

Coastline Classification Dataset of 25 Port Cities and Their Surrounding Areas along the B&R

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Abstract: This dataset focus on the delineation and classification of coastline in 25 port cities and its surrounding area along the Belt & Road (B&R). Landsat 8 OLI images in 2015 were used as basic data source, and the high-resolution remote sensing images such as Google Earth images were chosen as ancillary data. The 25 port cities are Shanghai, Busan, Singapore, Jakarta, Kyaukpau, Bangkok, Kuantan, Mumbai, Gwadar, Kolkata, Chittagong, Colombo, Doha, Abbas, Jeddah, Dubai, Lisbon, Petersburg, Djibouti, Sudan-port, Alexandria, Piraeus, Istanbul, Sydney, and Darwin. The mean high tide line was chosen as the proxy of coastline. Coastline was first classified into natural and artificial coastline, and then seven subtypes of artificial coastline were further categorized: groin and jetty, harbor and wharf, reclamation, aquaculture dike, salt pan dike, traffic dike, and sea wall. Visual interpretation method was adopted to delineate and classify coastline in and adjacent to port cities. The result shows that, “Harbor and Wharf” and “Traffic dike” are common coastline in well developed port cities, such as Shanghai, Singapore, and Pusan; while natural coastline are widely distributed in newly developed port cities, such as Kyaukpau, Gwadar, Kuantan, and Djibouti; the rest of port cities are significantly different from the above two types because both artificial and natural coastline could be found. The dataset is archived as .shp file, with the data size of 855 KB.

Keywords: Belt and Road; OBOR; port city; coastline; natural coastline; hardened coastline

1 Introduction

Based on the geographical distribution characters of global maritime economic activities^[1–4], location advantages and development status of port cities^[5–9], we choose 25 port cities for coastline classification. The dataset of the 25 port cities and their surrounding areas along the B&R^[10] have been enrolled into the GEOARC-2015 by the National Remote Sensing Center of China (NRSCC), Ministry of Science and Technology.

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2 Metadata of Dataset

The introduction of Coastline data in 25 port cities and its surrounding area along the Belt and Road (2015) consist of dataset full name, short name, authors, geographical region, time, data sharing policy, etc. The detailed description of the metadata is shown in Table 1.

Table 1 Summary of the metadata

Items	Description
Dataset full name	Coastline data in 25 port cities and its surrounding area along the B&R (2015)
Dataset short name	Coastline25CitiesB&R_2015
Authors	Song, Y. L-7245-2016, Yantai Institute of Coastal Zone Research, Chinese Academy of Science, ysong@yic.ac.cn Hou, X. Y. L-6506-2016, Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, xyhou@yic.ac.cn
Geographical region	25 port cities and their surrounding areas, port cities including Shanghai, Busan, Singapore, Jakarta, Kyaukpyu, Bangkok, Kuantan, Mumbai, Calcutta, Chittagong, Gwadar, Colombo, Doha, Abbas, Dubai, Lisbon, Jeddah, St Petersburg, Djibouti, Port Sudan, Piraeus, Istanbul, Sydney, Alexander, and Darwin
Time	2015
Number of tiles	25
Data format	.shp
Data Size	855 KB
Dataset and data files	The dataset consist of the vector data of coastline of 25 port cities and their surrounding areas. The data of each city is archived in a single folder with .shp file. All data of 25 cities are compressed into one data file
Foundation	National Natural Science Foundation of China (31461143032)
Data publisher	Global Change Research Data Publishing and Repository, http://www.geodoi.ac.cn
Address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China
Data sharing policy	Data from the Global Change Research Data Publishing & Repository includes metadata, datasets (data products), and publications (in this case, in the <i>Journal of Global Change Data & Discovery</i>). Data sharing policy includes: (1) Data are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use Data subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute Data subject to written permission from the GCdataPR Editorial Office and the issuance of a Data redistribution license; and (4) If Data are used to compile new datasets, the ‘ten per cent principal’ should be followed such that Data records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset ^[11]

3 Methods

Many definitions of the coastline exist, and the selection of specific definitions will have an important impact on the results of the study. In this paper, the mean high water line, one of the most widely used proxy of coastline^[12–13], were adopted. Cloudless Landsat 8 OLI im-

ages captured in 2015 (Table 2) were downloaded from USGS (<http://glovis.usgs.gov/>), and based on which visual interpretation method was adopted to delineate and classify coastlines.

According to their utilization status, the coastline data were classified into 8 categories, which are natural coastline, Groin and Jetty, Harbor and Wharf, Reclamation, Aquaculture dike, Salt pan dike, Traffic dike and Sea wall (Table 3).

