

Study of waste dumping ground in Mumbai, India using Landsat 8 OLI (30-m) and Planet Dove (3 m) Imageries

INTRODUCTION

Waste is considered as an important sustainable development indicator that is closely intertwined with many interdependent and trans-boundary issues. Waste management is linked to industrial policies, international and national economic strategies, environmental protection agreements and local community development planning. Current strategies aims at reducing the amount of waste sent to landfill by encouraging waste reduction, incineration, re-use and recycling. Nonetheless, as discussed in (Ottavianelli, 2005) the controlled disposal of waste into land is still an important and necessary means of effective waste management

Solid waste management is one among the basic essential services provided by municipal authorities in India to keep urban centers clean. Mumbai, the largest metropolis of India, with a population of 16.37 million in 2001 within its urban agglomeration area, generates a huge amount of waste of many kinds the management of which is a massive task for the local administration.

Brihanmumbai Municipal Corporation (BMC) is the civic body responsible for solid waste management and disposal in Mumbai. The per capita generation of wastes in Mumbai is about 630 gm. per person per day (MCGM 2004). The Corporation disposes waste through landfill or land dumping method. At present 3 landfill sites located at Deonar, Mulund and Gorai in Mumbai are active. Increasing population of the city has forced people to settle near the dumping grounds. Densely inhabited areas now surround the landfill sites. This has led to a situation where the residents have starting making complaints of environmental pollution caused due to burning of garbage and foul odor.

The use of space-borne remote sensing technology and Geographic Information System (GIS) to support efforts to control waste disposal has been examined in a number of research papers (Biotto et al., 2008; Silvestri and Omri, 2007; Doak et al., 2007; Tasaki et al. 2007). This research is focused on the use of satellite technology to monitor landfill sites.

In particular, the focus of the study is to

To identify the capability of high resolution Planet Dove and medium resolution Landsat data to identify the dumping ground.

To develop semi-automated method to identify the dumping ground using Planet Dove Dataset.

Datasets used

1. LANDSAT

Landsat represents the world's longest continuously acquired collection of space-based moderate-resolution land remote sensing data that can be downloaded freely from any of the three websites:

