



Possibility of Satellite Imagery for the Research on Post-disaster Urban Recovery

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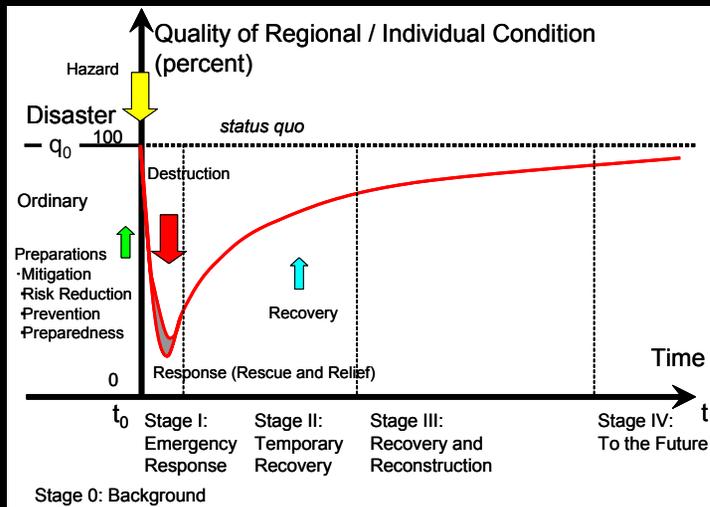
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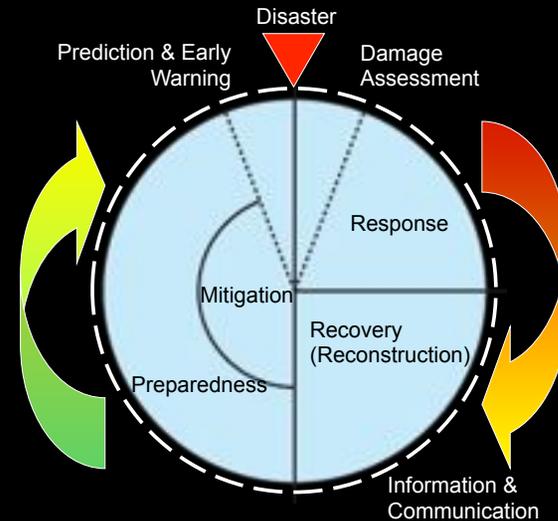
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Conceptual chronological model of seismic resilience (Murao, 2005)



Disaster Life Cycle



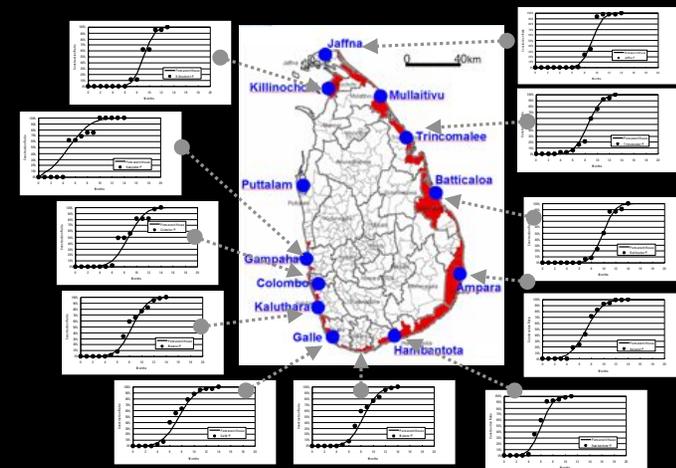
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Two Viewpoints for Post-disaster Recovery Research

- To devise better strategy for the future recovery planning in the world
 - Evaluate the strategy
 - Compare it with others in terms of regional/chronological differences, and disasters)
 - Quantitate the recovery process
- To record the dramatic urban change as recovery archives for the future
 - Important fragment in the urban history
 - With various media
 - With various form

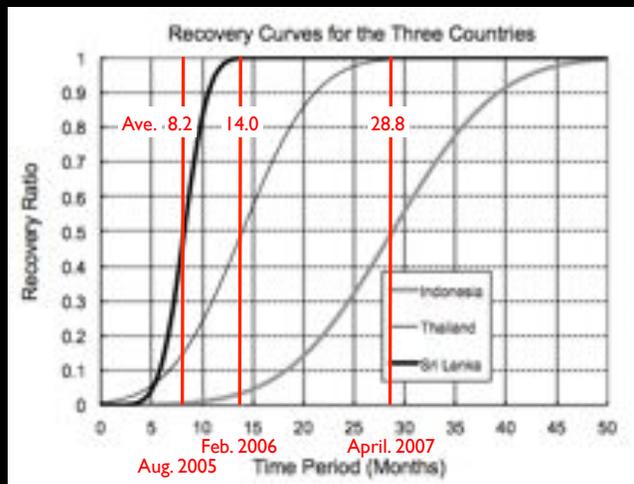
Significance of recovery monitoring

a. To devise better strategy for the future Recovery Curves in Terms of Housing Construction in Sri Lanka after 2004 Indian Ocean Tsunami



