First Regional Europa Re
Insurance Conference

Developing Catastrophe
and Weather Risk Markets
in Southeast Europe:
From Concept to Reality

12–14 October 2011
Ohrid, FYR of Macedonia

Insurance Claims Settlement: *A look at new advances in remote sensing & damage assessment technologies*

Shubharoop Ghosh, Managing Director, eCityRisk/ImageCat US
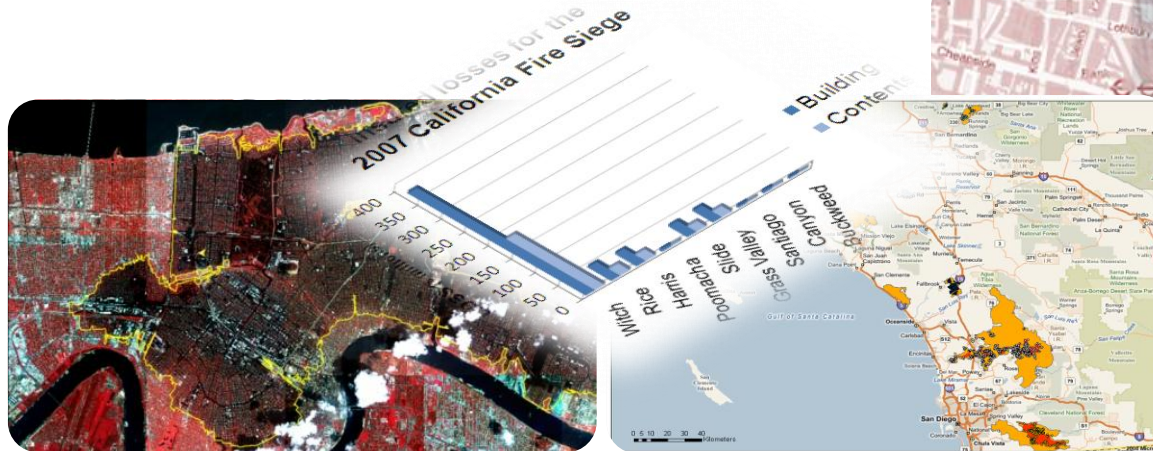
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ImageCat

Presentation overview

- Advances in catastrophe (CAT) response technologies

- Application to claims

- Framework for Europa Re claims system

About us

Inventors of Risk Management Technologies

ImageCat is an international risk management innovation company, highly regarded for its R&D and consultancy services.

eCityRisk is a trusted global provider of Visual Business Intelligence for the insurance and financial services industries, and part of the ImageCat family.

Clients include......

Existing challenges in claims

- Operational

  » Obtaining claims data when loss adjustors can't get into the area
  » Time taken to document building conditions
  » Assessing loss for inaccessible locations
  » Poor quality of policy data from insured
  » Processing steps involved on a case-by-case basis

- Strategic

  » Retaining clients through quick settlement and excellent service
  » Demonstrating industry best practise

- Financial

  » Rapidly understanding payment expectations
  » Reducing occurrence of false claims
  » Managing capital better
  » Avoiding downgrade by rating agencies

"The next generation claims management systems will reduce the total cost of processing claims, reduce the cycle time of end-to-end claims processing and provide greater customer retention."

Gartner, 2009*

A technology research and advisory company

The Opportunity

FYR Macedonia

Albania

Serbia

Finding an innovative and practical solution to reduce the time & cost for managing insurance claims in countries* served by Europa Re

* Current membership includes FYR Macedonia, Albania, Serbia. Accession negotiations for Georgia and Bosnia and Herzegovina will take place during the second half of 2011. Montenegro, Bulgaria, and Poland have also expressed interest in becoming Europa re shareholders.

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A new perspective for claims

Pre-event | **Event** | **Post-Event**

Geocoding at the time of underwriting

Pre-event Imagery

Exposure data

Protocols

Event Monitoring & immediate notification

Before/After image comparison

Phase1
48-72 hrs
- Imagery data collection
- Remote Damage Assessment
- **Phase1 Claims settled**

Phase 2
1-2 weeks
- Effectively target adjustors and claims resources
- In-field damage assessment
- **Phase 2 Claims settled**

Phase 3
within weeks
- Claims submission
- Assignment
- Evaluation in-house or send adjustors to review
- **Phase 3 Claims settled**

Claims Adjusting and Management

Financial Management

Work Management
Documents ǀ Correspondence ǀ
ǀ Contacts ǀ

Litigation Subrogation Salvage

A new perspective for claims

Event timeline | Pre-event | Event | Post-Event

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Litigation
Subrogation
Salvage

1. CAT Response Data & Systems
2. Damage Scales
3. Geocoding
4. Building Exposure Models

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Post Catastrophe (CAT) response

2007 UK Yorkshire floods
2007 UK Gloucester floods
2009 UK Cumbria floods

2008 Szechuan Earthquake, China

2003 Bam, Iran earthquake

2010 Western France Cyclone Xynthia floods

2004 San Simeon, CA earthquake
2004 Hurricane Charley
2004 Hurricane Ivan
2005 Hurricane Dennis
2005 Hurricane Katrina
2005 Hurricane Rita
2005 Hurricane Wilma
2007 California Wildfires
2008 Hurricane Gustav
2008 Hurricane Ike
2009 Atlanta-Georgia Floods
2011 Missouri, Alabama Tornadoes
2011 North Dakota Floods

2010 Madeira floods
2010 Madeira floods

2009 Italy L'Aquila Earthquake

2004 Niigata Japan Earthquake
2011 Japan Earthquake and Tsunami

2009 Sumatra Earthquake & Landslide
2011 Tsunami Samoa

2004 Indian ocean tsunami, Thailand, Damage Survey
2004 Indian ocean tsunami, Thailand, Recovery Survey

2010 Haiti Earthquake
2010 Chile Earthquake

2011 Queensland Flood
2011 Cyclone Yasi

2011 New Zealand Earthquake

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Selected CAT Response Clients

The damage information gathered by eCityRisk/ImageCat was essential for the GFDRR-sponsored Post-Disaster Needs Assessment carried out by the Government of Haiti with support from the World Bank, the UN, the Inter-American Development Bank, the EU, and other development partners.

eCityRisk/ ImageCat 's field deployment and damage assessment enabled Cat Modeler RMS to quickly assess the severity and extent of damage in the immediate aftermath of the 2005 hurricanes, including locations that were otherwise inaccessible. Cat losses based on eCityRisk/ ImageCat data were revised to 4X the original estimate for Katrina.

eCityRisk have a contract with the PICG at Lloyd's to rapidly collect fly-by visual intel after the next major US hurricane. We anticipate that the information collected will help Lloyd's to assess damage sustained and thereby take a view of potential loss.

eCityRisk's UK 2008 flood footprint enabled Allianz to determine that they picked up 15-20% distressed business within the impact zone. Also discovered that losses were slightly out of proportion with what Allianz expected, and were able to query why.

eCityRisk's disaster response data and services provide a core input to Guy Carpenter's i-aXs event tracking services.