1. Landsat Look Viewer
2. Earth Explorer
3. Global Visualization Viewer (GloVis)

2. PLANET DOVE DATA

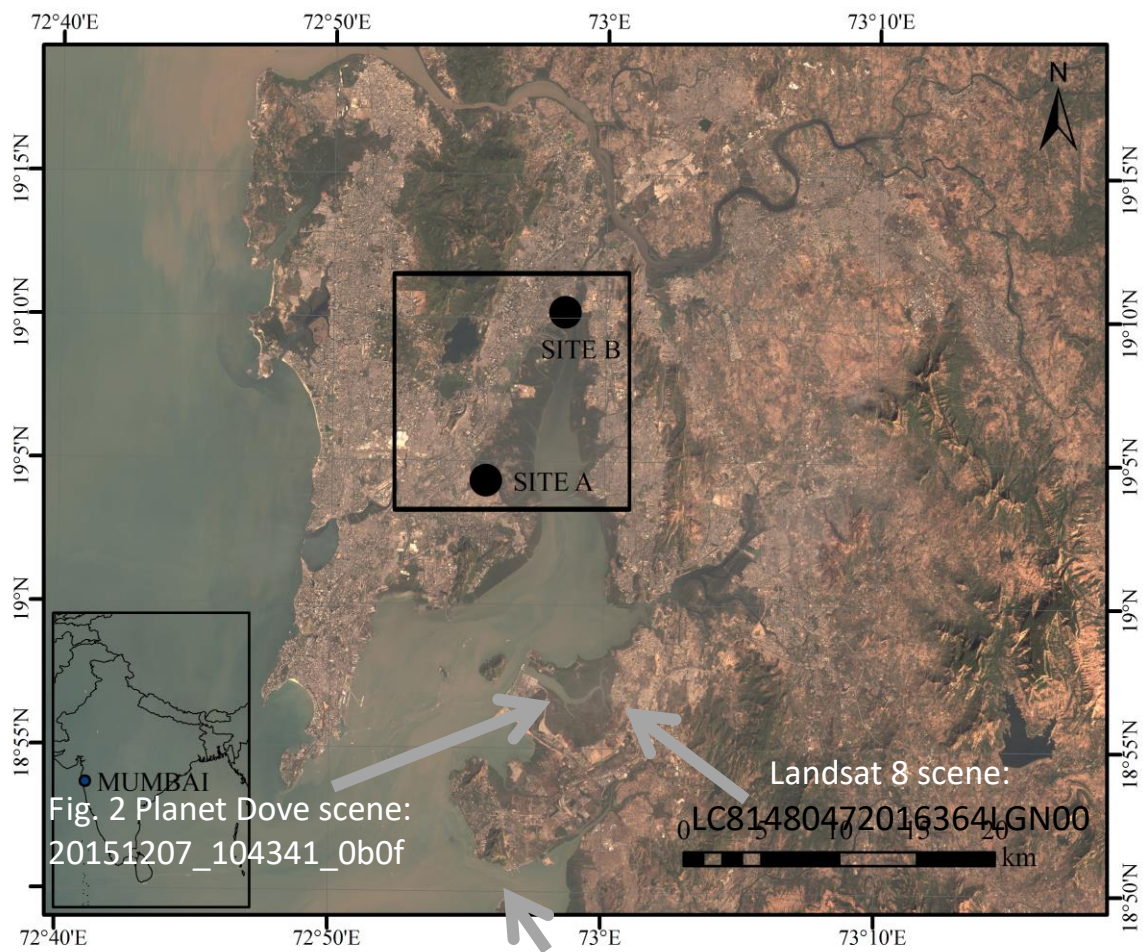
Doves form a satellite constellation that provides a complete image of Earth at 3-5 m optical resolution

Satellite	Band Name	Bandwidth (μm)	Spatial Resolution (m)	Temporal Resolution
Landsat 8 OLI	Band 2: Blue	0.45~0.51	30	16 days