Source: Murao, O., and Nakazato, H.: Recovery Curves for Housing Reconstruction in Sri Lanka after the 2004 Indian Ocean Tsunami, *Journal of Earthquake and Tsunami*, Vol.4, No.2, 51-60, DOI No: 10.1142/S1793431110000765, 2010.6

Comparison of Recovery Curves among Sri Lanka, Thailand, and Indonesia after the 2004 Tsunami



Source: Murao, O., Sugiyasu, K., and Nakazato, H.: Study on Recovery Curves for Housing Reconstruction in Sri Lanka, Thailand, and Indonesia after the 2004 Indian Ocean Tsunami, *Proceedings of the 10th International Symposium on New Technologies for Urban Safety of Mega Cities in Asia (USB)*, 8p., Chiang Mai, Thailand, 2011.10

b. To record the dramatic urban change



Source: Murao, O: Reconstruction Process based on the Spatial Reconstruction Model for Private Facilities in Chi-Chi Area after the 1999 Chi-Chi Earthquake, *Risk Engineering*, Vol.2, 3-15, 2006.3

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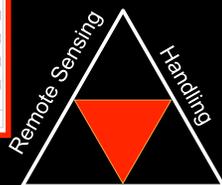
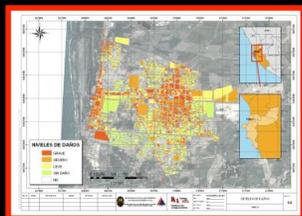
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Advantage to Use Remote Sensing for Post-disaster Recovery Research

(): property of field survey

1. Convenience to obtain adequate dataset
 - Worldwide (limited field area)
 - Continuously accumulated data (transient data)
 - Obtainability according to region, time, cost, and purpose (considerable cost)
2. Usability for comparative chronological analysis on the site
 - Availability of fixed point observation (need active survey/considerable cost)
 - Easy to understand changing urban situation with objective data (need proper viewpoints)

Possibility to Use Remote Sensing Technology in the Field



Field Survey to Understand the Facts



Discussion:
How we can
bridge the gap
between them

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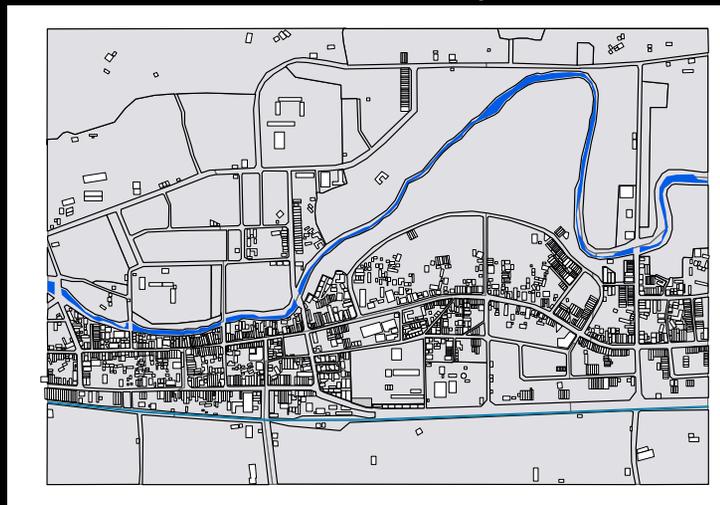
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IKONOS Imaging for Chi-Chi after the 1999 Taiwan Earthquake

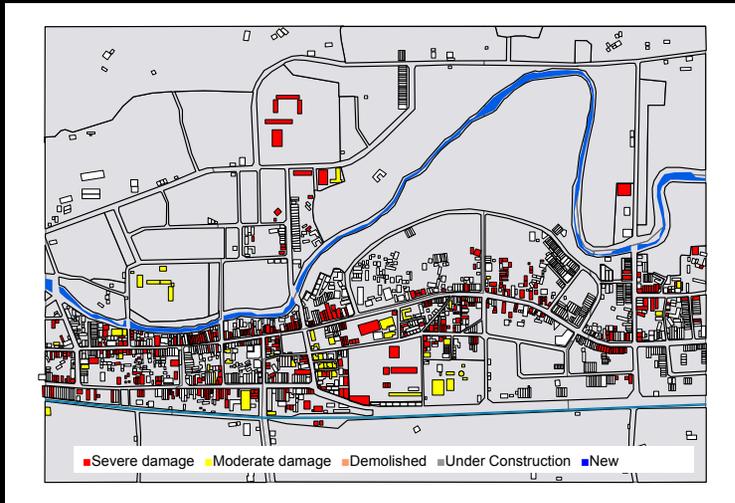


Source: Murao, O.,: Reconstruction Process based on the Spatial Reconstruction Model in Chi-Chi Area after the 1999 Chi-Chi Earthquake, AIJ, No. 607, 95-102, 2006.9