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Fly-by "vertical"

CAT Response Data

- High resolution Satellite (50 cm or less)
- Very-High Resolution Aerial (25 cm or less)

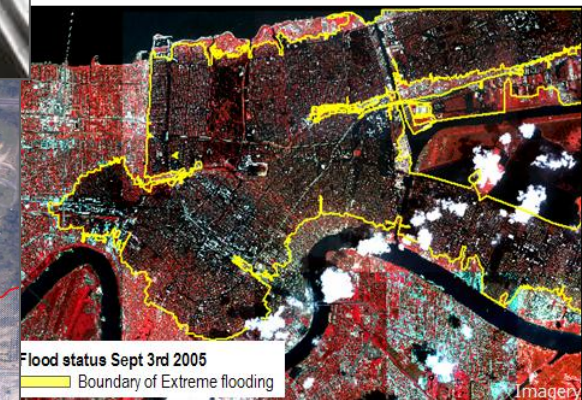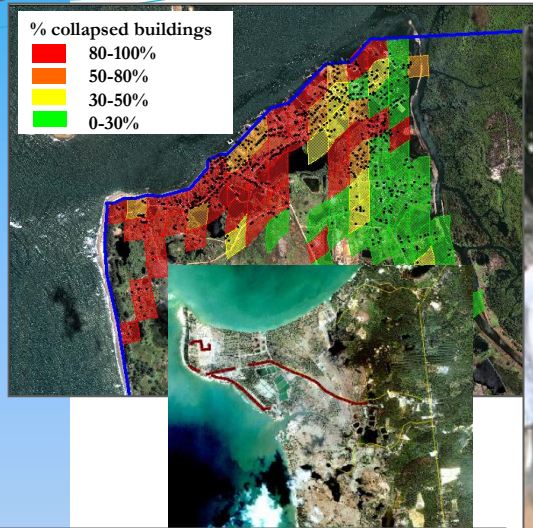Fly-by "oblique"

Drive-by

Flight Planning

Damage Data Capture

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Damage Data Delivery Platform
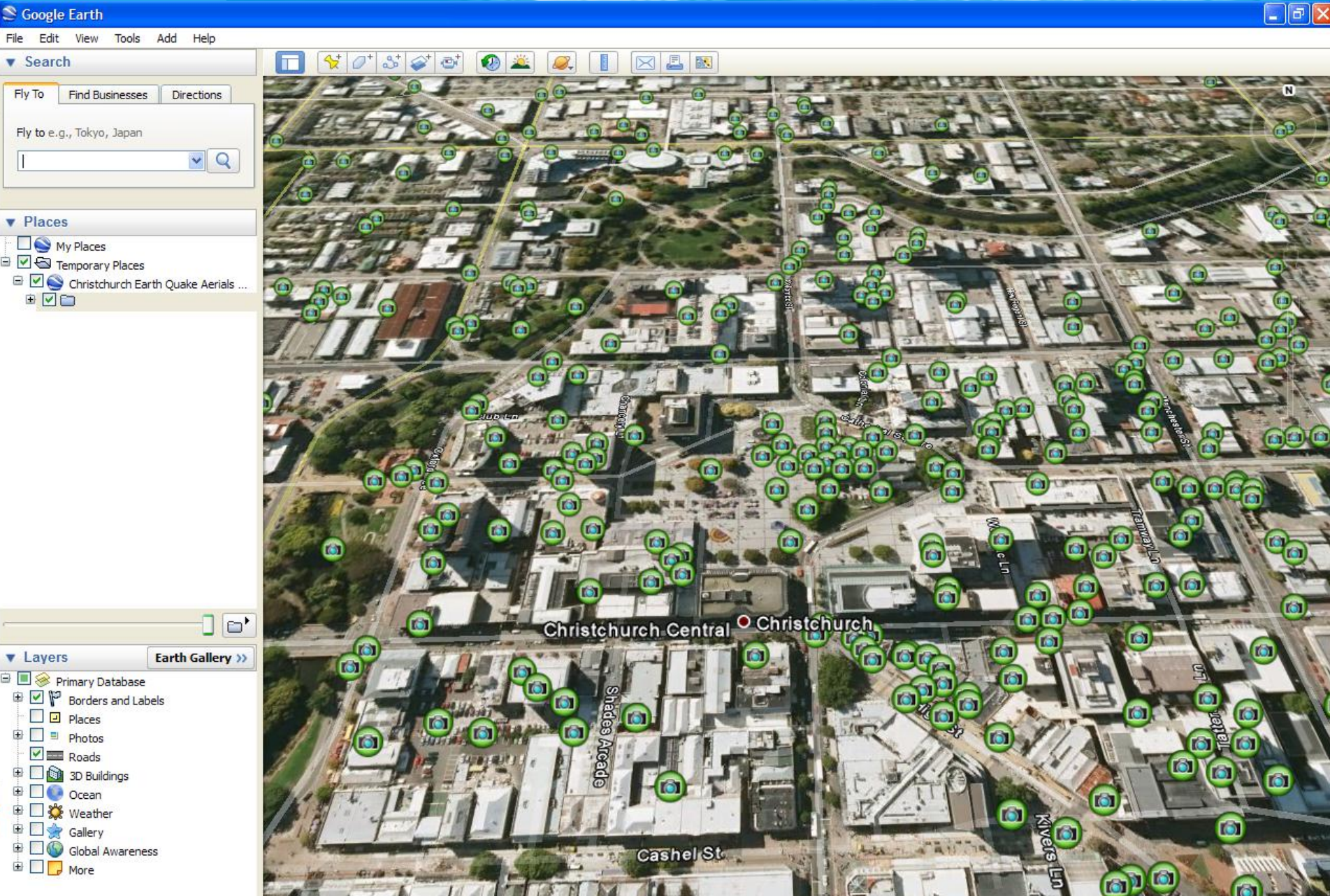
Damage Analysis Platform