	Band 3: Green	0.53~0.59	30	
	Band 4: Red	0.64~0.67	30	
	LC81480472016364LGN00, the acquisition date is 2016-12-29. LC81480472016028LGN00, the acquisition date is 2016-01-28.			
Planet	Band 1: Red	0.61~0.70	3	1 day
	Band 2: Green	0.50~0.59	3	
	Band 3: Blue	0.42~0.53	3	

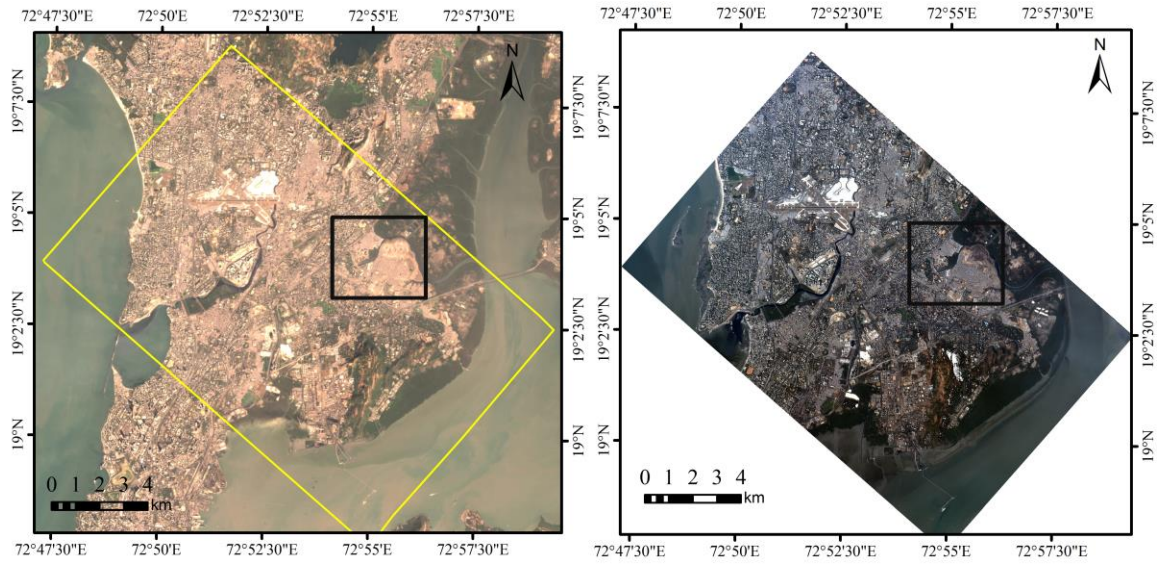
	20160206_095018_0c03	
	20151207_104341_0b0f	