Table 2 Landsat 8 OLI images used for coastline classification

Port cities	Date	Path/Row	Port cities	Date	Path/Row
Shanghai	2015/08/03	118/38	Port Sudan	2015/07/21	171/46
	2015/08/03	118/39		2015/07/21	171/47
Busan	2015/06/04	114/35	Bangkok	2015/05/21	128/51
	2015/06/04	115/35		2015/11/04	129/50
	2015/05/27	115/35		2015/11/04	129/51
	2015/05/27	115/36	Jakarta	2015/03/16	130/50
Dubai	2015/08/16	161/42		2015/08/31	122/64
	2015/09/19	159/43	St Petersburg	2015/09/23	123/64
	2015/09/26	160/42		2015/08/24	185/18
	2015/09/26	160/43	Abbas	2015/08/24	185/19
Alexander	2015/09/01	177/38		2015/08/19	159/42
	2015/09/24	178/38	Istanbul	2015/08/26	160/42
Calcutta	2015/11/19	138/44		2015/07/13	179/31
	2015/11/19	138/45		2015/06/28	179/32
	2015/10/25	139/44		2015/09/06	180/31
	2015/10/25	139/45		2015/09/06	180/32
Jeddah	2015/09/25	169/44	Chittagong	2015/09/06	180/32
	2015/09/16	170/45		2015/08/28	181/31
	2015/09/16	170/46		2015/11/05	136/44
	2015/09/16	170/47	Mumbai	2015/10/20	136/45
Lisbon	2015/06/26	204/33		2015/10/08	148/46
	2015/06/26	204/33	Gwadar	2015/10/08	148/47
Doha	2015/08/23	162/42		2015/09/07	155/43
	2015/08/23	162/43	Darwin	2015/05/11	106/68
Singapore	2015/06/01	125/59		2015/05/27	106/69
Sydney	2015/02/28	89/83	Kuantan	2015/07/26	126/58
	2015/02/28	89/84		2015/08/19	182/34
Colombo	2015/01/08	141/55	Piraeus	2015/07/09	183/33
	2015/02/25	141/56		2015/07/09	183/34
Kyaukpyu	2015/11/23	134/47	Djibouti	2015/10/06	166/52

Table 3 Categories of coastline in port cities and their surrounding areas

Types	Code	Description
Natural coastline	1	Undeveloped coastline without any form of dike
Groin and Jetty	11	Groin: low wall built out into the sea obliquely to prevent it from washing away sand and stones from beaches and regulate along-shore current Jetty: a wall built out into the sea with one side on shore for wave defending
Harbor and Wharf	12	Hardened wall that belong to harbor and wharf
Reclamation	13	Districts that is being reclaimed
Aquaculture dike	14	Dikes built for aquaculture
Hardened coastline	Salt pan dike	Dikes built for salt extraction
	Traffic dike	Dikes built for traffic, including sea walls with traffic functions
	Sea wall	Other coastal protection projects that separate land from water

4 Quality Control and Validation of Coastline Data

The Coastline data in 25 port cities and its surrounding area along the Belt and Road in 2015 shows that total length is 11,347.30 km, among which, the coastline length of natural coastline, groin and jetty, harbor and wharf, reclamation, aquaculture dike, salt pan dike, traffic dike and sea wall is 11,347.30 km, 532.33 km, 1,467.64 km, 320.72 km, 11.91 km, 127.28 km, 1,300.84 km and 548.83 km, respectively. The natural coastline, accounted for 62.02%, is major coastline in 25 port cities and their surrounding areas. The statistics of coastline length in 25 port cities and their surrounding areas is shown in Table 4.

The dataset consist of the coastline vector data of 25 port cities and their surrounding areas. The data of each city is archived in a single folder with .shp format. Field survey along Shanghai coastline has been conducted in 2013. The coastline delineation and classification results in Shanghai are more reliable because most of its coastlines have been hardened. During the process of coastline delineation and classification, high-resolution images of Google Earth have been referenced in order to improve the reliability of the result as much as possible. Google Earth images and coastline results of selected port cities, are shown in Figure 1–2 (Busan), Figure 3–4 (Bangkok), Figure 5–6 (Mumbai), Figure 7–8 (Jeddah), Figure 9–10 (Alexander), Figure 11–12 (Lisbon), and Figure 13–14 (Sydney).

