

aramma_2020_IOP_Conf._Ser._
_Mater._Sci._Eng._797_012010.
pdf
by

FILE	ARAMMA_2020_IOP_CONF._SER._MATER._SCI._ENG._797_012010.PDF (918.71K)		
TIME SUBMITTED	06-JUN-2020 12:10PM (UTC+0700)	WORD COUNT	2095
SUBMISSION ID	1338781006	CHARACTER COUNT	9639

PAPER • OPEN ACCESS

Analysis of Longshore Sediment Transport at Theestuaries of Jeneberang River and Tallo River Caused by Waves on Coast of Makassar

To cite this article: Riswal Karamma *et al* 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **797** 012010

4
View the [article online](#) for updates and enhancements.

Analysis of Longshore Sediment Transport at Theestuaries of Jeneberang River and Tallo River Caused by Waves on Coast of Makassar

Riswal Karamma^{1,3*}, M. Saleh Pallu¹, M. Arsyad Thaha¹, Mukhsan Putra Hatta¹, A. Subhan Mustari¹, Ahmad Syarif Sukri²

¹ Department of Civil Engineering, Hasanuddin University Jalan Poros Malino Km. 6 Bontomarannu, 91271, INDONESIA

² Department of Civil Engineering, Universitas Haluoleo, 93232 Kendari, Sulawesi Tenggara, INDONESIA

*Corresponding author's e-mail: riswalchiwal@gmail.com

Abstract. The length of the Makassar Coast reaches ± 35.52 km. In the northern coastal area of Makassar City, the Tallo River Estuary and the south side of the Jeneberang River Estuary, both estuaries can affect longshore sediment transport on the coast of Makassar City. The purpose of this research was to determine the direction of longshore sediment transport on the coast at the estuaries of the Jeneberang River and Tallo River caused by waves on the Makassar Coast. The analysis carried out in this research is the analysis of wind direction, wind speed, effective retrieval, wave forecasting, wave return analysis, breaking wave analysis and longshore sediment transport analysis. The result of this research indicates that the longshore sediments transport in the Tallo River Estuary is relatively heading north or away from the coast of Makassar and longshore sediments transport in the Jeneberang River Estuary is relatively heading north or heading to the coast of Makassar.

1. Introduction

Makassar City is one of the cities in Indonesia that has a coastline. The length of the coastal city of Makassar reaches ± 35.52 km. The coastal area of Makassar city provides productive natural resources both as a source of food, mineral and energy mining, recreational media or tourism [1]. To the north of the coastal area of Makassar City is the Tallo River Estuary and to the south there is the Jeneberang River Estuary, these two estuaries can affect sediment transport along the coast of the Makassar City coast. Triadmodjo [2] explained that there are several ways commonly used to predict sediment transport along the coast, one of which is to use empirical equations based on the wave conditions of the area being reviewed. The CERC equation [3] is one of the equation of the empirical sediment transport along the coast. The CERC equation is used to calculate the amount of sediment transport along the coast in conditions without structure [4].

2. Purpose of research

The purpose of this research was to determine the direction of sediment transport along the coast at the estuary of the Jeneberang River and Tallo River caused by waves on the Makassar Coast. Sediment



Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

material near the coast will be driven by longshore current (Sorensen 2006). Thus resulting in longshore drift. To calculate sediment transport along the coast, the following equation can be used.

$$K = 1.4 e^{(-2.5 D_{50})} \tag{1}$$

$$Q_1 = K \left(\frac{\rho \sqrt{g}}{16 K^{\frac{1}{2}} (\rho_1 - \rho) (1 - n)} \right) H_b^{\frac{5}{2}} \sin(2 a_b) \tag{2}$$

3. Research method

The method used in this research is descriptive qualitative, the results of the research and analysis are described in a scientific paper in the form of narrative, then from the analysis that has been carried out, a conclusion is drawn. The data used in this research are wind direction and velocity data from 2008 to 2018 as well as data on research locations sourced from ECMWF and satellite imagery (Google Earth). Data analysis techniques used in this research is in the form of wind direction and velocity analysis, effective fetch analysis, wave forecasting, breaking wave analysis and sediment transport analysis.

The thinking flow of this research begins with the literature research or looking for problems that often occur, then data collection in the form of wind direction and velocity and making a map of the research location. After conducting data collection and data analysis, result and discussion are obtained, then draws a conclusion accompanied by recommendations.

