Building and road earthquake damage detection using high spatial resolution remote sensing image

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Contents

- **Background**

- **Building damage detection**

  – **Using post-earthquake image**

  – **Using multi-temporal image**

- **Road damage detection**

- **Earthquake is one of the most devastating disasters**

Image Source: Wikipedia & Google

1.Background

- **As important man-made objects, buildings and roads are often severely damaged in the earthquake**

Image Source: Wikipedia & Google

- **High resolution remote sensing images can be used to detect damage information efficiently**

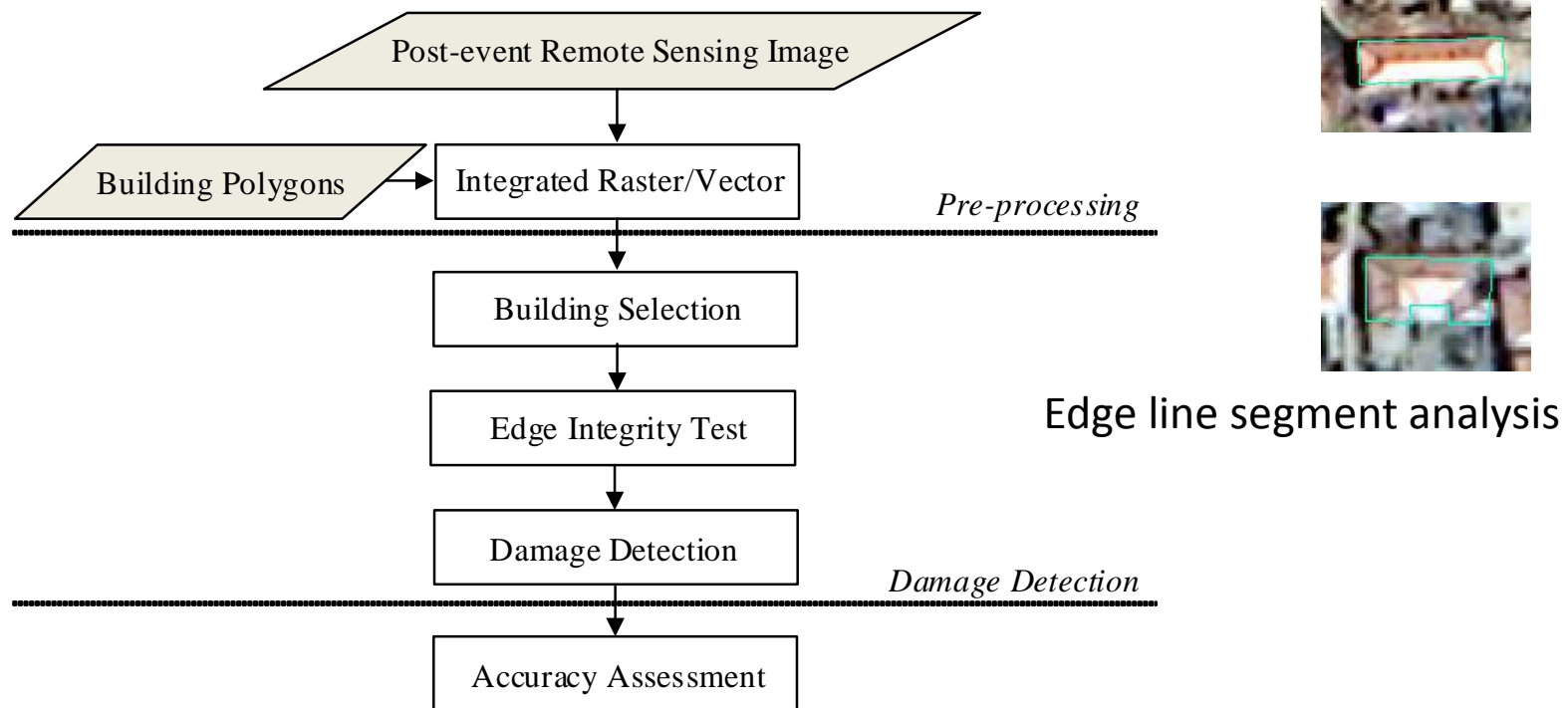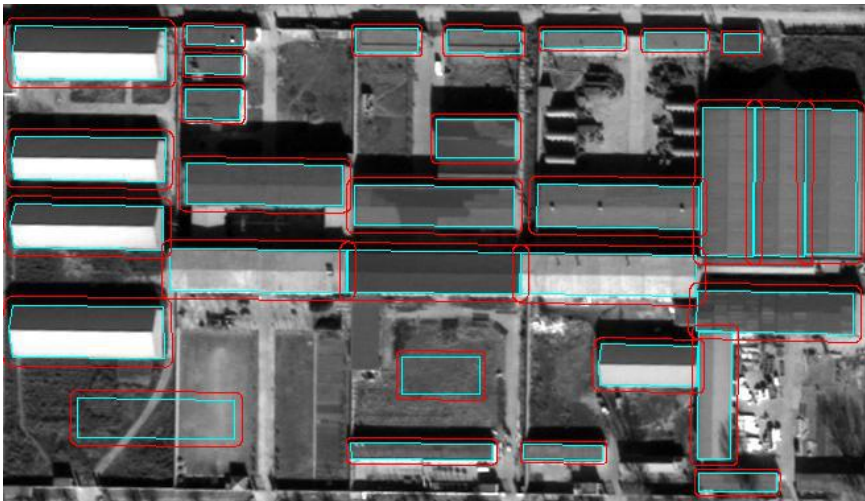Image Source: CEODE