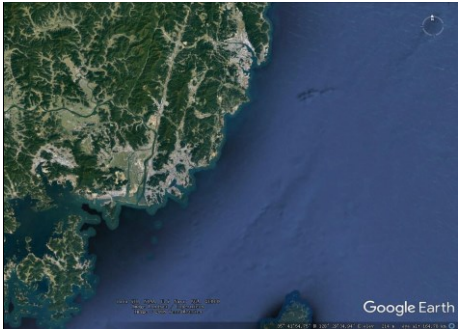


Figure 1 Google Earth images of Busan

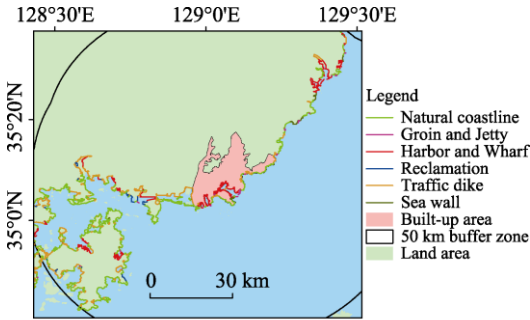


Figure 2 Coastline classification of Busan

Table 4 The statistics of coastline length in 25 port cities and their surrounding areas along the B&R

Port cities	Coastline Length (km)	Natural coastline						Hardened coastline												Sea wall			
		Groin and Jetty			Harbor and Wharf			Reclamation			Aquaculture dike			Salt pan dike			Traffic dike			Length (km)		Proportion (%)	
		Length (km)	Proportion (%)	Length (km)	Length (km)	Proportion (%)	Length (km)	Length (km)	Proportion (%)	Length (km)	Length (km)	Proportion (%)	Length (km)	Length (km)	Proportion (%)	Length (km)	Length (km)	Proportion (%)	Length (km)	Length (km)	Proportion (%)	Length (km)	Proportion (%)
Shanghai	708.14	67.17	9.49	58.79	8.30	85.37	12.06	47.84	6.76	9.41	1.33	11.44	1.62	121.85	17.21	306.27	43.25						
Busan	1,227.89	632.42	51.50	18.43	1.50	134.03	10.92	30.74	2.50	0.00	0.00	0.00	0.00	392.29	31.95	19.98	1.63						
Singapore	438.50	114.50	26.11	35.90	8.19	166.40	37.95	18.90	4.31	0.00	0.00	0.00	0.00	54.40	12.41	48.40	11.04						
Jakarta	400.99	250.85	62.56	21.57	5.38	81.09	20.22	19.58	4.88	0.00	0.00	0.00	0.00	17.84	4.45	0.92	0.23						
Kuantan	190.36	147.06	77.25	15.32	8.05	17.35	9.11	0.00	0.00	0.00	0.00	0.00	0.00	10.63	5.58	0.00	0.00						
Bangkok	393.90	103.10	26.17	0.00	0.00	106.80	27.11	0.00	0.00	0.00	0.00	105.20	26.71	20.80	5.28	58.00	14.72						
Kyaukpnyu	72.34	69.11	95.53	0.60	0.83	2.63	3.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
Chittagong	114.40	69.70	60.93	0.60	0.52	22.70	19.84	0.00	0.00	0.00	0.00	0.00	0.00	14.00	12.24	7.40	6.47						
Calcutta	381.90	285.80	74.84	0.00	0.00	34.50	9.03	0.00	0.00	0.00	0.00	0.00	0.00	59.10	15.48	2.50	0.65						
Colombo	286.10	222.45	77.75	9.23	3.23	20.98	7.33	0.00	0.00	0.00	0.00	0.00	0.00	33.44	11.69	0.00	0.00						
Mumbai	503.20	331.90	65.96	9.70	1.93	75.90	15.08	0.50	0.10	2.50	0.50	1.50	0.30	48.50	9.64	32.70	6.50						
Gwadar	62.52	47.54	76.04	0.00	0.00	2.50	4.00	0.00	0.00	0.00	0.00	0.00	0.00	12.48	19.96	0.00	0.00						
Abbas	341.84	250.46	73.27	24.61	7.20	36.01	10.53	1.89	0.55	0.00	0.00	0.00	0.00	28.87	8.45	0.00	0.00						
Dubai	903.24	573.95	63.54	173.08	19.16	98.82	10.94	0.00	0.00	0.00	0.00	0.00	0.00	57.39	6.35	0.00	0.00						
Jeddah	471.11	393.08	83.44	11.54	2.45	40.60	8.62	0.00	0.00	0.00	0.00	0.00	0.00	25.89	5.50	0.00	0.00						
Doha	418.85	221.20	52.81	68.28	16.30	96.76	23.10	21.79	5.20	0.00	0.00	0.00	0.00	10.82	2.58	0.00	0.00						
Djibouti	63.07	33.75	53.51	3.46	5.49	17.43	27.64	0.00	0.00	0.00	0.00	0.00	0.00	8.43	13.37	0.00	0.00						
Port Sudan	233.87	190.84	81.60	2.83	1.21	25.22	10.78	1.50	0.64	0.00	0.00	0.00	0.00	13.48	5.76	0.00	0.00						
Alexander	256.55	141.61	55.20	17.56	6.84	63.44	24.73	0.00	0.00	0.00	0.00	0.00	0.00	17.97	7.00	15.97	6.22						
Piraeus	597.80	458.29	76.66	21.48	3.59	62.19	10.40	0.00	0.00	0.00	0.00	0.00	0.00	55.84	9.34	0.00	0.00						
Istanbul	501.92	318.38	63.43	3.93	0.78	94.03	18.73	7.80	1.55	0.00	0.00	0.00	0.00	38.86	7.74	38.92	7.75						
Lisbon	569.11	371.24	65.23	5.71	1.00	25.82	4.54	150.37	26.42	0.00	0.00	0.00	0.00	15.97	2.81	0.00	0.00						
St Petersburg	362.38	160.64	44.33	7.17	1.98	74.55	20.57	19.81	5.47	0.00	0.00	0.00	0.00	82.44	22.75	17.77	4.90						
Darwin	382.34	273.41	71.51	6.67	1.74	8.12	2.12	0.00	0.00	0.00	0.00	0.00	0.00	94.14	24.62	0.00	0.00						
Sydney	1,464.98	1,309.30	89.37	15.87	1.08	74.40	5.08	0.00	0.00	0.00	0.00	0.00	0.00	65.41	4.46	0.00	0.00						