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EMS-98 DAMAGE SCALE		REMOTE SENSING BASED CRITERIA	REMOTE SENSING SCALE
Grade 1: Negligible to slight **No structural damage,** **slight non-structural damage** Hair-line cracks in very few walls. Fall of small pieces of plaster only. Fall of loose stones from upper parts of buildings in very few cases.	**Grade 2: Moderate damage** **(slight structural damage, moderate non-structural damage)** Cracks in many walls. Fall of fairly large pieces of plaster. Partial collapse of chimneys.	Damage may not be discerned from image. Pre- and post-event images may be similar shape, size, color . Removal of tiles from roof; small amount of debris. Confidence in determination low. In-field verification will be needed for such cases.	**RS1: SLIGHT TO MODERATE DAMAGE**
Grade 3: Substantial to heavy **(moderate structural damage, heavy non-structural damage)** Large and extensive cracks in most walls. Roof tiles detach. Chimneys fracture at the roof line; failure of individual non-structural elements (partitions, gable walls).	**Grade 4: Very heavy damage** **(heavy structural damage,** **very heavy non-structural damage)** Serious failure of walls; partial structural failure of roofs and floors.	Portions of wall visible on ground. Large amount of debris visible at gable and bearing end. Debris visible at roof line between structures. Confidence in determination high. In-field verification may or may not be needed for such cases.	**RS2: EXTENSIVE DAMAGE**
Grade 5: Destruction **(very heavy structural damage)** Total or near total collapse.		Total or near total collapse. Large amounts of debris visible. Rooflines no longer visible. Interior walls visible. Confidence in determination very high. In-field verification may not be needed for such cases.	**RS3:CATASTROPHIC DAMAGE**

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Grade 1: Negligible to slight **No structural damage,** **slight non-structural damage** Hair-line cracks in very few walls. Fall of small pieces of plaster only. Fall of loose stones from upper parts of buildings in very few cases.	**Grade 2: Moderate damage** **(slight structural damage, moderate non-structural damage)** Cracks in many walls. Fall of fairly large pieces of plaster. Partial collapse of chimneys.	Damage may not be discerned from image. Pre- and post-event images may be similar shape, size, color . Removal of tiles from roof; small amount of debris. Confidence in determination low. In-field verification will be needed for such cases.	**RS1: SLIGHT TO MODERATE DAMAGE**
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	Grade 5: Destruction **(very heavy structural damage)** Total or near total collapse.	Total or near total collapse. Large amounts of debris visible. Rooflines no longer visible. Interior walls visible. Confidence in determination very high. In-field verification may not be needed for such cases.	**RS3:CATASTROPHIC DAMAGE**

February 2011 New Zealand Earthquake

10 m

Remote Sensing based determination : RS2 Extensive Damage

EMS-98 Grade 4:
Very Heavy Damage

February 2011 New Zealand Earthquake

FLOOD DAMAGE SCALE[1]	REMOTE SENSING BASED CRITERIA[2]	REMOTE SENSING SCALE[3]
WF-2 Some resulting damage to interior of building from water.	Flood depth 0-2 ft	**RS1: SLIGHT TO MODERATE DAMAGE**
WF-3 Extensive damage to interior from water.	Flood depth 2- 8 ft	**RS2: EXTENSIVE DAMAGE**
WF-4 Failure of wall frame.	Flood depth > 8 ft	**RS3:CATASTROPHIC DAMAGE**

[1] *Womble et al, 2006*
[2] *Developed by incorporating multiple sources such as high resolution aerial images of sampled buildings in ZIP codes, LiDAR, high resolution DEMs, and high watermark observations if available*
[3] *Damage levels are estimates developed based on flood depth and building vulnerability to still water according to HAZUS-MH depth damage functions*

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Overview of Flood Inundation Showing Affected Regions Following Queensland, Australia Floods (10-14 January 2011)

Area of Queensland affected
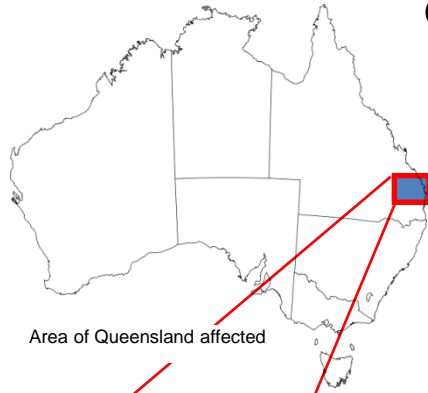
City affected	Dates	Details
Toowoomba	10/01/2011	Flash Flood 3 weeks rain + 6.3 inches in 36 hrs (Brisbane Times)
Grantham & Gatton	10/01/2011	Lockyer Creek 18.92 m (Gatton), 7 m (Grantham) (Courier Mail)
Ipswich	10/01/2011	Bremer River 19.4 m - 3000 homes flooded (Courier Mail)
Brisbane	13/01/2011	Brisbane River 4.46 m - 20000 homes flooded (ABC)

55 Km

Ipswich & Brisbane Area

Grantham & Gatton Area

16 Km

7 Km

Toowoomba Area

Data developed using multiple sources including modeled results, aerial images and photographs, and news reports.
Map produced for A4 printing, and is for reference use only. No liability concerning use of this map is assumed by the producer. ©eCityRisk 2011