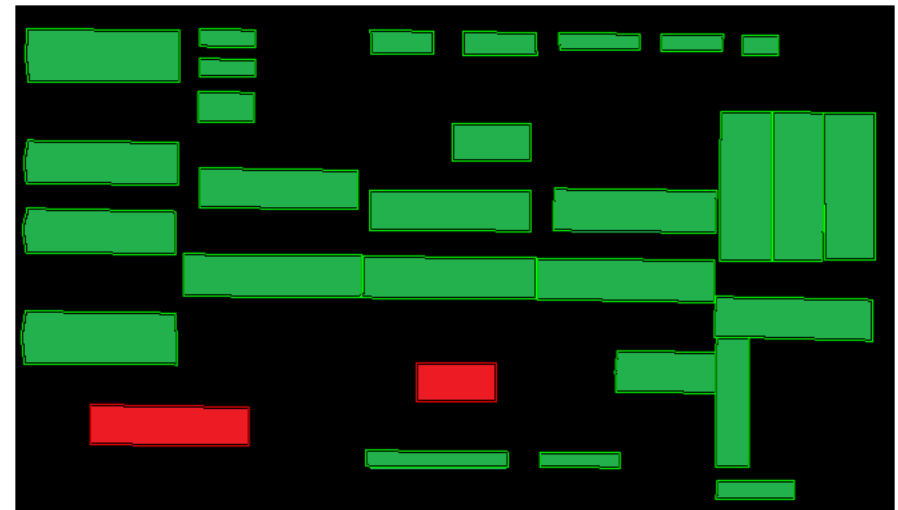# 2. Building damage detection

- **Using post-earthquake image**

Pre-processing

Damage Detection

Edge line segment analysis

- **Comparing the gradient feature between building edges and buffers**

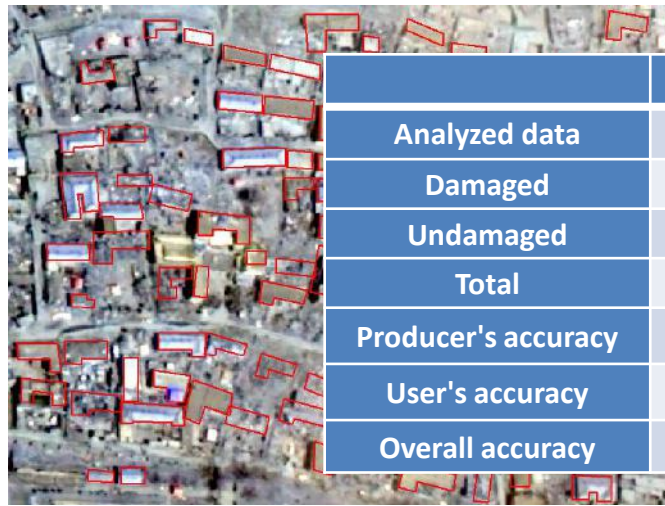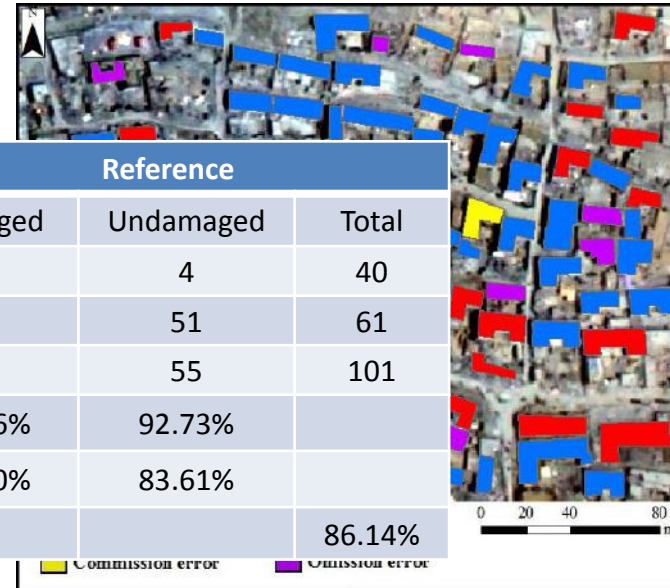**Building polygons and buffers**

Green: Undamaged   Red: Damaged