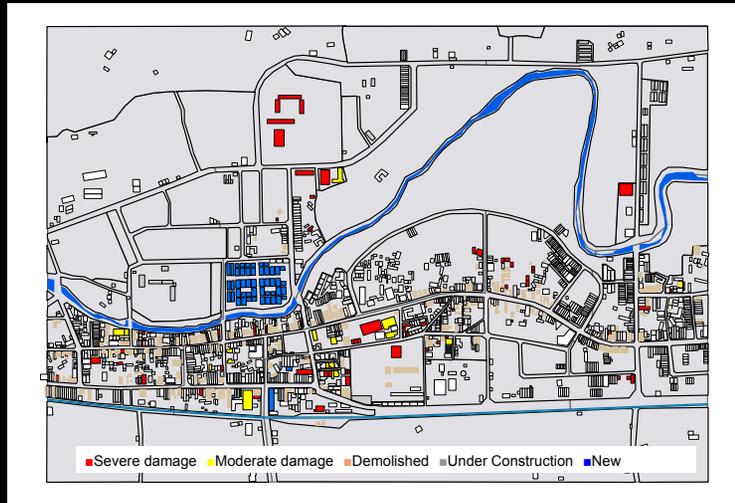
Before the Earthquake



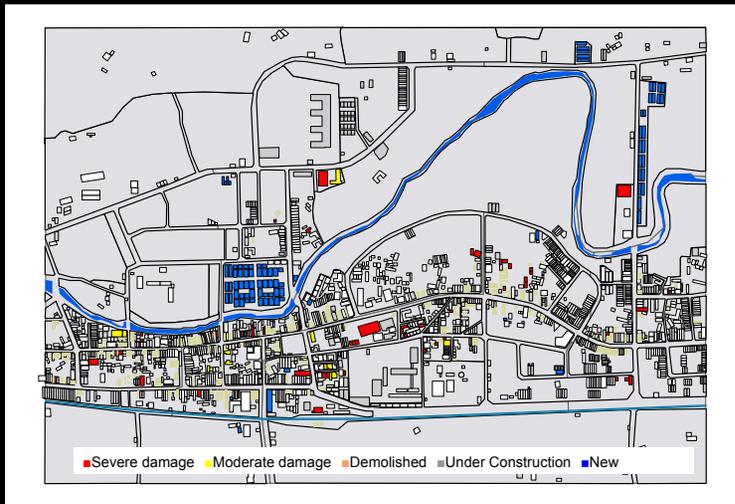
Building Damage Conditions, September 21, 1999



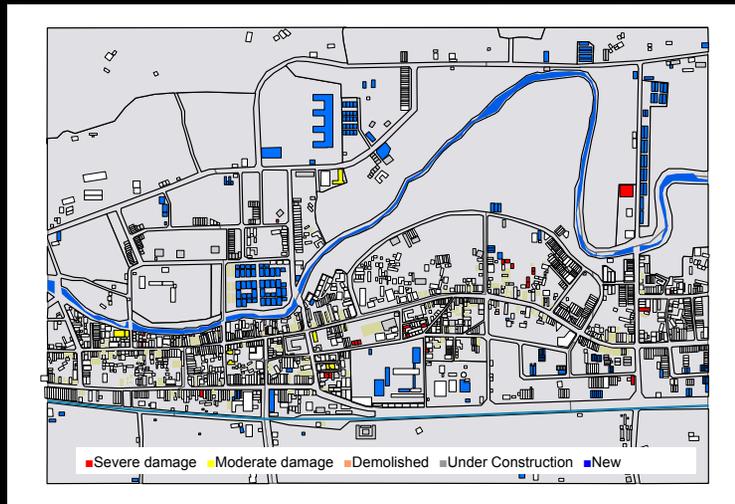
6 months passed (April, 1999)