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% Area Flooded by Postcode

Flood Event	Date	Post Code	Flooded Area
Brisbane & Ipswich	13/01/2011	4106	91.3%
Brisbane & Ipswich	13/01/2011	4072	38.2%
Brisbane & Ipswich	13/01/2011	4075	35.6%
Brisbane & Ipswich	13/01/2011	4010	35.4%
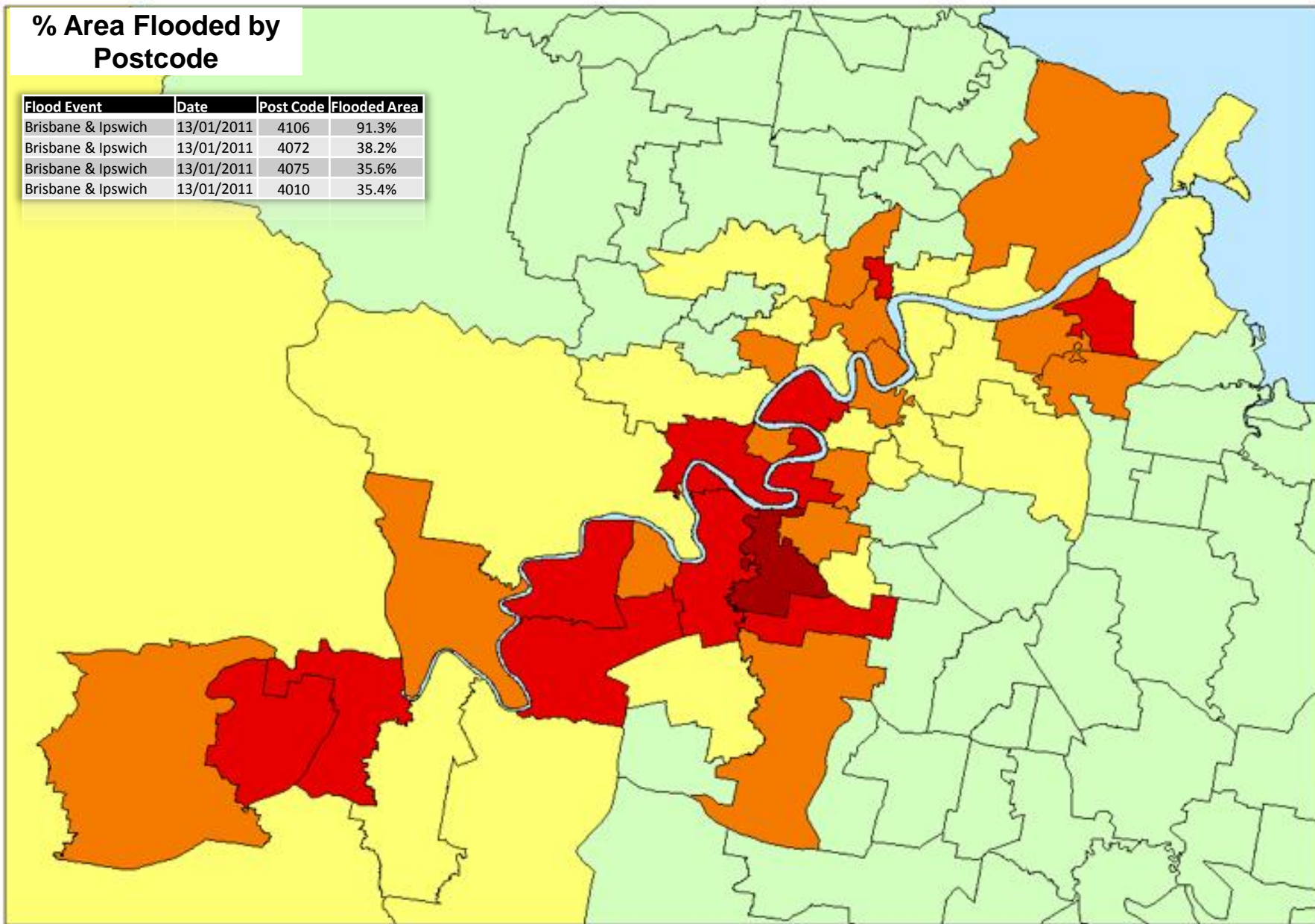
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Flood depth analysis (1/2)

Estimated flood depth: 2m

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Flood depth analysis (2/2)

Building ID:4
Facility: Holiday Inn
Address: 2200 Burdick Expy E, Minot, ND 58701
Parcel: MI19B280000010
HAZUS occupancy: COM 8, COM 8, RES 4
Description: 7 story hotel with a connection ballroom, indoor pool and entertainment casino area. The hotel appears to be constructed of reinforced concrete with steel framing in the larger open areas.
Square Footage: 1)hotel 109,203 2)warehouse 12,460 3)casino 22,425. Total 144,088

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Flood depth analysis (2/2)

Building ID:4
Facility: Holiday Inn
Address: 2200 Burdick Expy E, Minot, ND 58701
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appears to be constructed of reinforced concrete with steel framing in the larger open areas.
Square Footage: 1)hotel 109,203 2)warehouse 12,460 3)casino 22,425. Total 144,088
Water depth at first floor: 2-5 feet

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Flood depth analysis accuracy

