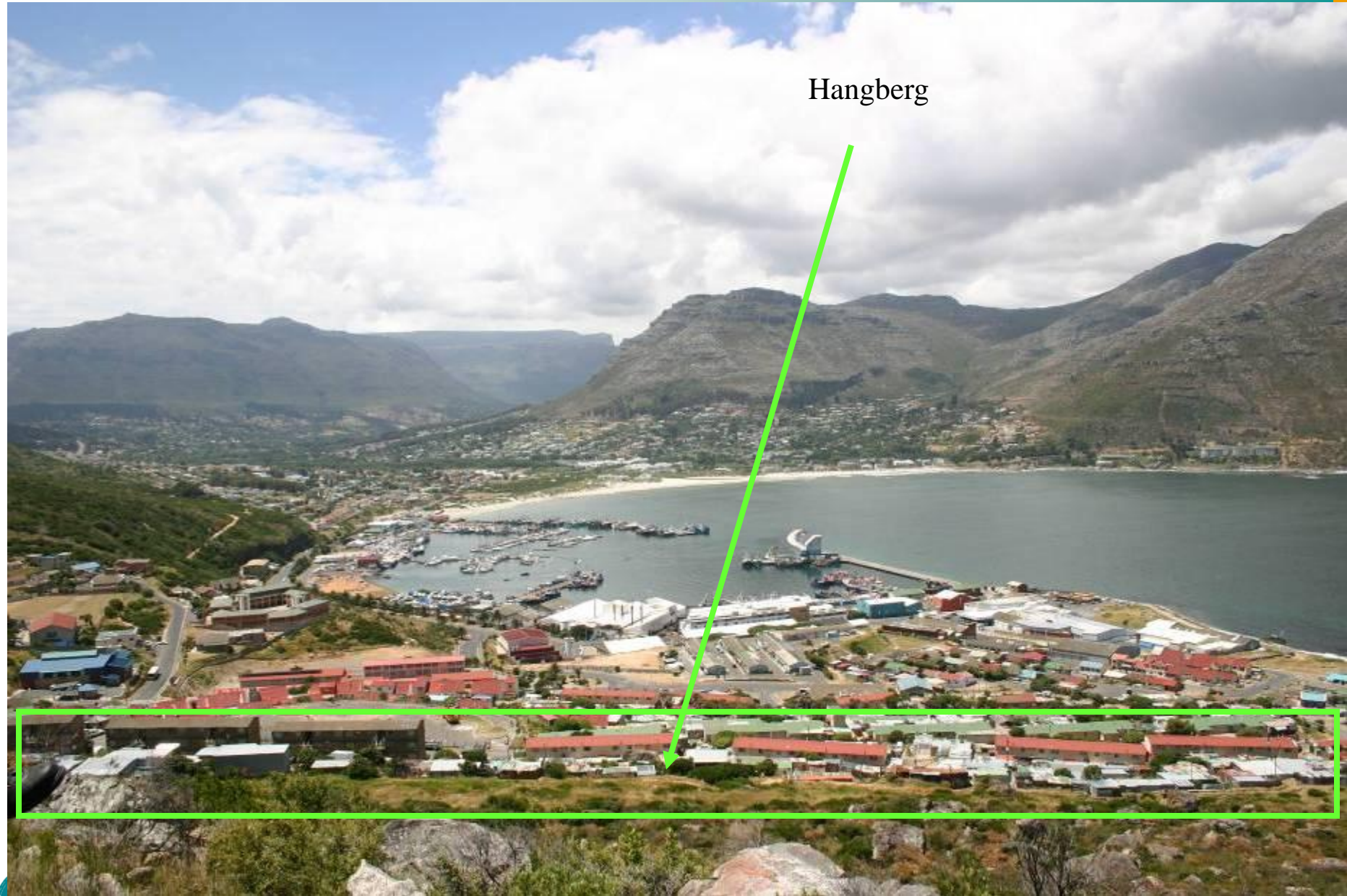
- The risk assessment was completed as part of a Community-Based Risk Assessment course presented by DiMP
- The risk assessment was done over the period 19-23 November 2004, with a field assessment from 22-23 November 2004.

View of Hangberg from across the valley

Hangberg



View of Hangberg from above the settlement



Hangberg

Risk Assessment Methodology



- Historical Records
- Focus group discussion
 - Community Mapping
 - Risk Prioritisation
- Transect walk(s)
- Household & Individual interviews



Focus Group Discussion



Community Hazard Mapping



Transect Walk



Household Interview

Limitations of assessment



- Did not interview:
 - Elderly
 - Children / Youth
 - Disabled persons
 - Housing department and other City stakeholders
- No infrastructure mapping (GPS)

Settlement characteristics



- History influenced by the Group Areas Act
- Historic reliance on fishing industry
- Relatively old settlement
- Tight-knit community with strong family bonds
- Currently a lack of employment opportunities