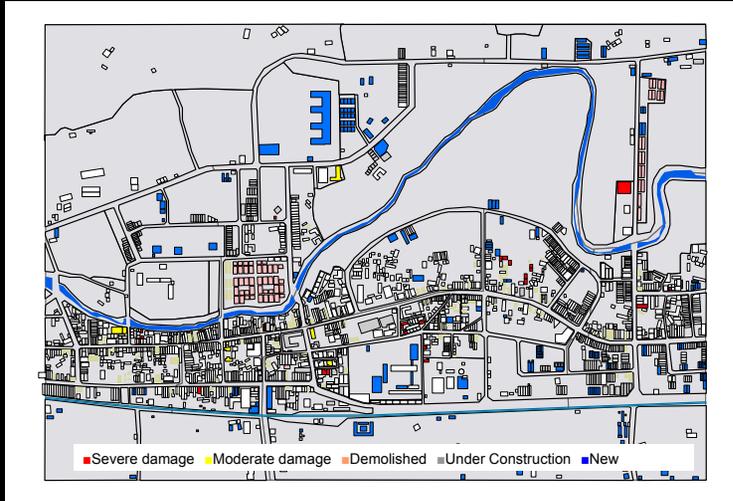
1 year passed (September, 2000)



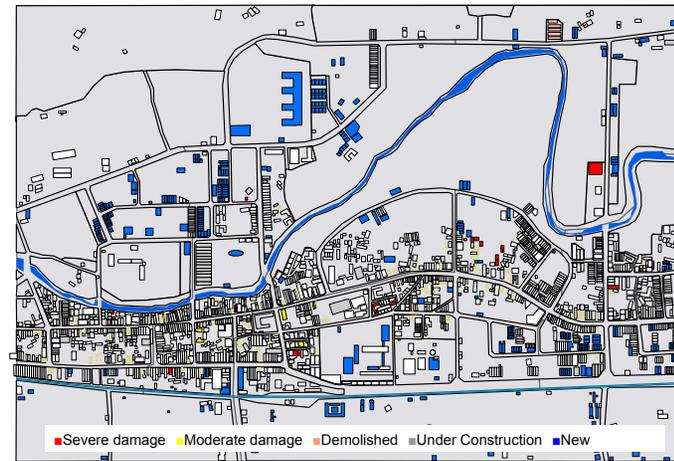
1 year and 3 months passed (January, 2002)



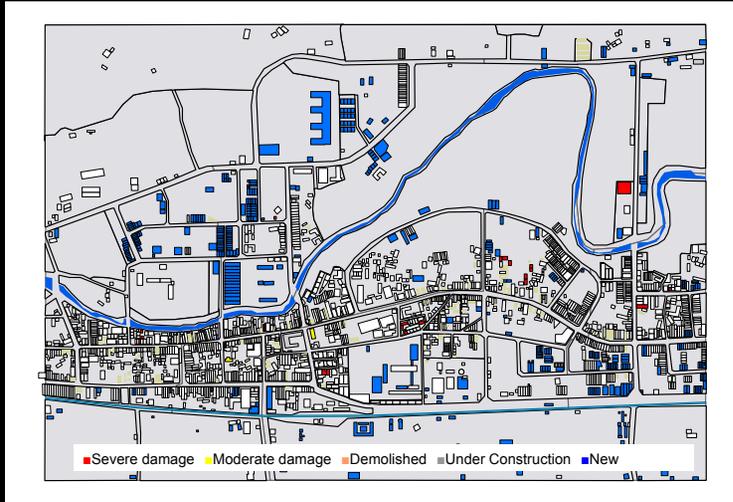
2 years and 11 months passed (August, 2002)



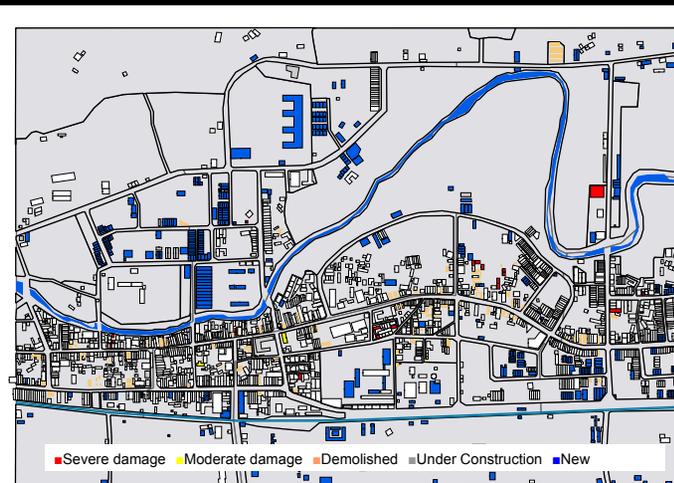
4 years passed (September, 2003)