- Compared modeled versus observed depth from aerial photos

- Offset consistent with typical crawl-space or basement uplift height

- No spatial pattern in offsets

- Extreme differences often associated with high first floor elevations

Modeled versus observed depths

$y = 0.7645x + 3.2481$
$R^2 = 0.6578$

Modeled innundatoin depth

Observed depth at ground floor from Pictometry*

* www.pictometry.com

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claims workflow

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ground-up loss

Damage and insured Loss Estimates at Postcode Level

Insured	LAT	LON	Street name	House number	Postcode	Occupancy	Post code (lookup)	Occupancy (lookup)	Shaking Intensity (MMI)	No Visible Damage	Light damage	Moderate damage	Heavy Damage	Collapsed	Average Loss (%)	TIV	Calculate Ground-up Loss	Policy Limit	Policy Excess	Loss to Policy Layer	Line	Loss to Line
45689	-43.53214	172.64040	Hereford Street	190	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	20000	$4,263			£4,263		£0
45690	-43.53121	172.64132	Worcester Street	154	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	24481	$5,219			£5,219		£0
45691	-43.53252	172.64040	Liverpool Street	9	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	113813	$24,262			£24,262		£0
45692	-43.53218	172.63525	Hereford Street	104	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	10000	$2,132			£2,132		£0
45693	-43.53269	172.63982	Manchester Street	146	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	120000	$25,581			£25,581		£0
45694	-43.53218	172.63525	Hereford Street	104	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	14000	$2,984			£2,984		£0
45695	-43.53252	172.63690	High Street	281	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	55000	$11,725			£11,725		£0
45696	-43.53252	172.63690	High Street	281	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	55000	$11,725			£11,725		£0
45697	-43.53485	172.63689	Colombo Street	642	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	278000	$59,263			£59,263		£0
45698	-43.53485	172.63689	Colombo Street	642	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	278000	$59,263			£59,263		£0
45699	-43.53485	172.63689	Colombo Street	642	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	38500	$8,207			£8,207		£0
45700	-43.53480	172.63887	Colombo Street	644	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	391000	$83,351			£83,351		£0
45701	-43.53453	172.63887	Colombo Street	644	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	19900	$4,242			£4,242		£0
45702	-43.53186	172.63770	Colombo Street	644	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	7000	$1,492			£1,492		£0
45703	-43.53186	172.63770	Lichfield Street	96	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	5000	$1,066			£1,066		£0
45704	-43.53300	172.63434	Hereford Street	141	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	67500	$14,389			£14,389		£0
45705	-43.53300	172.63434	Hereford Street	141	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	40000	$8,527			£8,527		£0
45706	-43.53326	172.63404	Cashel Street	83	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	230000	$49,030			£49,030		£0
45707	-43.53326	172.63404	Cashel Street	83	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	230000	$49,030			£49,030		£0
45708	-43.53190	172.64121	Cashel Street	82	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	1520000	$324,026			£324,026		£0
45709	-43.53190	172.64121	Cashel Street	82	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	1520000	$324,026			£324,026		£0
45710	-43.53394	172.63682	Hereford Street	195	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	590000	$125,773			£125,773		£0
45711	-43.53394	172.63682	Hereford Street	195	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	590000	$125,773			£125,773		£0
45712	-43.53394	172.63682	Colombo Street	668	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	1135000	$241,953			£241,953		£0
45713	-43.53394	172.63682	Colombo Street	668	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	360000	$76,743			£76,743		£0
45714	-43.53394	172.63682	Colombo Street	668	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	360000	$76,743			£76,743		£0
45715	-43.53394	172.63682	Colombo Street	668	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	540000	$115,114			£115,114		£0
45716	-43.53250	172.63401	Colombo Street	668	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	35000	$7,461			£7,461		£0
45717	-43.53247	172.63982	Colombo Street	668	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	108000	$23,023			£23,023		£0
45718	-43.53247	172.63982	Oxford Terrace	134	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	108000	$23,023			£23,023		£0
45719	-43.53247	172.63982	Manchester Street	152	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	110000	$23,449			£23,449		£0
45720	-43.53268	172.63648	Manchester Street	152	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	405000	$86,336			£86,336		£0
45721	-43.53268	172.63648	Manchester Street	152	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	405000	$86,336			£86,336		£0
45722	-43.53268	172.63648	Cashel Street	79	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	67000	$14,283			£14,283		£0
45723	-43.53190	172.64121	Cashel Street	79	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	10000	$2,132			£2,132		£0
45724	-43.53190	172.64121	Colombo Street	687	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	10000	$2,132			£2,132		£0
45725	-43.53326	172.63493	Colombo Street	687	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	2115000	$450,865			£450,865		£0
45726	-43.53326	172.63493	Colombo Street	687	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	2115000	$450,865			£450,865		£0
45727	-43.53326	172.63493	Hereford Street	195	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	534050	$113,846			£113,846		£0
45728	-43.53286	172.63404	Hereford Street	195	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	1145000	$244,085			£244,085		£0
45729	-43.53286	172.63404	Cashel Street	110	8011	Commercial	8011	Commercial	8	75%	9%	7%	6%	3%	21%	1145000	$244,085			£244,085		£0

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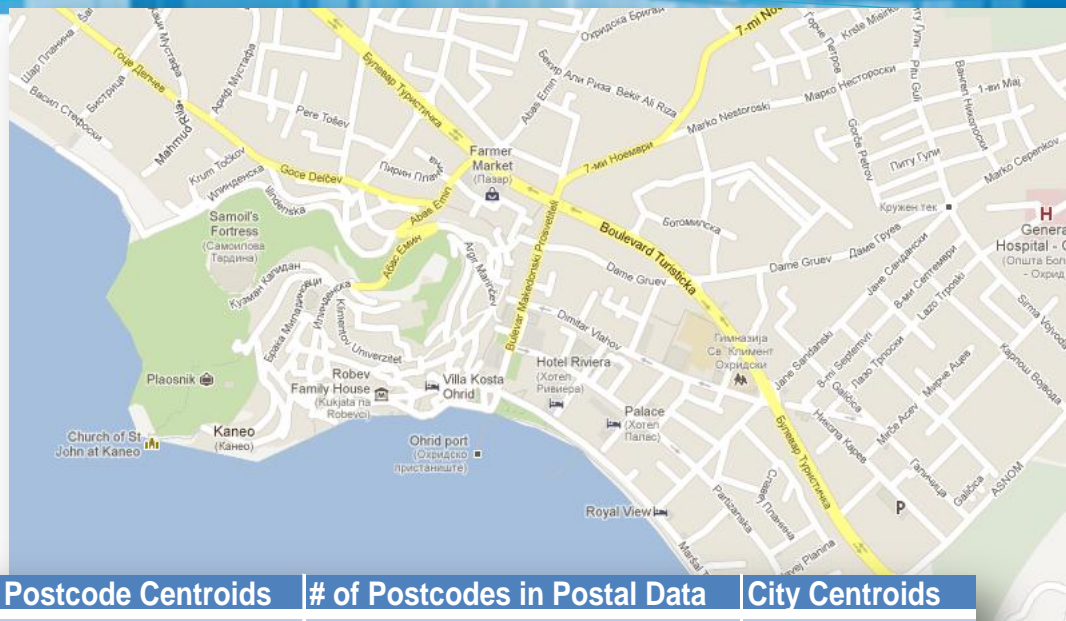
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Geocoding

- ☁ Resolution
  - » City
  - » Postcode
  - » Street
  - » Rooftop

Countries	Street Segments	Postcode Centroids	# of Postcodes in Postal Data	City Centroids
Albania	100	518	unknown	434
Bosnia and Herzegovina	141	655	677	1049
Macedonia	16081	300	320	247
Serbia	98731	1300	1700	NA
Bulgaria	131665	4817	4660	1327
Georgia	0	N/A	NA	345
Montenegro	3495	0	126	279
Poland	942705	22000	22000	16622

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Building Exposure Databases

Quality exposure data is critical for effectively managing CAT risk including supporting claims activities after an event...