Settlement Characteristics

- Livelihoods

- Fishing (Trawlers / Factories)
- Bartering
- City Council
- Forestry / National Park
- Working for Water / Working on Fire
- Poaching
- Boat-building





Risks

- Historic data
- Qualitative information from interviews and discussions
- Loss Information Comparison
- Mitigation strategies



Risks - Loss Information Comparison



Official City of Cape Town fire records (Historical records):

Fire Incidents: Hangberg	1999	2000	2001	2002	2003	Total
Urban fringe fires	1	2	7	3	2	15
Bungalow fires	1		6	5	4	16
Bungalows destroyed in fires	2		7	7	6	22

Information from focus group discussions and household interviews:

Losses in community due to hazards	Number of deaths	Frequency of incidents
Drownings of poachers	2-4 people per year	2 incidents per year
Falls	4 people in last 2 years	Frequent falls
Informal Dwelling Fires	Man and child killed in past 4 years	5 remembered in last 4 years
Violence at clubs	No reported	Frequent
Serious flooding	No deaths	One serious event in 2001
Minor flooding	No deaths	Seasonal - during rains

Risks - Community flood mitigation measures



- Soakaway pipes
- Channels / furrows
- Building bungalows on bricks
- Improved foundations
- Building on stilts

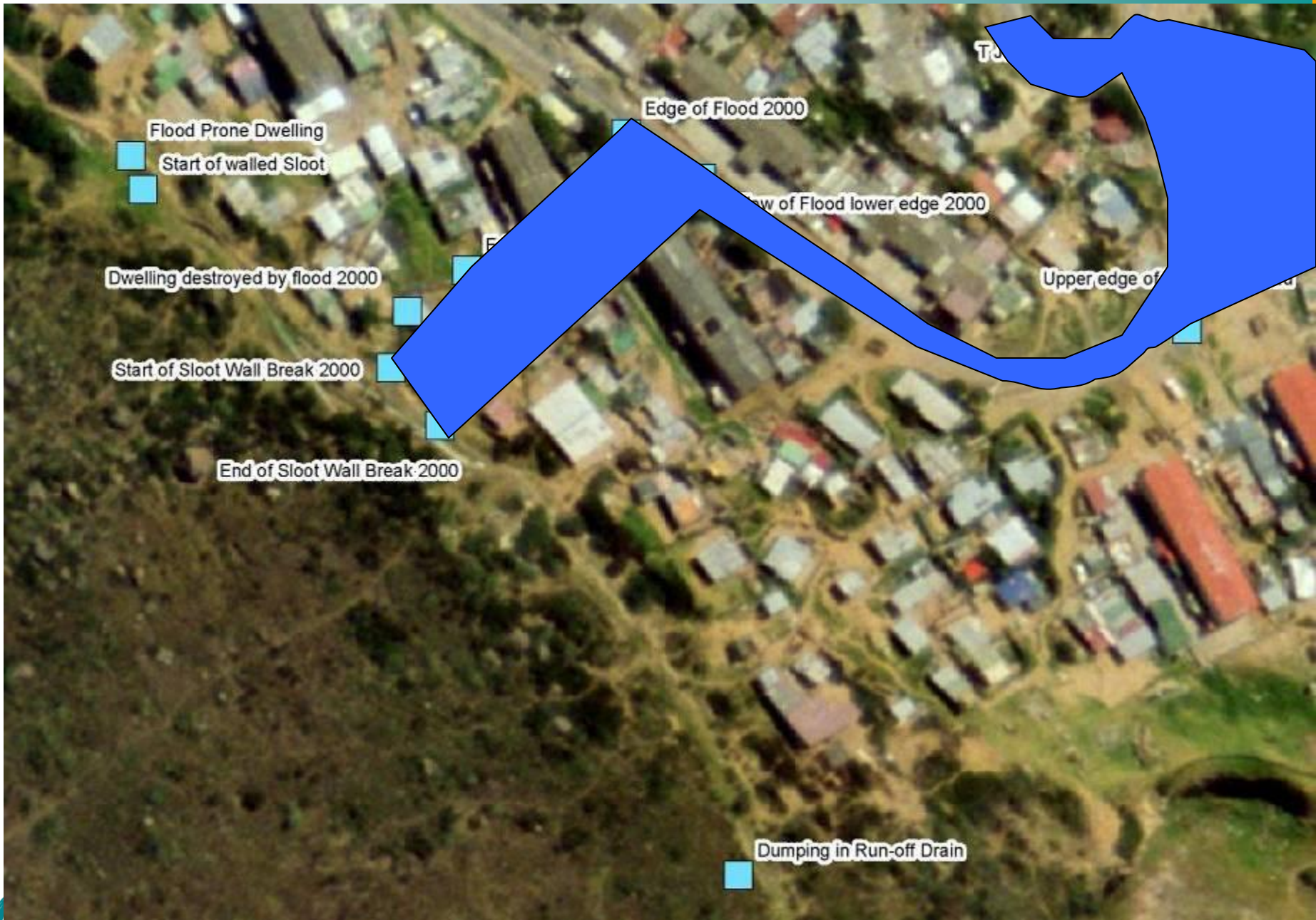
Risk Prioritisation

- Community risk prioritisation
- Group (researcher / outsider) assessment and prioritisation