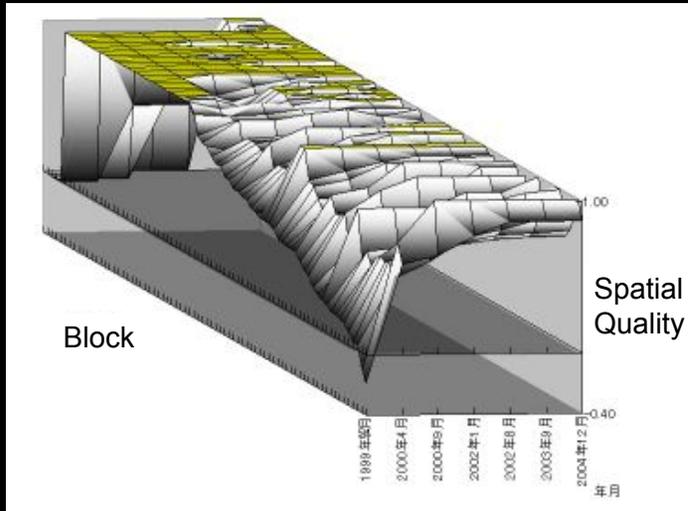
5 years and 2 months passed (December, 2004)



6 years passed (September, 2005)



3D model to demonstrate Recovery Process of Chi-Chi

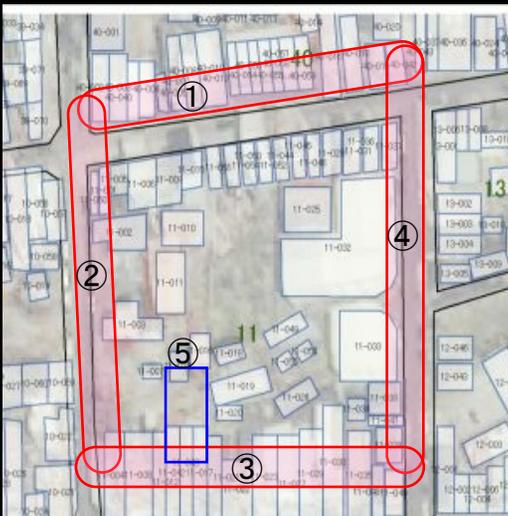


Purpose

- To record the post-disaster recovery process in Chi-Chi as digital archives because a post disaster recovery process is a dramatic turn in the long term history of the cities.

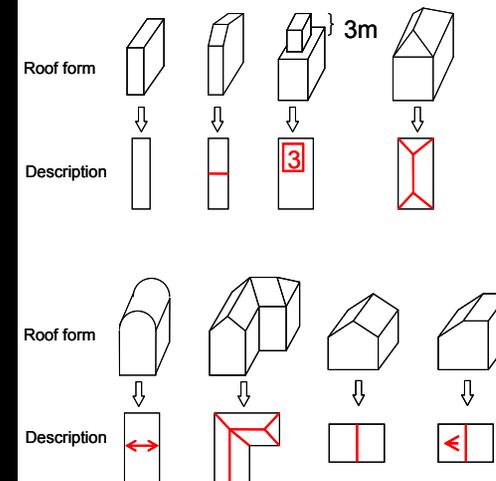


Counterclockwise Order to Photograph



Recording Roof Form

How to record the roof form in Chi-Chi



Correction of the Building Façade Images Photographed at the Site



(a) photograph taken at the site

(b) processed image

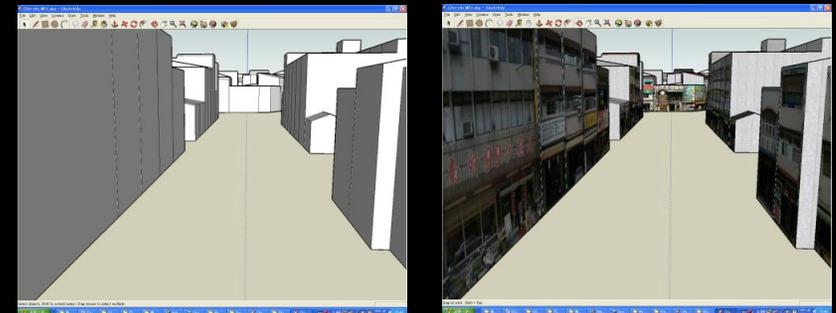
Elevation Image of the Cluster of the Buildings as Seen from a Street



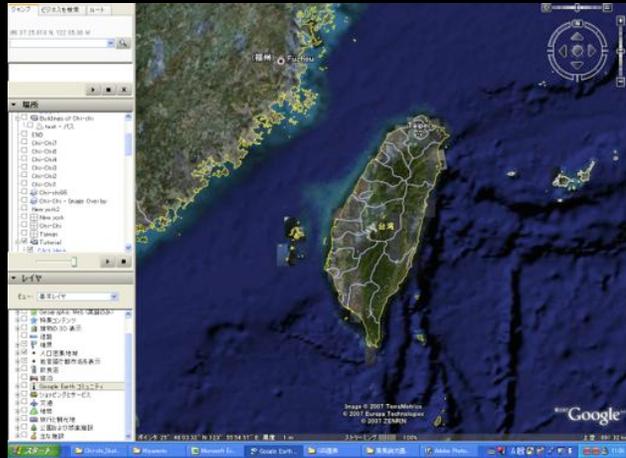
Application of the Elevation Photographs as Textures to the Building Frames