Table 1: The Landsat and Planet Dove datasets used in this study

STUDY AREA



Maximum likelihood classification has been used successfully analyze very high-resolution Planet Dove imagery to map waste disposal sites.



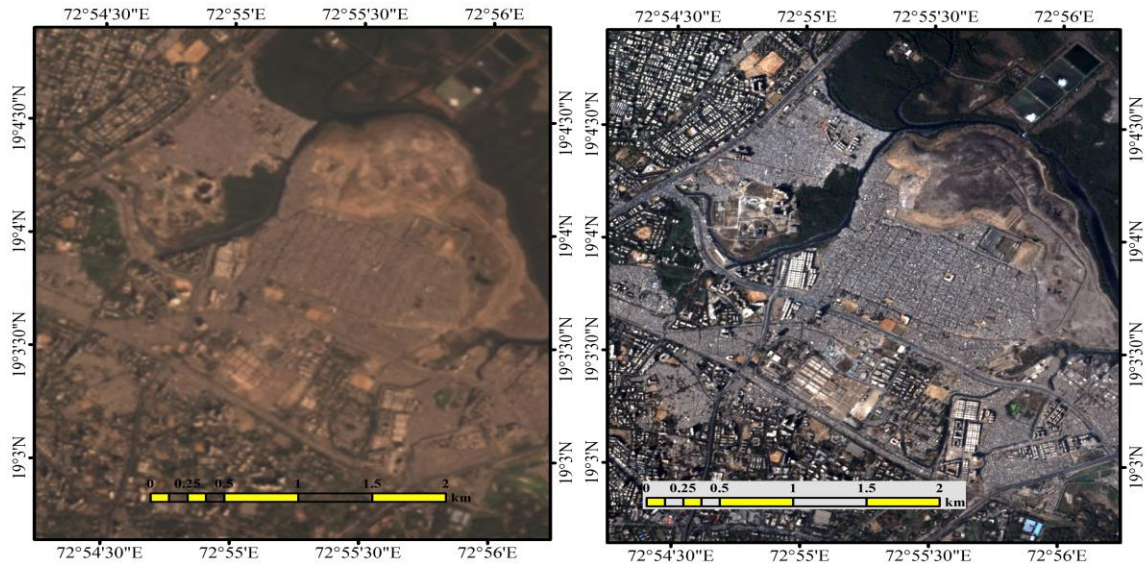
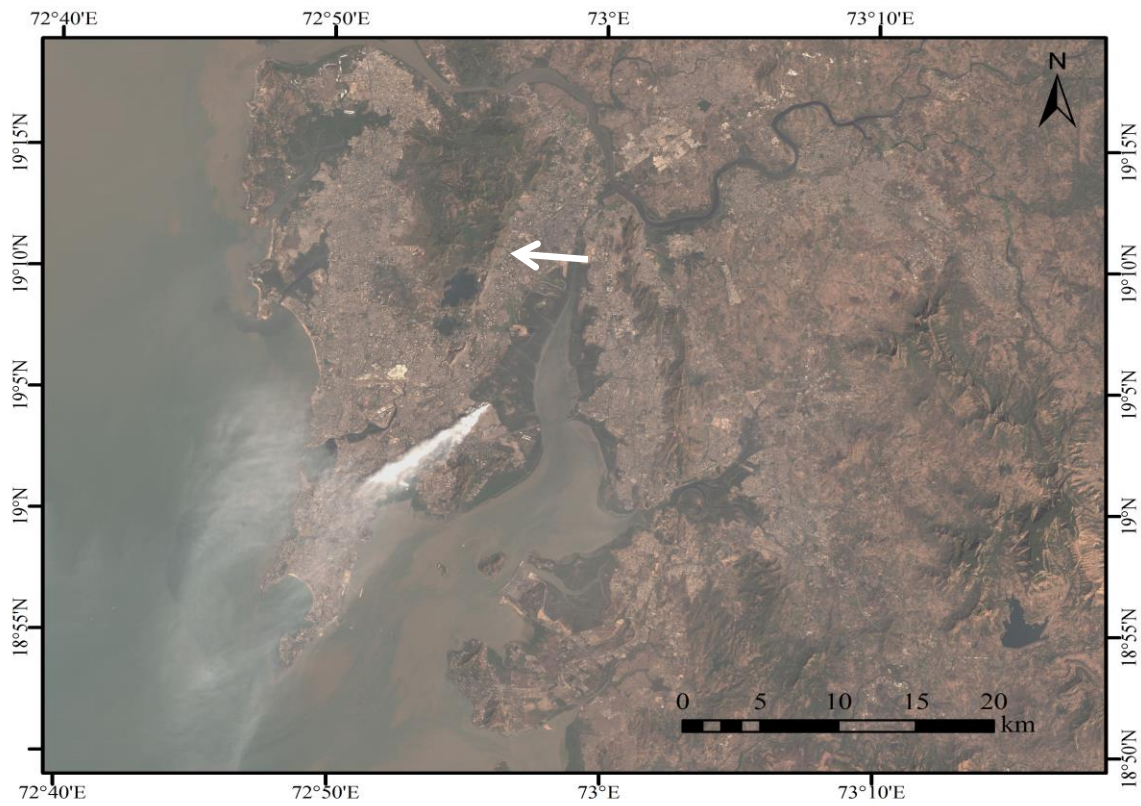


