


Introduction and objectives  
Study Area and Data Set  
Used methodology  
Results and conclusions

# Land Use Change Detection Using Satellite Images for Najran City, Kingdom of Saudi Arabia (KSA)

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## Introduction and objectives

Land cover is the physical material at the surface of the earth, include grass, asphalt, trees, bare ground, water, etc.  
Land use is a description of how people utilize the land  
Remote sensing is the acquisition of information about an object or phenomenon without making physical contact with the object


### Importance of Change detection

- to determine better land use policy.
- to project transportation and utility demand.
- to identify future development pressure points and areas to implement effective plans.
- to manage regional development.

### Study objective

The objective of this research is to identify the land use/land cover analysis and change detection techniques using temporal multi-spectral data (2009 and 2014) of the Landsat TM image.

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Once the phenomenon for change detection has been selected, the following steps should be employed:

- 1 Image acquisition
- 2 Image preparation
- 3 Selection of a change detection algorithm
- 4 Production of change detection results

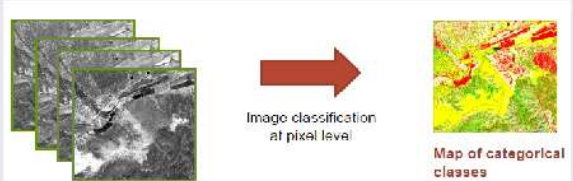



Figure : The traditional approach for land cover mapping

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## Used change detection techniques

Four of the most commonly used change detection techniques were discussed to detect the nature and extent of the land-cover changes in Najran area using Landsat images. These techniques are;

- post-classification,
- image differencing,
- image rationing, and
- principal component analysis.


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## Study Area and Data Set


The study area is an area of approximately 800 square kilometers. It includes various land use activities: urban, desert and road networks.

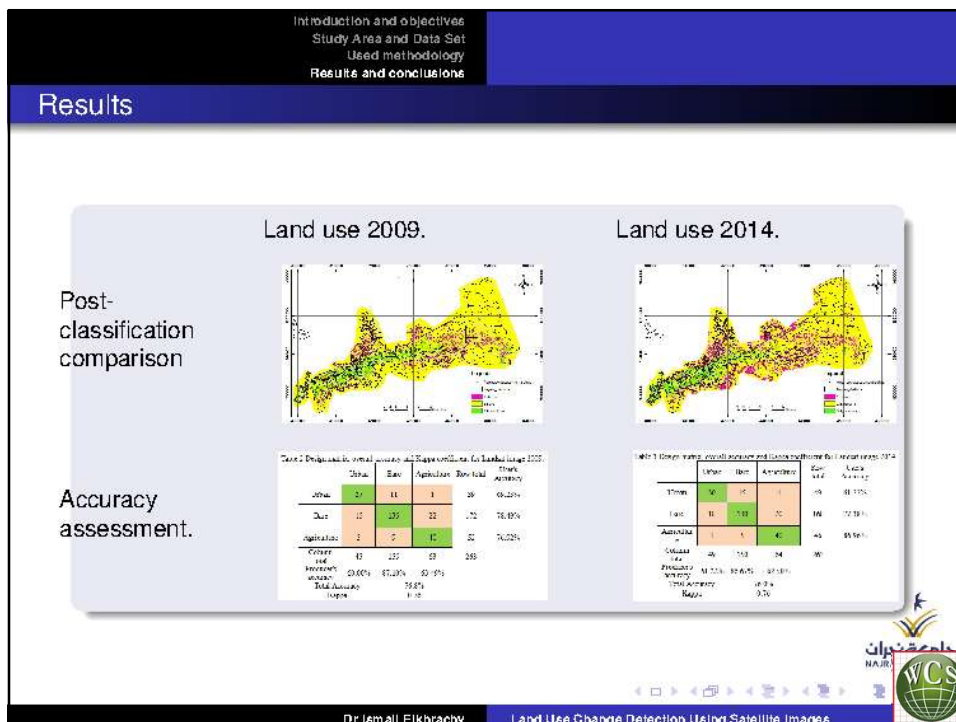
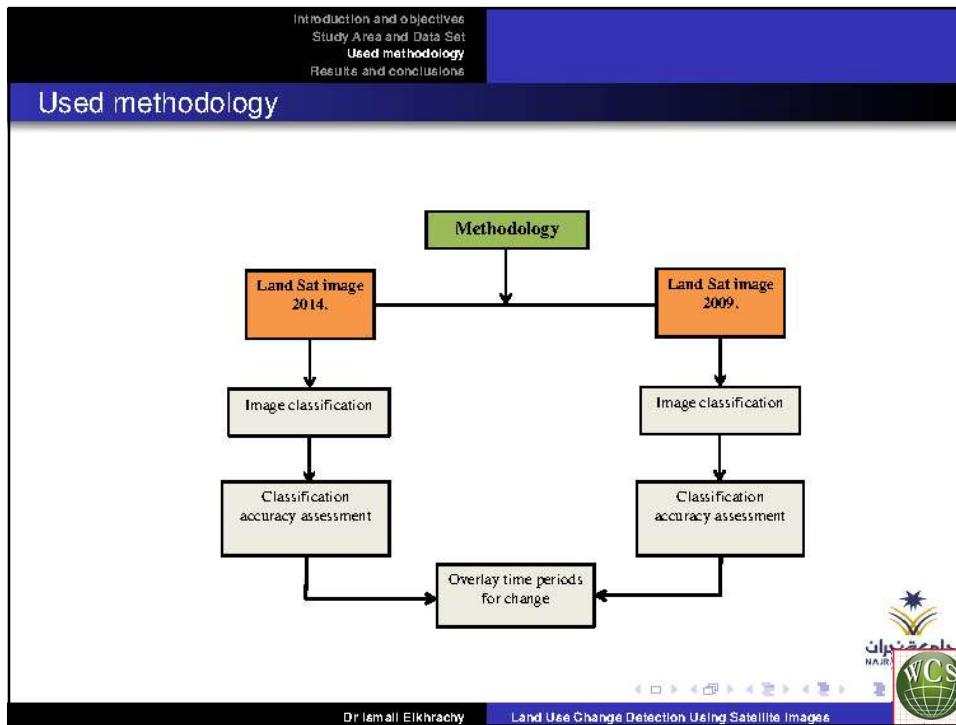