Fire Incidents



Flood incident: 2001

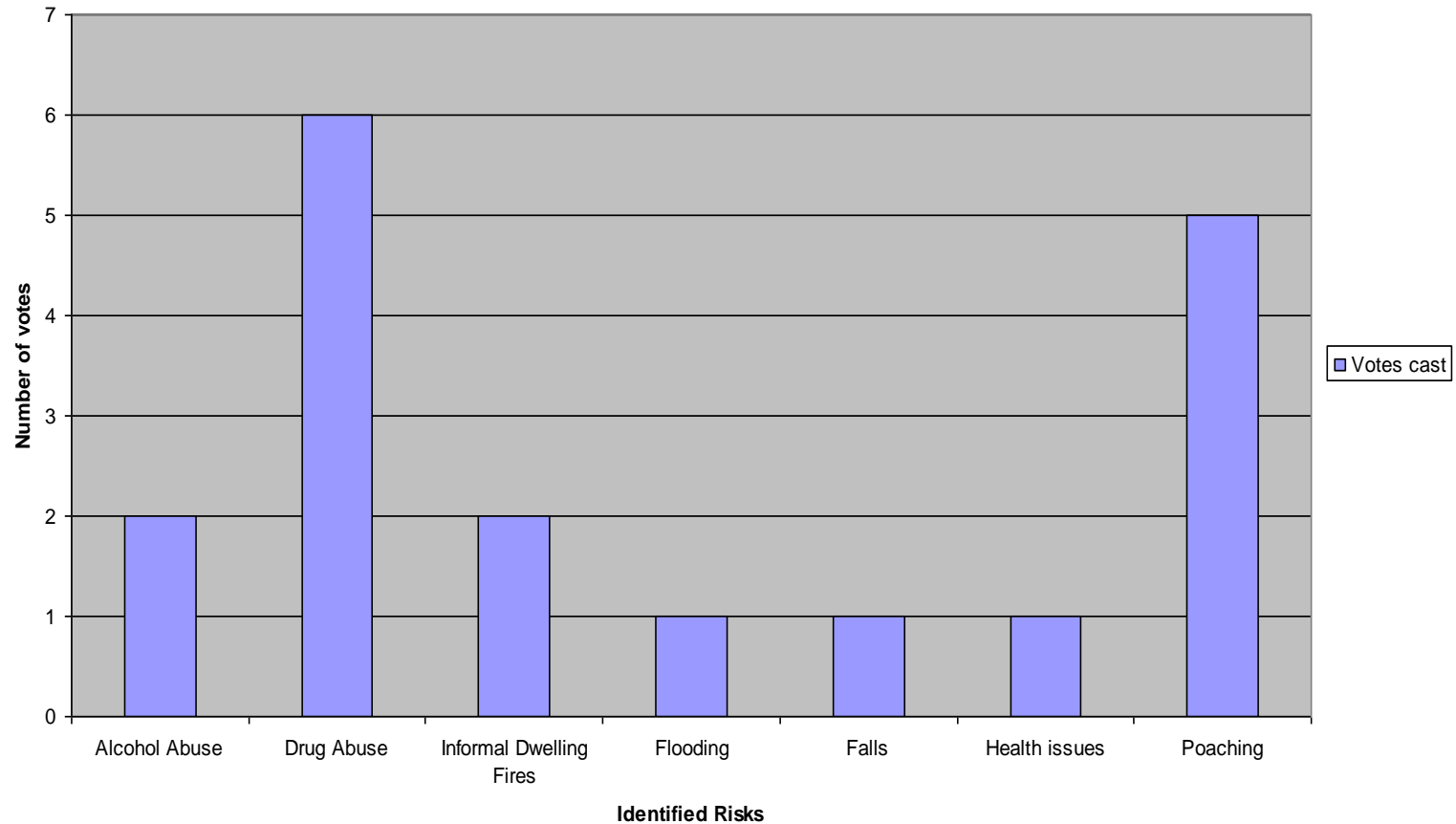


Hazard: Falls

Community Risk Prioritisation



Risk Prioritisation by Focus Group



(Prioritisation done by one mixed-gender adult focus group)

Findings



Disaster Risk	Level of Risk	Prioritisation Rating	Priority
Serious flooding	Extreme	13	1
Drownings of poachers	High	11	2
Informal Dwelling Fires	High	11	2
Falls	High	9	3
Violence at clubs	High	9	3
Minor flooding	High	9	3

Factors used to develop risk prioritisation:

- risk levels calculated by considering likelihood and consequences
- risk prioritisation calculated by considering Seriousness, Manageability, Urgency, Growth and Adverse development impact

Recommendations



- Enhanced risk communication
- Encourage community mitigation measures
- Encourage relationship with City
- Advocacy on issues related to poaching, job opportunities and housing