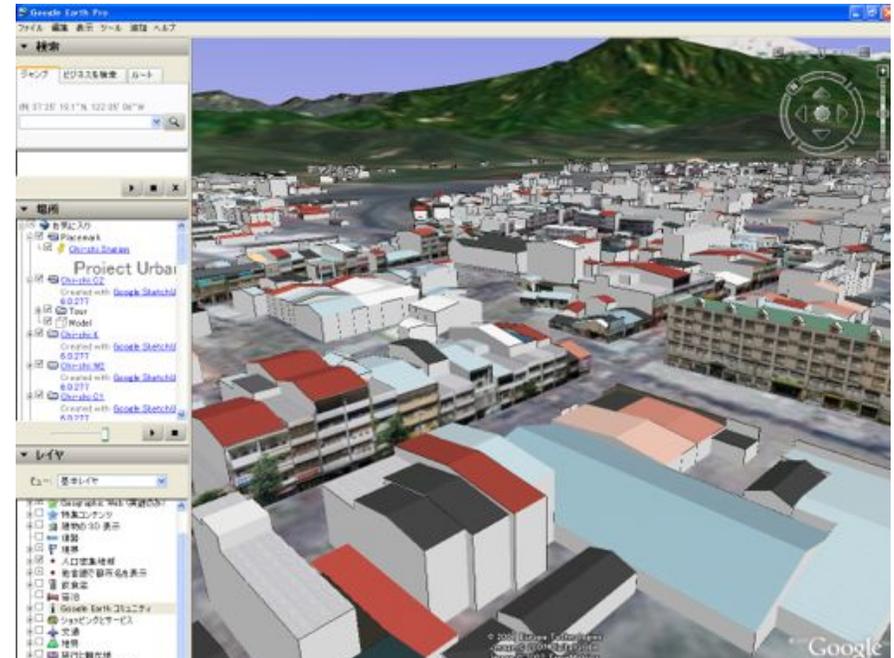
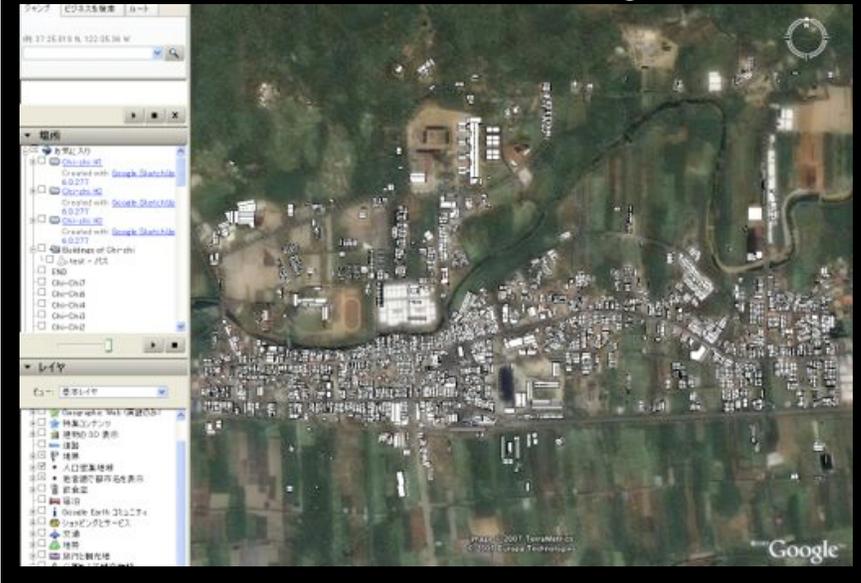
Example of the buildings in the virtual space with exterior walls and roofs (before and after applying the texture)