The used Landsat satellite imagery is downloaded from the USGS Earth Explorer (<http://earthexplorer.usgs.gov>).

| Image                 | Image Type               | Image Source         |
|-----------------------|--------------------------|----------------------|
| Landsat 7 ETM+ 2004   | Orbito Product level 1-G | USGS website         |
| Landsat 7 ETM+ 2004   | Orbito Product level 1-G | USGS website         |
| Desert's boundary map | shape file               | Najran municipality  |
| Google Earth images   | Satellite images         | Google Earth website |

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## Results cont.

### Change from 2009 to 2014

As value

Table 4 The lands cover changes in ( $km^2$ ) in 2009 and 2014.

| Class name   | 2009<br>$km^2$ | 2014<br>$km^2$ | Total<br>$km^2$ | change |
|--------------|----------------|----------------|-----------------|--------|
| Urban        | 74.2           | 128.5          | 54.3            | 73.2%  |
| Bare         | 687.8          | 639.6          | -48.2           | -7%    |
| Agriculture  | 57.4           | 51.4           | -6              | -10.5% |
| Total $km^2$ | 819.4          | 819.4          |                 |        |

From to value

Table 5 Changes of land cover classes from 2009 to 2014

|           | Urban  |      | Bare   |      | Agriculture |      |
|-----------|--------|------|--------|------|-------------|------|
|           | $km^2$ | %    | $km^2$ | %    | $km^2$      | %    |
| 2009      | 74.2   | 9.1  | 687.8  | 83.9 | 57.4        | 7    |
| 2014      | 128.5  | 15.7 | 639.6  | 78.1 | 51.4        | 6.2  |
| Unchanged | 58.2   | 78.4 | 586.4  | 85.3 | 20.2        | 25.2 |
| Gained    | 70.3   | 91.7 | 53.2   | 7.7  | 31.2        | 24.1 |
| Lost      | 16     | 21.6 | 101.5  | 14.8 | 37.2        | 24.8 |

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## Conclusions

In this work, land use change detection is we are mainly highlighted by using Landsat image 30 m spatial resolutio for Najran city. The following are conclusions were obtained:


- ① Unsupervised image classification has been performed to classify the images into different land use categories.
- ② Three land use classes have been identified as urban, barren land and agricultural. Classification accuracy is also estimated using the field knowledge obtained from Google earth images.
- ③ The obtained accuracy was between 61% to 87% percent for all the classes. Change detection analysis showed that Built-up area has been increased by 73.2%, agricultural area has been decreased by 10.5 % and barren area reduced by 7% during time from 2009 to 2014.
- ④ The quantitative study indicated that the area of urban class has unchanged by  $58.2km^2$ , gained  $70.3 km^2$  and lost  $16 km^2$ .
- ⑤ For bare land class  $586.4km^2$  has unchanged,  $53.2km^2$  has gained and  $101.5km^2$  has lost.
- ⑥ While agriculture area class,  $20.2km^2$  has unchanged,  $31.2km^2$  has gained and  $37.2km^2$  has lost.

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Thank you for your attention.

Questions?



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