Fig. 1 (top left) Landsat scene:LC81480472016364LGN00, **(top right)** Planet Dove scene: 20160206_095018_0c03 **(bottom left)**



Deonar dumping ground
fire which started on Jan
27, 2016

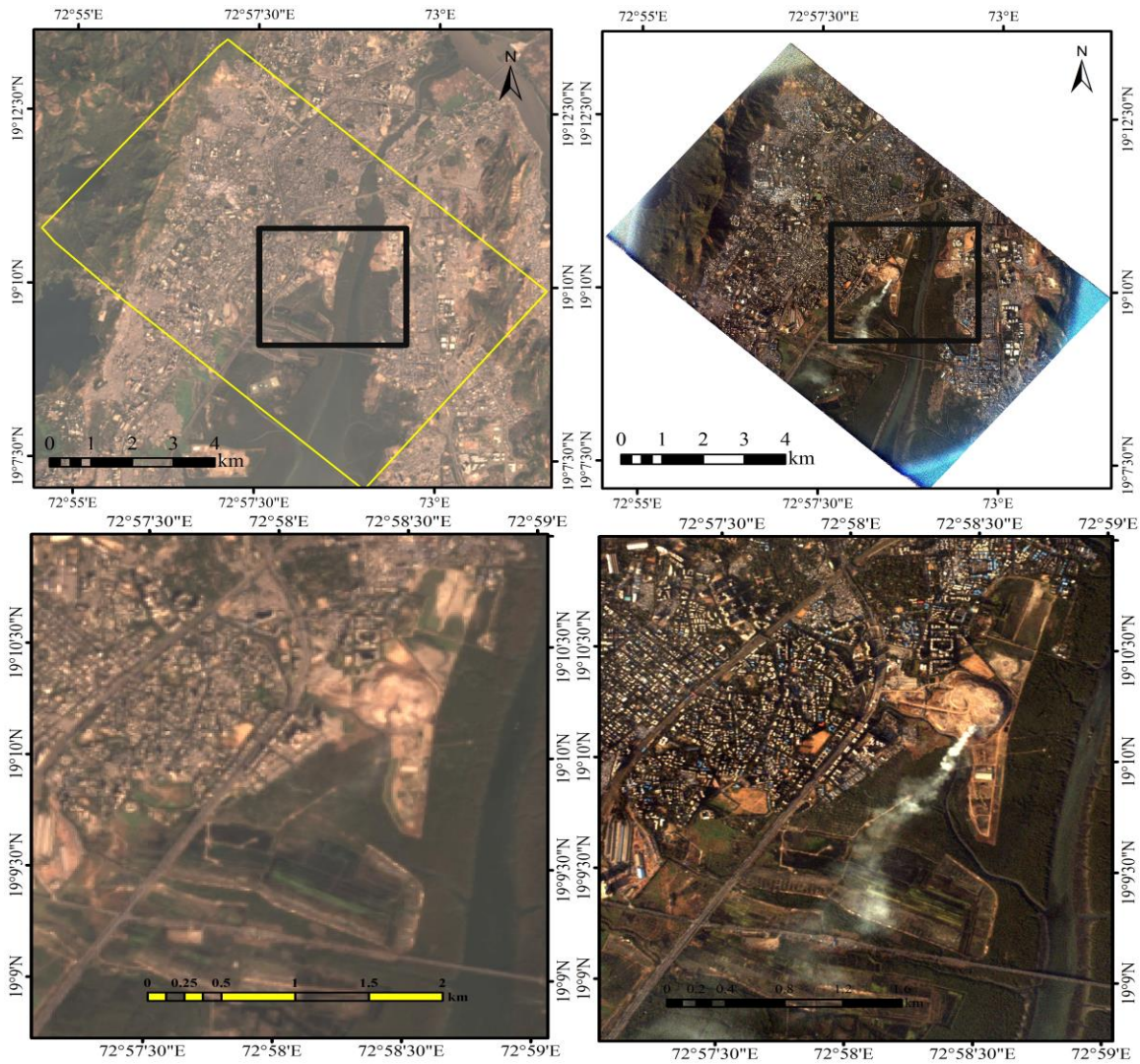
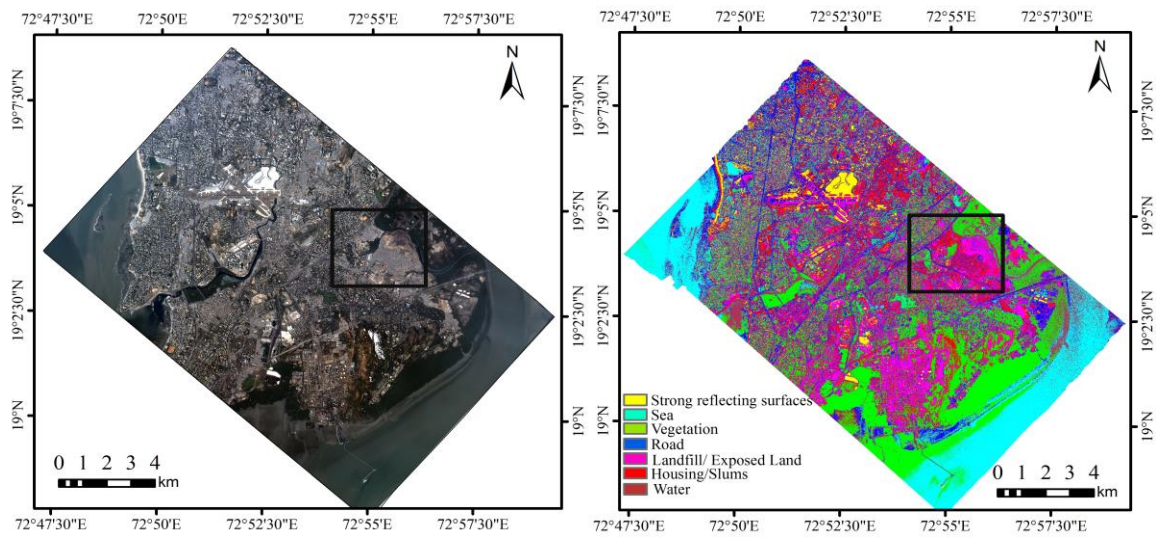