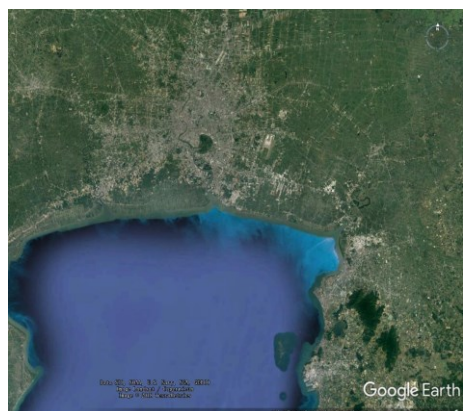


Figure 3 Google Earth images of Bangkok

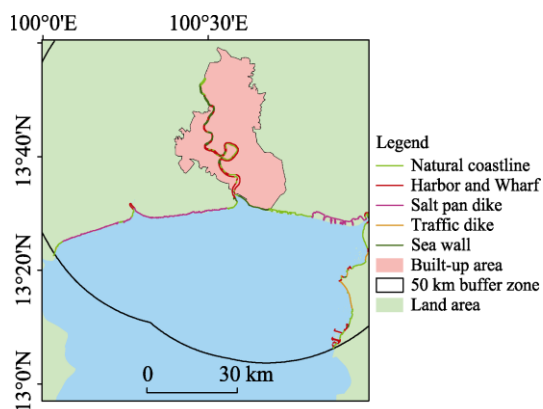


Figure 4 Coastline classification of Bangkok

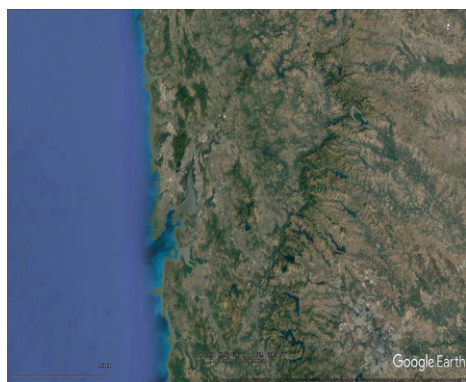


Figure 5 Google Earth images of Mumbai

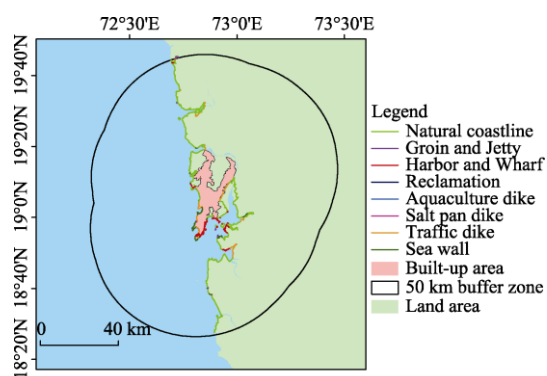


Figure 6 Coastline classification of Mumbai



Figure 7 Google Earth images of Jeddah

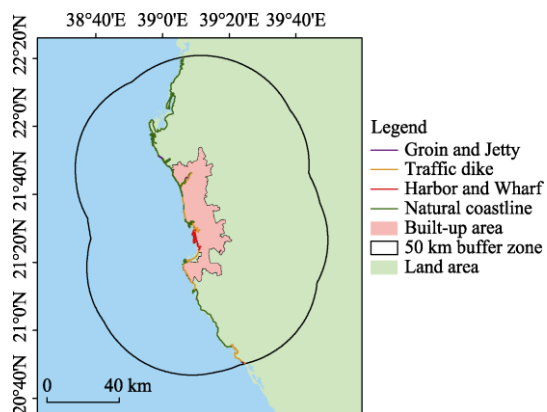


Figure 8 Coastline classification of Jeddah



Figure 9 Google Earth images of Alexander

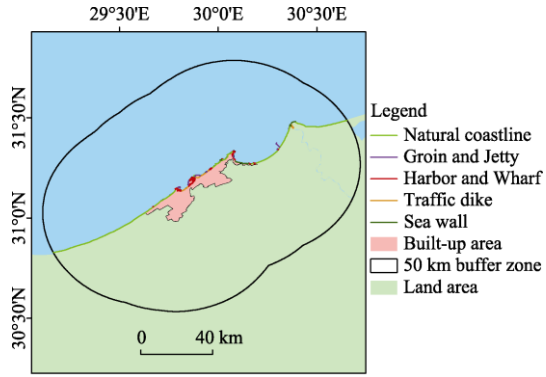


Figure 10 Coastline classification of Alexander