4. Result and discussion

In forecasting the wave used wind data sourced from ECMWF with a span of about 10 years from the beginning of 2008 to the end of 2017. The location of wind data retrieval and examples of wind velocity and direction data used in this research can be seen in Figure 1. and Table 1.

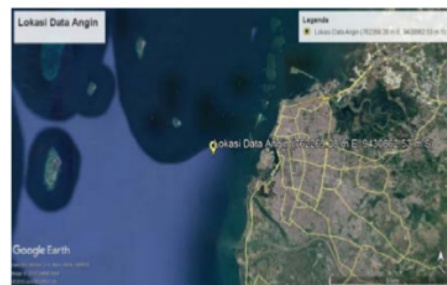


Figure 1. Location of wind data retrieval

Based on the results of wind data analysis, wind events at the research locations as shown in Table 1 were obtained.

Table 1. Percentage of wind events based on direction

Direction	Data	Percentage (%)
0	329	2.05
45	358	2.23

Direction	Data	Percentage (%)
90	3466	21.56
135	5355	33.31
180	856	5.32
225	612	3.81
270	2381	14.81
315	2719	16.91
Jumlah	16076	100

Based on the table above, it can be seen that the highest amount of wind events in the research location came from the southeast with a total data of 5355 data and a percentage of wind events around 33.31% followed by east, west, northwest, south, southwest, northeast, and north . Meanwhile, wind rose at the researchlocation can be seen in Figure 2.

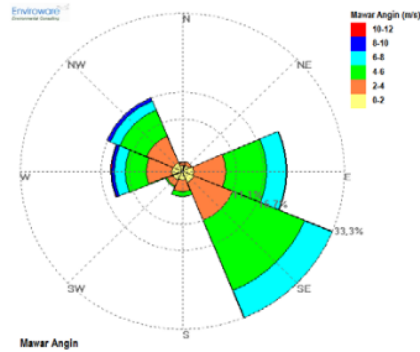


Figure 2. Wind rose in the reserach location

The map of measurement results and fetch calculations can be seen in Table 2.

Table 2. Effective fetch in the research location

No.	Direction	Effective Fetch (km)
1	North	179.64
2	South West	340.36
3	West	447.62
4	North West	419.05

Based on the results of the effective data analysis and fetch above. The height and period of deep sea waves at the research location can be seen in Table 3.

Table 3. The height and period of deep oceanwaves are significant at the reserachlocation

Time	Wave Direction	T (s)	H (m)
2017-06-28 T12:00	270	2.9	5.83
2017-06-28 T18:00	270	2.84	5.79

Time	Wave Direction	T (s)	H (m)
2017-06-29 T00:00	270	2.77	5.74

Based on the results of wave data analysis, wind events were found in the research locations as shown in Table 4.

Table 4. Percentage of wave occurrence based on direction

Direction	Data	Percentage (%)
0	329	5.45
45	0	0
90	0	0
135	0	0
180	0	0
225	612	10.13
270	2381	39.41
315	2719	45.01
Jumlah	6041	100

Based on the table above it can be seen that the highest number of wave occurrence data in the research location comes from the northwest with 45.01 data and the percentage of wave occurrence is around 2719% followed by west, southwest and north. Meanwhile, there is no potential for waves from the northeast, east, southeast and south because it is obstructed by the land area of the research location. The wave rose at the research location can be seen in Figure 3.

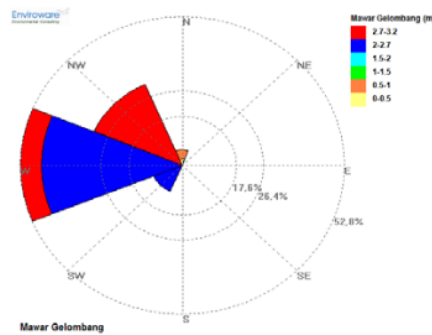


Figure 3. Wave rose in the research location

Table 5. Height and period of ocean waves with certain return times

Return Period	North		North West		West		South West	
	H	T	H	T	H	T	H	T
2	0.40	2.01	1.31	4.58	1.38	4.54	0.99	3.74
5	0.58	3.03	1.79	5.83	2.05	6.30	1.53	5.40
10	0.70	3.71	2.11	6.66	2.50	7.46	1.90	6.50

Return Period	North		North West		West		South West	
	H	T	H	T	H	T	H	T
25	0.86	4.57	2.51	7.71	3.07	8.93	2.35	7.90
50	0.97	5.20	2.81	8.48	3.49	10.02	2.69	8.93
100	1.08	5.83	3.11	9.25	3.91	11.11	3.03	9.96

The determination of the height and depth of breaking waves can also be done by making superposition graphs between wave heights that are affected by shoaling and refraction processes with graphs of wave height affected by water depth. In this case, it is considered the height of the breaking wave is proportional to the depth of the water, i.e. the breaking wave height is 0.78 from the depth of the water. After analyzing the breaking waves the breaking waves at the reserach location can be seen in Table 6.