2. Building damage detection

➢ **Study area: Yushu, Qinghai**

➢ **Data source: Quickbird**

➢ **Imaging time: April 14, 2010**

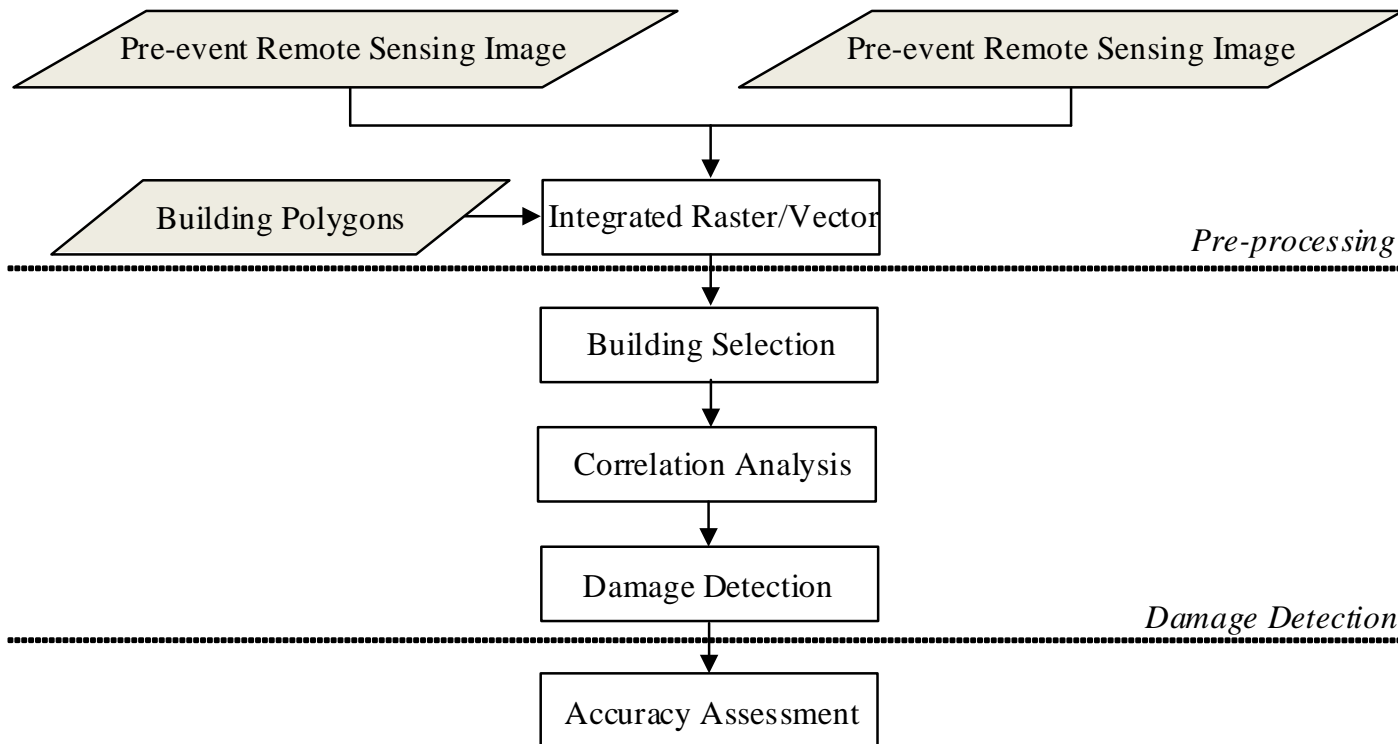| Analyzed data	Reference		
	Damaged	Undamaged	Total
Damaged	36	4	40
Undamaged	10	51	61
Total	46	55	101
Producer's accuracy	78.26%	92.73%	
User's accuracy	90.00%	83.61%	
Overall accuracy			86.14%