Landscape of Taiwan on GoogleEarth



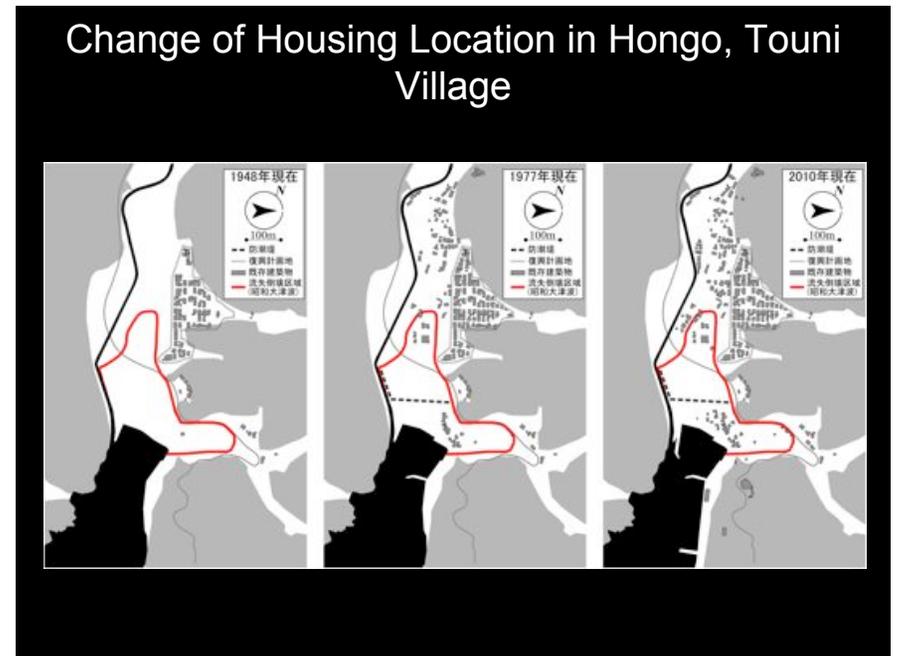
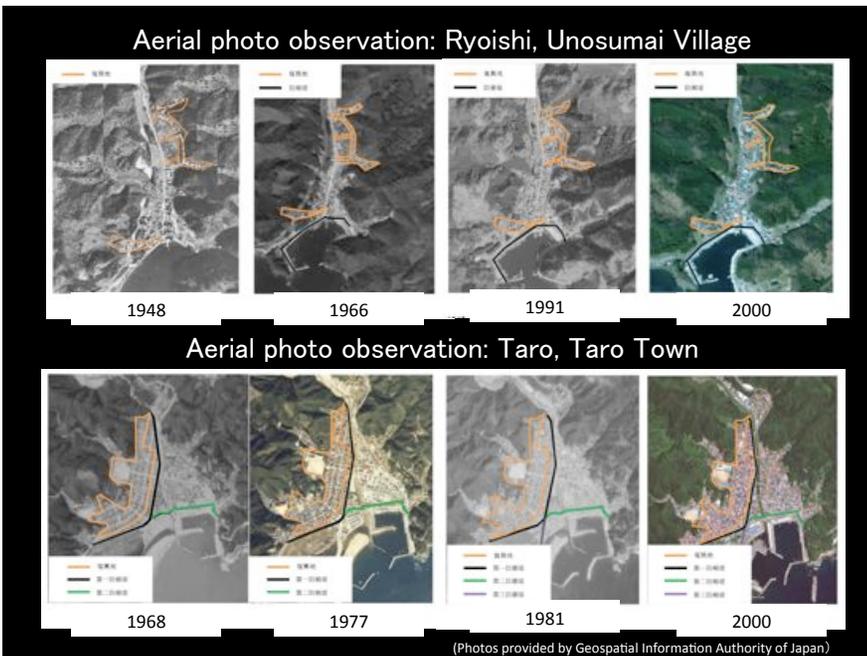
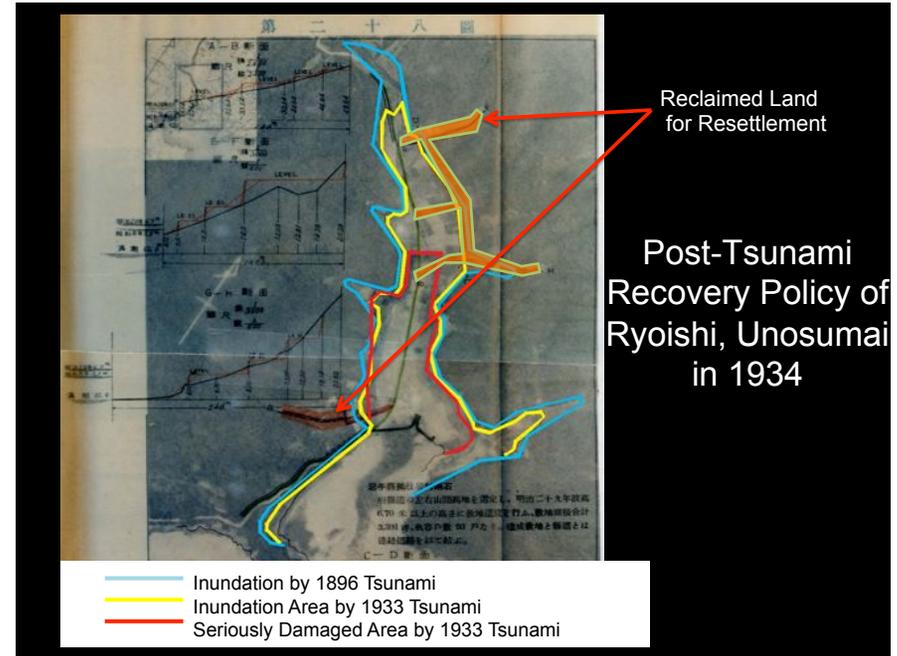
Position of the district on GoogleEarth