- Levels of Building exposure data
  - » Level 1: Post Code or Other homogeneous zones
  - » Level 2: Per building
  - » Level 3: Per building with field verification
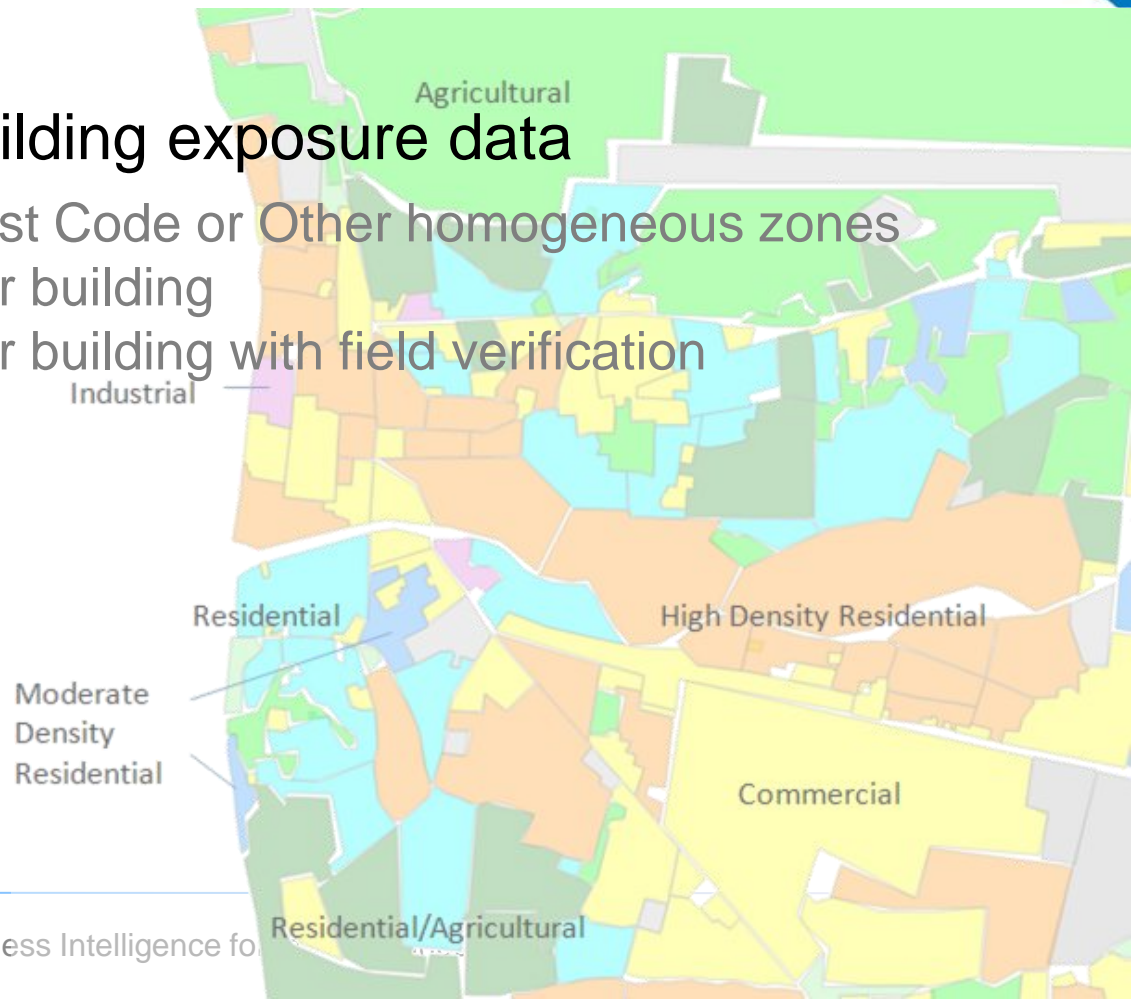
Agricultural

Industrial

Residential

High Density Residential

Moderate Density Residential

Commercial

Residential/Agricultural

Indonesia Exposure Database
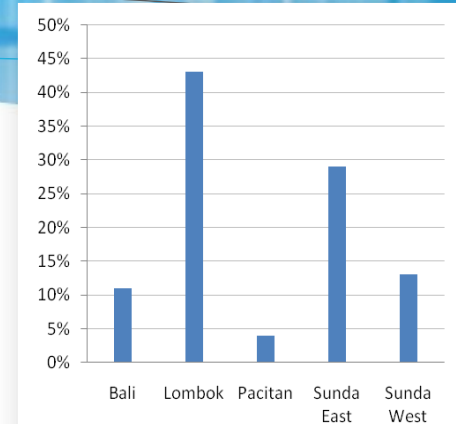
Building Count distributions for five urban areas spread across three regions of Indonesia
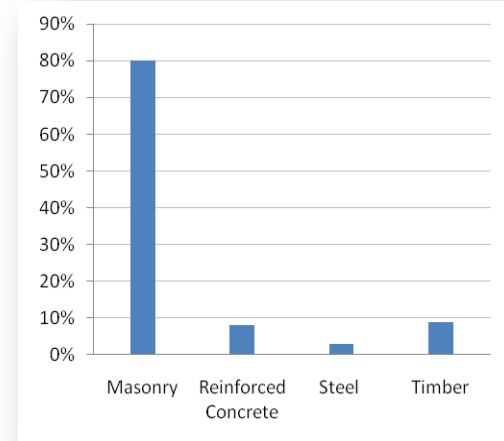
Distribution of Construction Types for the Indonesia Exposure Database