Study area

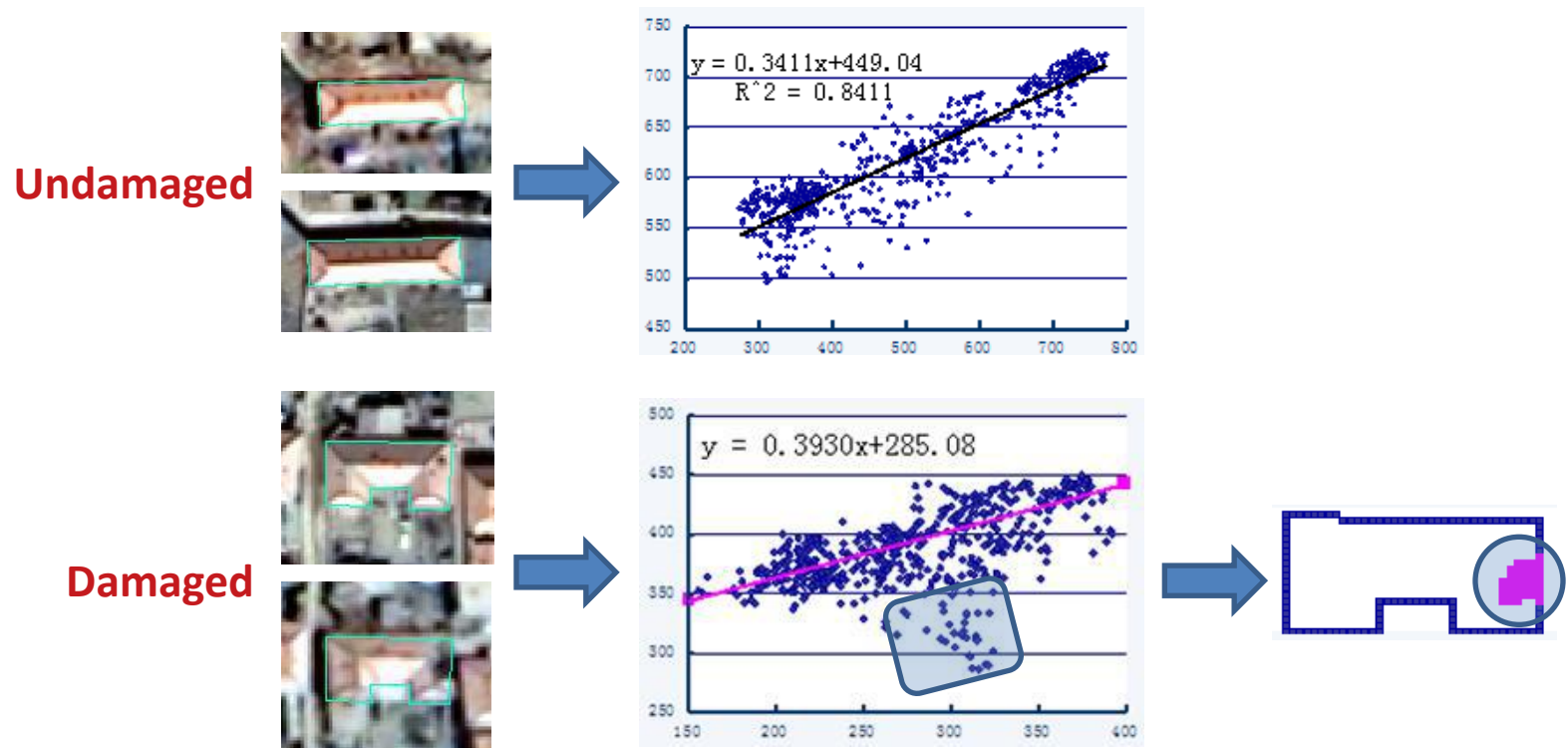**Damage Detection results**

2. Building damage detection

- **Using multi-temporal image**