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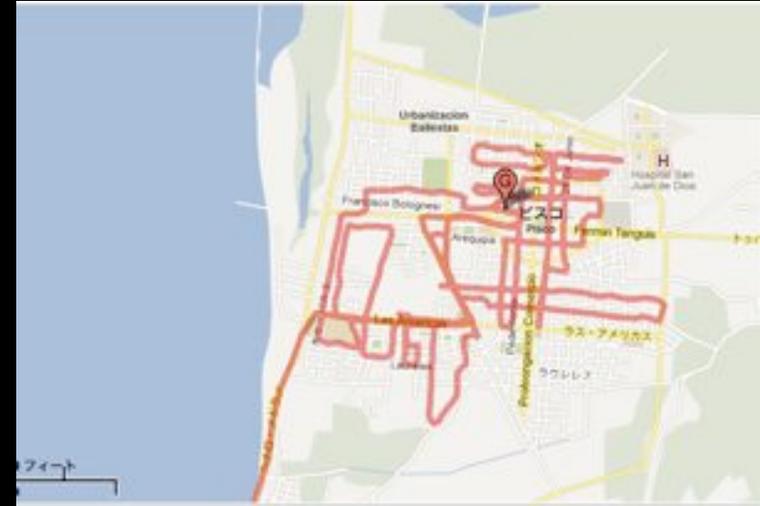
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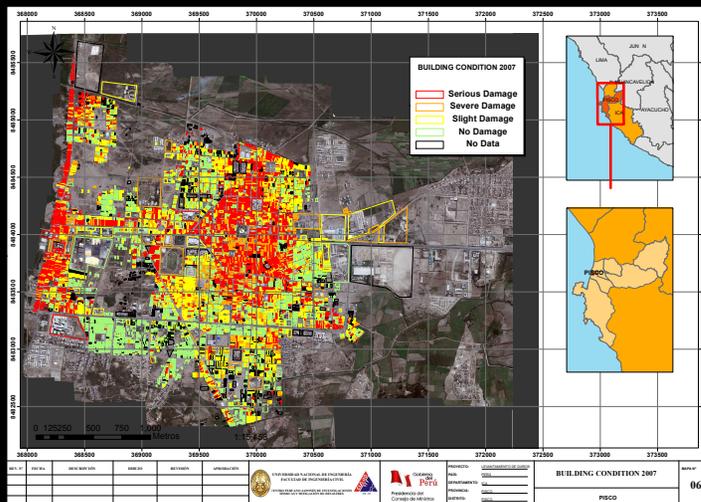
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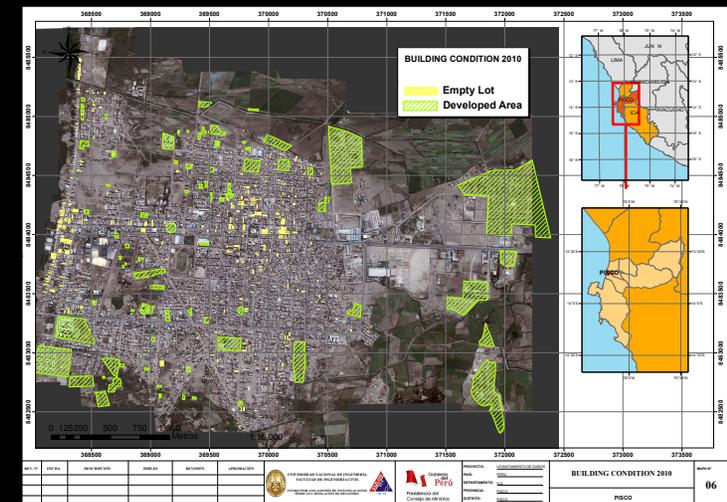
Field Survey in Pisco in July 2012



Building Damage Condition due to the 2007 Peru Earthquake (CISMID)



Recovery Condition based on Satellite Image as of July 2010 and the Field Survey in July 2012





2007/8/27

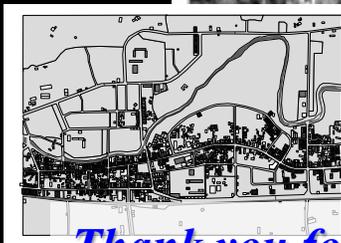
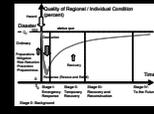


2010/7/10

Fig. 11 Empty Lots Selection Based on Comparison between the image of 2007 and 2010



Fig. 13 Housing Project for Pisco (Ministro de Vivienda, Construcción y Saneamiento [7])



Thank you for your kind attention!