Lombok survey example ground photographs viewed in Google Earth

Framework for a Remote Sensing Based Claims Management System

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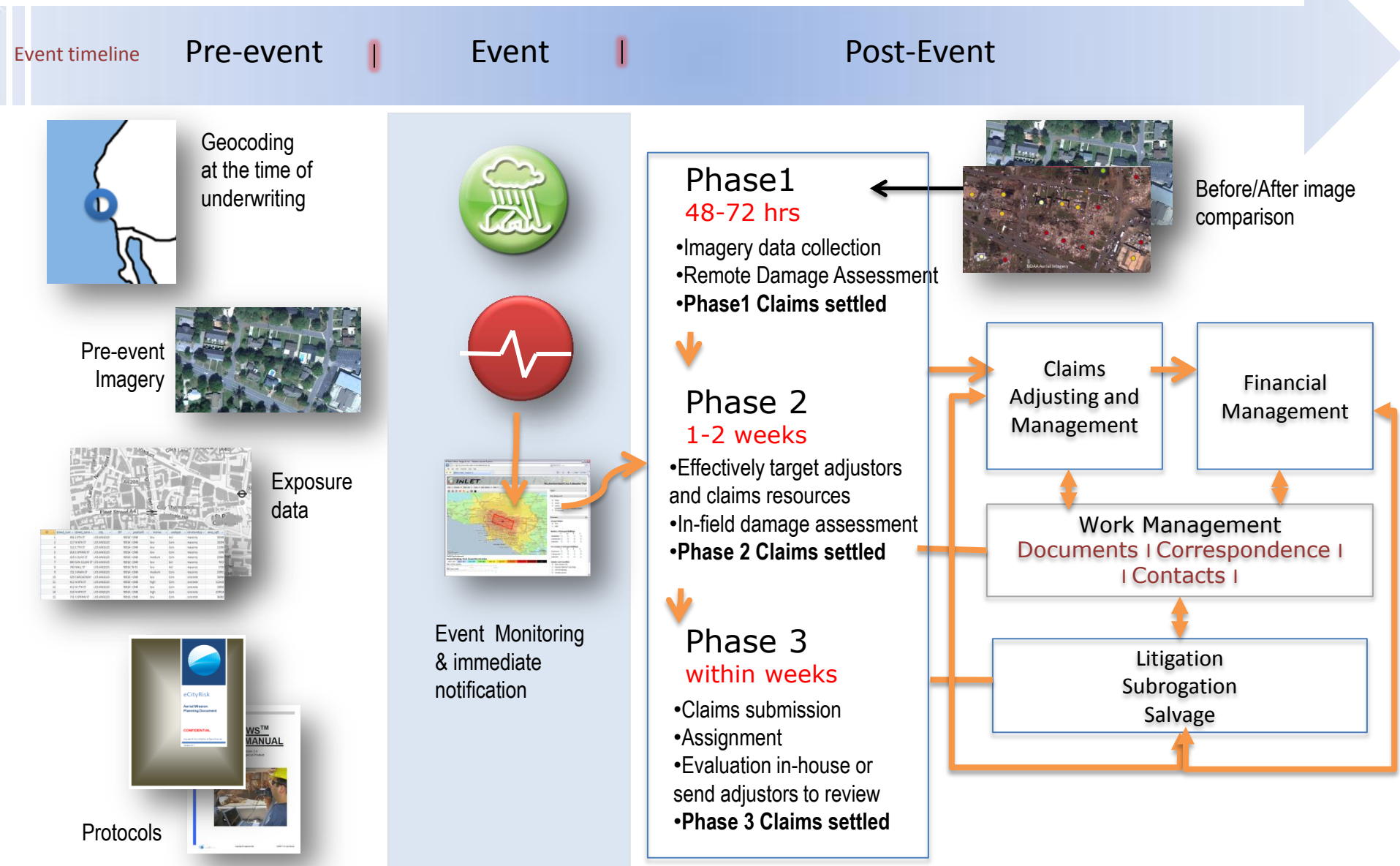
Objectives

- Simplify standard claims functionalities by designing a system based on flexible business rules that may be tailored to Europa Re customer requirements

- Develop a set of standard protocols and criteria for damage and loss estimation using remote sensing technologies as the basis.
  - » Imagery acquisition and processing
  - » Damage assessment based on scientific damage scale
  - » Translate damage into a loss value
  - » Data capture, storage and dissemination

- Integrate with the suite of systems that are under development
  - » Web-based underwriting system
  - » High-resolution catastrophe risk models for earthquake and flood.

- Improve claims performance by providing decision makers the tools that assist them to take effective action on the front lines of the claims process