2. Building damage detection

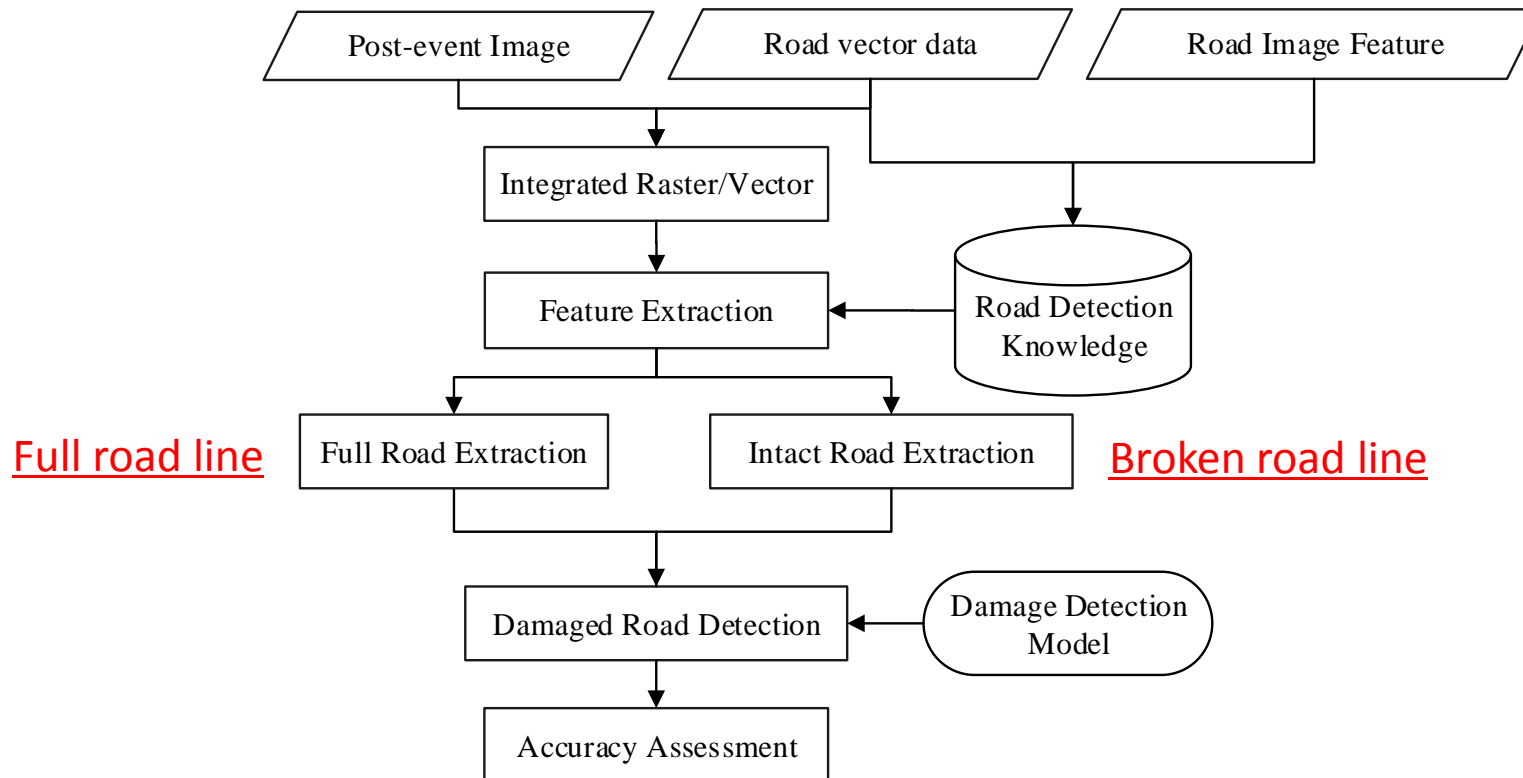- **Gray correlation matching between the buildings in the pre- and post-event image**