Fig. 2 (top left) Landsat scene:LC81480472016364LGN00, over Mumbai, India (**top right**) Planet Dove scene: 20151207_104341_0b0f (**bottom left**) Landsat scene zoomed in over Mulund Dumping Ground Mumbai, India (**top right**) Planet Dove scene zoomed in over Mulund Dumping Ground Mumbai, India



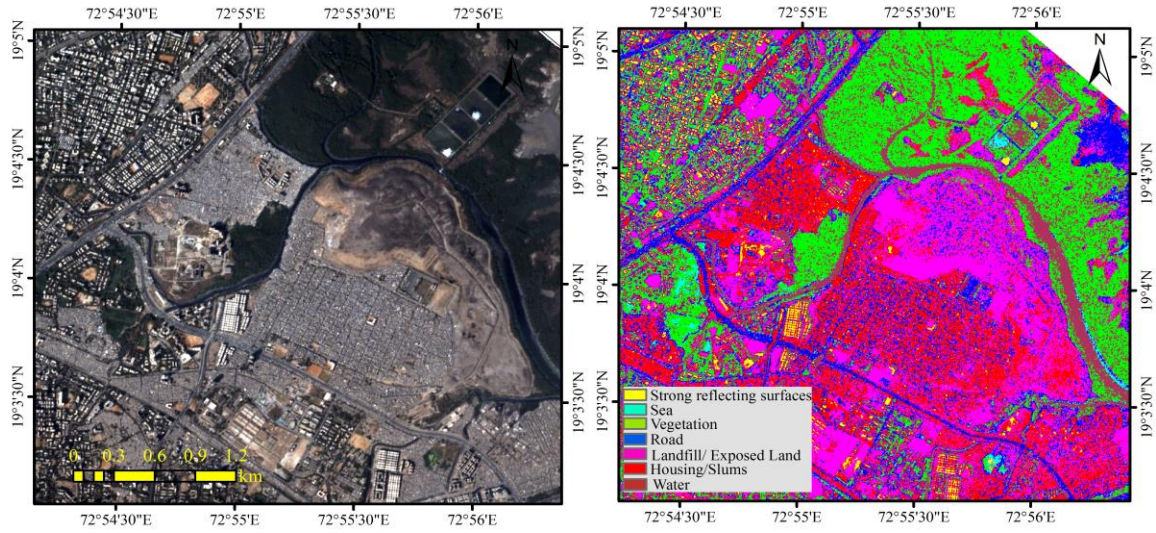


Fig. 3 (**top left**) Planet Dove scene:20160206_095018_0c03, over Mumbai, India (**top right**) land cover classification by maximum likelihood classification using Planet Dove scene (**bottom left**) Planet Dove scene zoomed over Deonar Dumping ground (**bottom right**) land cover classification by maximum likelihood classification using Planet Dove scene around Deonar Dumping Ground

FUTURE COURSE OF ACTION

