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Environmental Change of Saemangeum Tideland based on Remote Sensing Method

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Abstract. Reclamation project is very efficient development plan which saves the sea to create new land in case of Republic of Korea where the population density is high and urbanization is still in progress. However, reclamation project is necessary to be managed consistently because to install the artificial structures in natural terrain may cause the environmental change. Thus, in this study, we suggested the remote sensing method as the efficient management plan about large-scale reclamation project and derived quantitative environmental change based on this method.

Keywords: Saemangeum tideland, Reclamation project, Environmental change, Remote sensing

1 Introduction

Saemangeum project which is started to discuss taking this opportunity of introduction of foreign rice due to drought, food crisis, and cold weather damage, etc. from 1960s to 1980s. This project was began on November, 1991 through the process such as economic feasibility analysis, environmental effects evaluation, agreement of residents, discussion of ministry concerned, license of public waters reclamation.

Saemangeum seawall was listed in the Guinness Book of World Records as the longest (33.9km) seawall in the world which was constructed on January, 2010. Currently, the site development is now in progress in accordance with master plan of Saemangeum which was announced on September, 2014 [1].

In this study, we tried to detect the change of time sequential environment by calculating the existing land use changed due to Saemangeum reclamation project. We utilized Landsat 5 TM and 8 OLI TIRS images to detect the change about the large scale region corresponding to 409km^2 [2],[3].

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2 Data acquisition

In this study, we utilized Landsat satellite images to monitor the time sequential change about tideland in west coast. The used images were 6 dates in September, 1996, September, 2005, October, 2009, September, 2013, October, 2014, and April, 2015. The seawall was constructing in 1996, almost constructed in 2005, had constructed in 2009. Table 1 shows the information of satellite images used in this study.

Table 1. Information of satellite images

Kind of satellite images	Date of image	Cloud cover (%)	Image quality
5 TM L1T	1996.09.01	0	9
5 TM L1T	2005.09.26	28	9
5 TM L1T	2009.10.07	0	9
8 OLI TIRS L1T	2013.09.16	0	9
8 OLI TIRS L1T	2014.10.05	0	9
8 OLI TIRS L1T	2015.04.15	1	9

3 Data processing and analysis

We utilized masking band in order to detect the land use changes according to time series. We cut the images to size as study area where include the Saemangeum project area. Fig. 1 shows the study area. After this, we set the ROI(Region of interest)s and selected regions according to the classification items. Fig. 2 shows the setting of ROIs. Maximum likelihood method was used for image classification which is high frequency [4],[5].

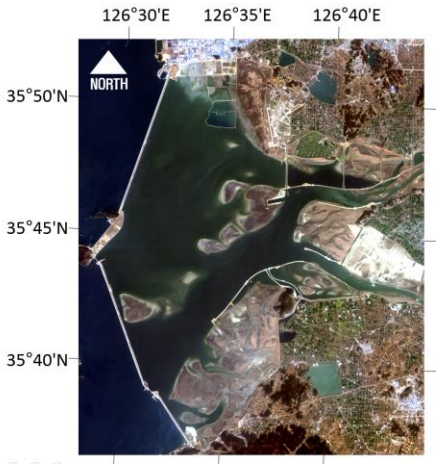

Fig. 1. Study area

Fig. 2.Setting of ROIs

Table 2 shows the ROI setting.

Table 2. ROI setting

Sort of classification	Color	
Sea	Red	
Tideland	Green	
Farm	Blue	
Mountain	Cyan	
Lake	Magenta	
Construction	Yellow	
Bare soil	Maroon	

The area about the whole study area including the outside sea of tideland is 744.759km^2. We could recognize the change of area according to the each items as shown in Table 3.

Table 3. Change of area according to the each items (unit : km^2)

	Sea	Tideland	Farm	Mountain	Lake	Construction	Bare soil
1996	305.6	137.7	150.1	53.0	10.7	65.7	21.8
2005	389.5	60.4	178.9	38.1	15.5	62.0	0.5
2009	390.9	64.8	168.2	38.4	27.6	53.3	1.5
2013	318.2	161.7	156.6	36.6	6.6	58.0	7.1
2014	313.5	126.8	165.0	34.1	5.8	69.0	30.5
2015	301.2	153.1	176.0	30.4	15.7	58.6	9.8

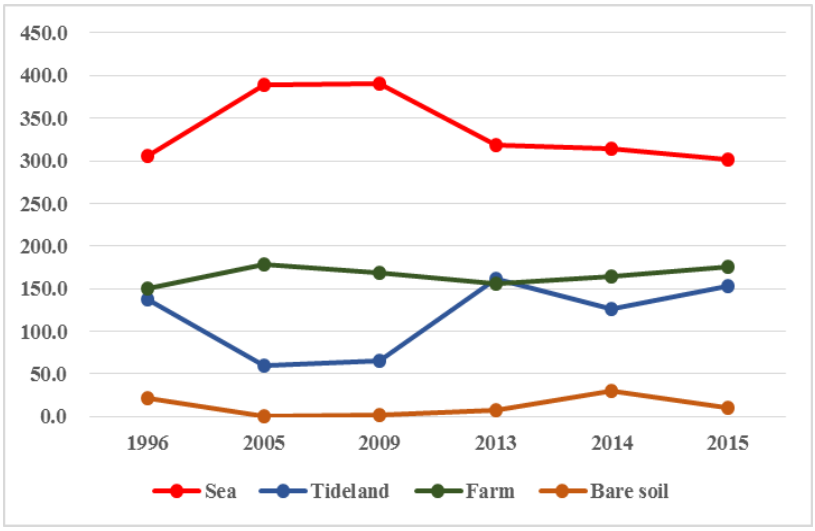

Fig. 3. Change of area according to the each classification item

The items shown the most noticeable changes are the area of inside and outside of the seawall, the area of tideland in the Table 3 and Fig. 3. The area of sea was increased about 85.3km^2 and tideland was decreased about 72.9km^2 in between year of 1996 and 2009. The seawall project was ongoing during this period. On the other hand, we could recognize that the area of farmland was increased about 19.4km^2 and sea was decreased about 17.0km^2 in between year of 2013 and 2015 gradually.

4 Conclusion

In this study, we classified and analyzed the images using Landsat satellite images to figure out the time sequential land use changed due to large-scale reclamation project quantitatively. As results, we could figure out the area change about sea, tideland, farmland, etc. clearly caused by seawall project and brea water bank project. Henceforth, if the continuous monitoring is carried out using satellite images, it is expected to be a low-cost management about large-scale tideland.

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