Undamaged

$y = 0.3411x + 449.04$
$R^2 = 0.8411$

Damaged

$y = 0.3930x + 285.08$

2. Building damage detection

Study area

Analyzed data	Reference		
	Damaged	Undamaged	Total
Damaged	56	8	64
Undamaged	3	29	32
Total	59	37	96
Producer's accuracy	94.92%	78.38%	
User's accuracy	87.50%	90.63%	
Overall accuracy			88.54%

Damage Detection results

3. Road damage detection

- **Using post-earthquake image**

Post-event Image | Road vector data | Road Image Feature

Integrated Raster/Vector

Feature Extraction ← Road Detection Knowledge

Full road line — Full Road Extraction | Intact Road Extraction — Broken road line

Damaged Road Detection ← Damage Detection Model

Accuracy Assessment

Edge Detection

Line segment detection

Parallel line detection

Full road extraction result

Road segment connection
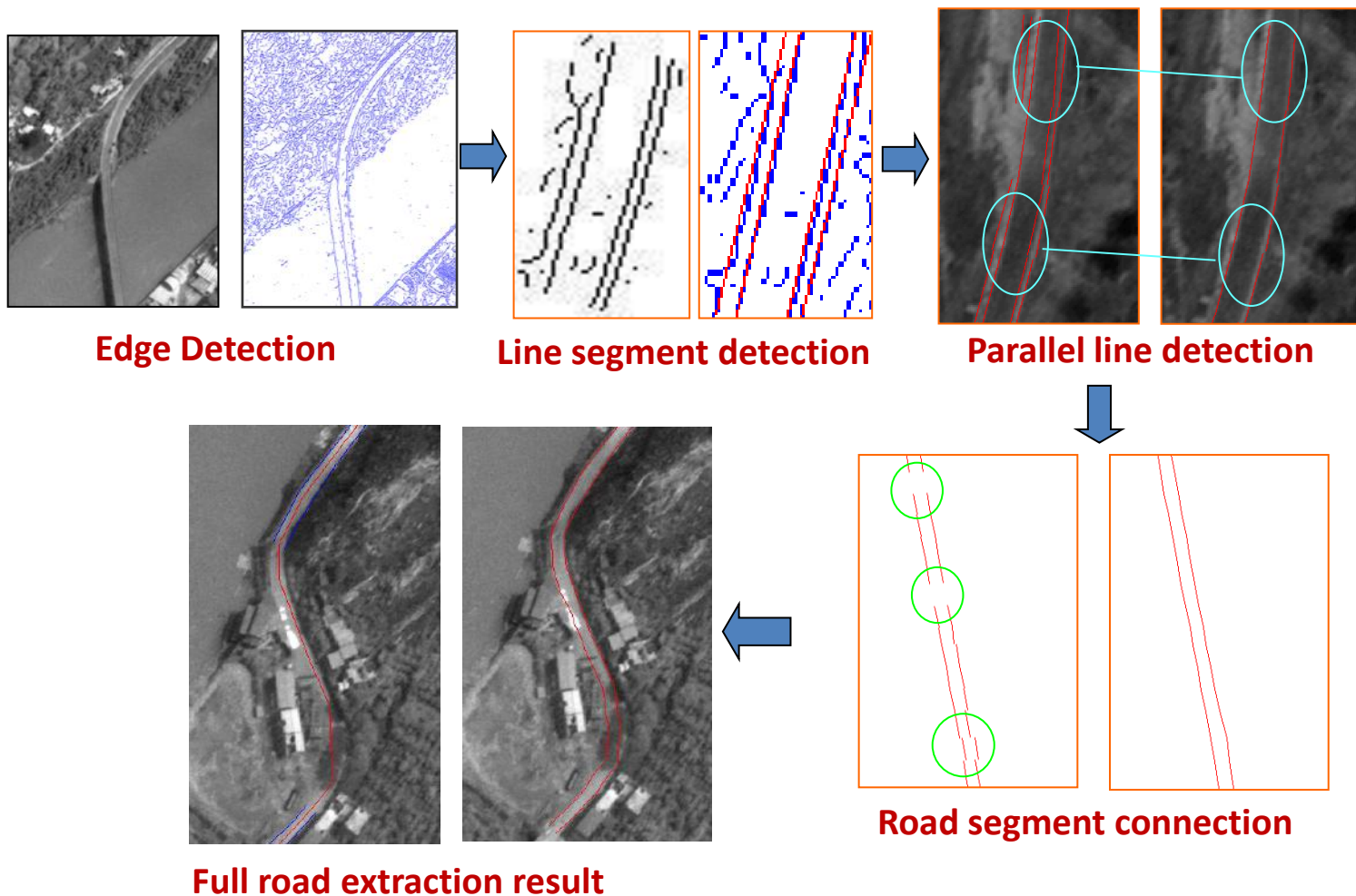
3. Road damage detection

Study area

Road damage detection result

Slightly damaged
Partially damaged
Seriously damaged
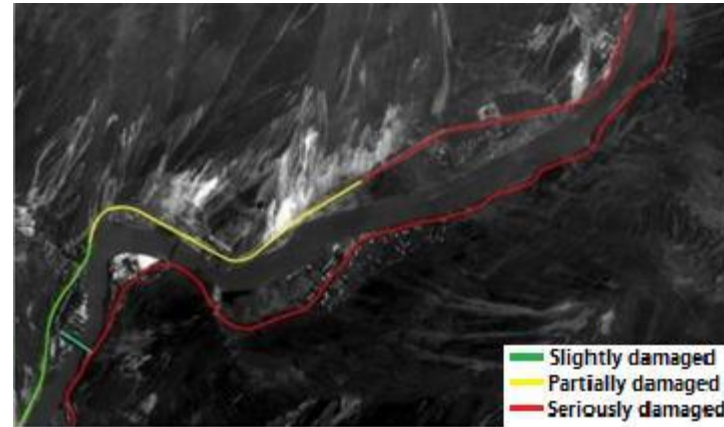
Local area   **Full road extraction**   **Intact road segment**   **Damaged road segment**

Thank you!