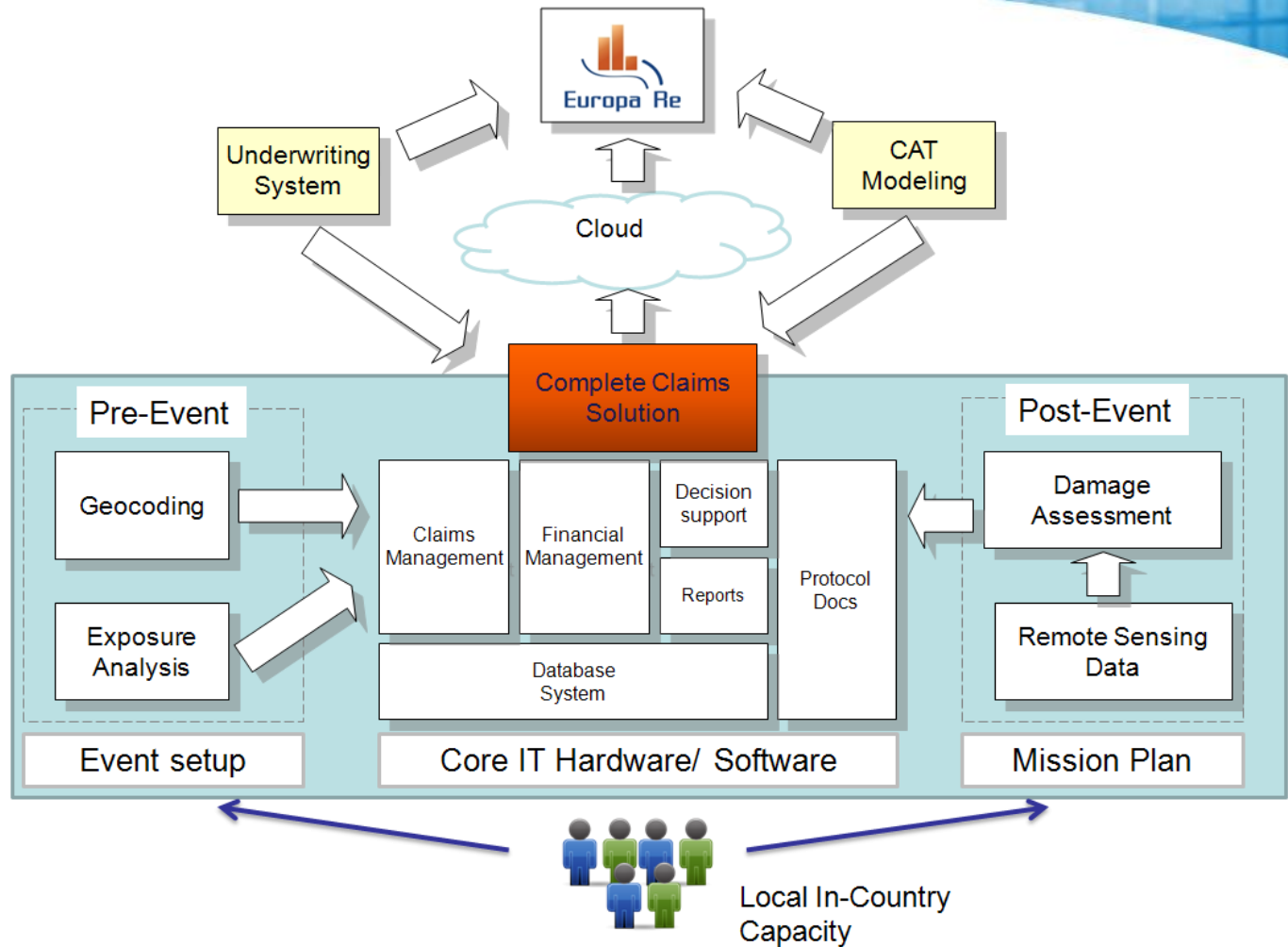# A new perspective for claims

Pre-event | **Event** | **Post-Event**

Geocoding at the time of underwriting

Pre-event Imagery

Exposure data

Protocols

Event Monitoring & immediate notification

Phase 1
48-72 hrs
- Imagery data collection
- Remote Damage Assessment
- **Phase1 Claims settled**

Before/After image comparison

Phase 2
1-2 weeks
- Effectively target adjustors and claims resources
- In-field damage assessment
- **Phase 2 Claims settled**

Phase 3
within weeks
- Claims submission
- Assignment
- Evaluation in-house or send adjustors to review
- **Phase 3 Claims settled**

Claims Adjusting and Management

Financial Management

Work Management
Documents I Correspondence I
I Contacts I

Litigation
Subrogation
Salvage

The Framework

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Potential to Use Transformational Technologies

- Event monitoring and early impact overview
  e.g. InLET* system for California, eDecider** from NASA

- Advanced geocoding at the time of underwriting

- Mission plan and design for post-CAT imagery collection

- Damage assessment using credible and established scientific observation scale

- Utilizing local capacity and crowdsourcing technology for damage interpretation

- Using Google Earth and online database/portal for damage data review and delivery

* Internet-based Loss Estimation Tool, see www.imagecatinc.com
** Earthquake-Data Enhanced Cyber Infrastructure for Disaster Evaluation and Response , see http://e-decider.org/

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Benefits

- Improved post-cat response for all parties involved – Europa Re, insurers, insured

- Advise regulators and reinsurers of exposure concerns

- Identify magnitude and distribution of damage

- Prioritize adjuster deployment

- Rapidly quantify losses for rapid claims settlement

Conclusion

- Philosophy behind proposed claims system is to save time and money for customers

- Tremendous potential to transform current claims management practice and systems

- Experience with several major Cat events and recognized by multiple Lloyds syndicates (UK/Europe) and US insurers and brokers

- Harness the best technology and local capacity as effective response is from those who know how to respond plus those who know the local conditions

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Albania

Major cities: Tirana**,** Durres, Shkoder, Elbasan**,** Fier**,** Korce, Vlore**,** Berat, Lushnje, Kavaje

Major Risk: Floods, Earthquakes, Drought

Potential eCityRisk Claims related service –

•Better geolocate insured properties

•Exposure analysis of insured properties

•Rapid post-flood/earthquake building damage assessment
- •Phase 1 (48-72 hrs) : Deploy private/govt. plane/helicopter (fly-by)
- •Phase 2 (week 1-2): Manage adjustor deployment to affected areas
- •Phase 3 (ongoing): Manage incoming claims and reconcile with Phase 1 and 2 data

Date	Event	Damage
11/01/2010	2010 Albania Floods	Moderate damage –Flooding nearly 2,500 homes

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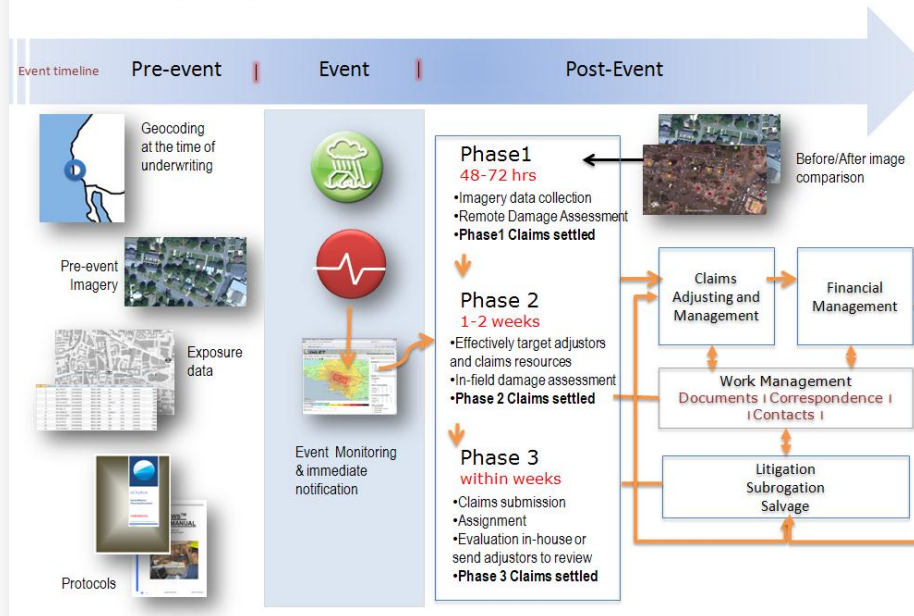
Thank You!

sg@ecityrisk.com

ImageCat