Table 6. The height and depth of the wave rupture at the research location

No	Direction	Tallo Estuary		Jeneberang Estuary	
		Hb	Db	Hb	Db
1	North	1.05	1.3	0.9	1.2
2	Northwest	3.3	4.3	3.2	4.3
3	West	3.6	4.6	4	5.2
4	Southwest	-	-	2	2.65

After analyzing the breaking waves, the direction of sediment transport along the coast at the research location using equation 1 and equation 2. The direction of sediment transport along the coast in the research area can be seen in Table 7. and Table 8.

Table 7. Longshore sediment transport of Tallo river estuary

Direction	Wave Percentage	K	Cb	ab	PI	Qs	Explanation
			(m/d)	(o)	(Nm/d/m)	(m ³ /hari)	
North	5.45	0.4	3.57	41	2.45	-5.4	Toward South
Northwest	45.01	0.4	6.49	4	6.19	-111.65	Toward South
West	39.41	0.4	6.72	49	54.18	856.3	Toward North
						739.3	Toward North

Table 8. Sediment transport along the coast of Jeneberang river estuary

Direction	Wave Percentage	K	Cb	ab	PI	Qs	Explanation
			(m/d)	(o)	(Nm/d/m)	(m ³ /hari)	
North	5.5	0.4	3.4	62.0	1.5	-3.2	Toward South
Northwest	45.0	0.4	6.5	17.0	23.4	-421.8	Toward South
West	39.4	0.4	7.1	28.0	59.5	941.0	Toward North
Southwest	10.1	0.4	5.1	73.0	7.2	29.1	Toward North
						545.1	Toward North

For more details, the direction of sediment transport along the coast in the Tallo River estuary and the Jeneberang river estuary towards the Makassar coast can be seen in Figure 4.



Figure 4. Longshore sediment transport directions in the Tallo river estuary and the Jeneberang river estuary towards the Makassar coast

5. Conclusion and recommendation

Conclusion from the research of Analysis of Sediment Transport Tracing the Coast at the Estuaries of Jeneberang River and Tallo River Caused by Waves on the Coast of Makassar are:

- a. Sediment transport along the coast in the Tallo River Estuary is relatively heading north or away from the coast of Makassar.
- b. Sediment transport along the coast in the Jeneberang River Estuary is relatively towards the north or leads to the coast of Makassar.

For further research it is recommended to conduct numerical modeling and/or laboratory modeling as a comparison material.

References

- [1] Spatial Plans of Makassar City 2005-2035, 2005, Regional Development Agency of Makassar city, Makassar.
- [2] Triadmodjo, B, Coastal Engineering, 1999, Beta Offset, Yogyakarta. 184-188
- [3] USACE, Coastal Engineering Manual, 2002, Washington, D.C.
- [4] Umar, H, et al., Sediment Transport Reduction Along the Coast Case Study of Glagah Beach, Kulon Progo, Central Java, 2016, JPE-UNHAS, Vol. 20, No. 2, Makassar.

ORIGINALITY REPORT

%**9**

SIMILARITY INDEX

%**4**

INTERNET SOURCES

%**2**

PUBLICATIONS

%**5**

STUDENT PAPERS

PRIMARY SOURCES

1

Submitted to University of Ulster

Student Paper

%**3**

2

dspace.brunel.ac.uk

Internet Source

%**2**

3

Submitted to Syracuse University

Student Paper

%**2**

4

tubdok.tub.tuhh.de

Internet Source

%**1**

5

www.coursehero.com

Internet Source

%**1**

6

L. Sheela Nair, V. Sundar, N.P. Kurian.
"Longshore Sediment Transport along the Coast
of Kerala in Southwest India", Procedia
Engineering, 2015

Publication

%**1**

7

Nofriani Fajrah, Fhedriyan Saputra Efendy.
"Analysis of quality control weld cladding at
Cladtek BI-Metal Manufacturing", AIP
Publishing, 2020

<%**1**

EXCLUDE QUOTES ON

EXCLUDE
BIBLIOGRAPHY ON

EXCLUDE MATCHES < 5
WORDS