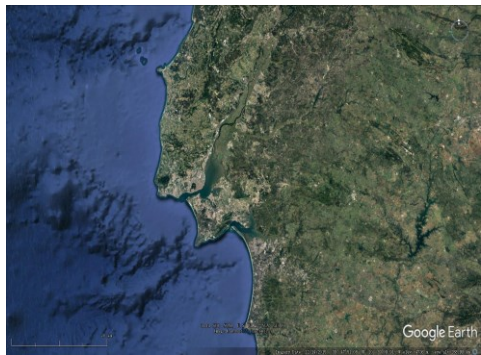


Figure 11 Google Earth images of Lisbon

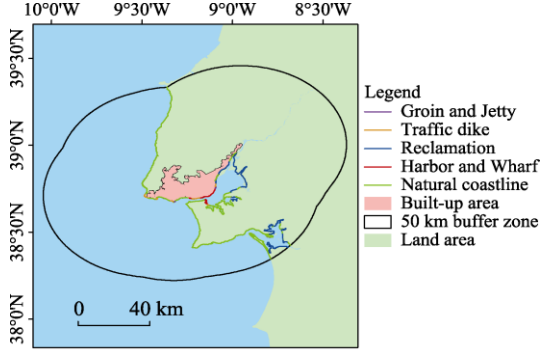


Figure 12 Coastline classification of Lisbon

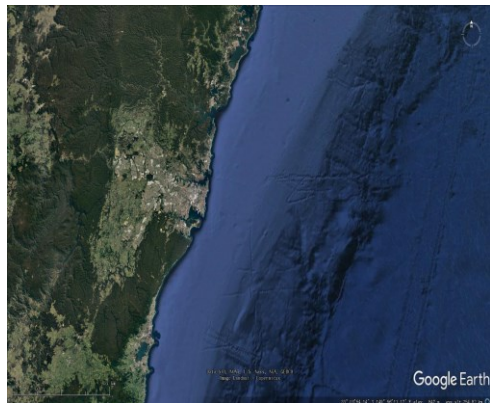


Figure 13 Google Earth images of Sydney

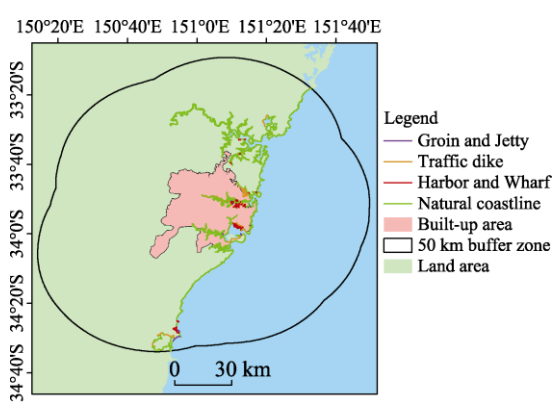


Figure 14 Coastline classification of Sydney

Author Contributions

Overall plan and technical framework of this dataset was designed by Hou, X. Y. Landsat 8 OLI images were processed and analyzed by Song, Y.

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