THE EFFECT OF RUNOFF ON FLOODED WATER IN THE RIVER FLOW AREA

Acep Hidayat, Muhammad Isradi
Faculty of Engineering, Univeristy Mercu Buana Jakarta, Indonesia
acep.hidayat@mercubuana.ac.id, isradi@mercubuana.ac.id
Joewono Prasetijo
Faculty of Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia
joewono@uthm.edu.my

Rudi Hendrawan
Director Restu CIpta Persada company Water Resources, Indonesia
rudihes.studio@gmail.com

Abstract
Efforts to increase the utility have led to changes in land use, especially forests. Land use is one of the factors that influence the water function of a watershed. Appropriate land use can provide benefits for the surrounding area but improper land use can provide disadvantages for the surrounding area. Changes in land use in an area can affect the function of water management (hydro-orology). This is in accordance with the opinion of Lily Montarcih L (2009), which states that any treatment given to a plot of land can affect the water system in that place and places downstream. The hydrological condition of the Banjar-Jeruk legi watershed is currently experiencing a change in the watershed hydrological characteristics which is marked by an increase in the potential for flooding due to increased river discharge and drought in the dry season. This can cause huge losses, damage to facilities and infrastructure, deteriorate food pre-conditions and disrupt people's living arrangements. Apart from natural factors such as climate and extreme rainfall, these threats can also occur due to human factors such as land use. Based on one of the land functions as a regulator of the cycle, the effect of land use changes on hydrological characteristics needs to be studied. The hydrological characteristics used as parameters in this study are fluctuation of discharge and runoff coefficient.

Keywords
watershed, land use, river characteristics

1. Introduction
Along with the increase in the number and activities of humans, the need for land has also increased. To meet these needs, humans tend to use the land towards a higher use and increase the potential of the land. Efforts to increase the utility have led to changes in land use, especially forests. Land use is one of the factors that influence the water function of a watershed (Hidayat, Acep . 2017). Appropriate land use can provide benefits for the surrounding area but improper land use can provide disadvantages for the surrounding area. Changes in land use in an area can affect the function of water management (hydro-orology). This is in accordance with the opinion of Lily Montracih L (2009), which states that any treatment given to a plot of land can affect the water system in that place and places downstream. The hydrological condition of the Banjar-Jeruk legi watershed is currently experiencing a change in the watershed hydrological characteristics which is marked by an increase in the potential for flooding due to increased river discharge and drought in the dry season and figure 1 shows the watershed areas Banjar-Jeruklegi. This can cause huge losses, damage to facilities and infrastructure, deteriorate food pre-conditions and disrupt people's living arrangements. Apart from natural factors such as climate and extreme rainfall, these threats can also occur due to human factors such as land use. Based on one of the land functions as a regulator of the cycle, the effect of land use changes on hydrological characteristics needs to be studied. The hydrological characteristics used as parameters in this study are fluctuation of discharge and runoff coefficient (Sari, I, Hidayat, A, Indah, N, 2018).

1.2. Identification of problems

Based on the background of the problem, it can be identified the problems to be discussed, namely:
1. The factor of the amount of runoff.
2. Effect of runoff on river volume
Figure 1 shows watershed areas:

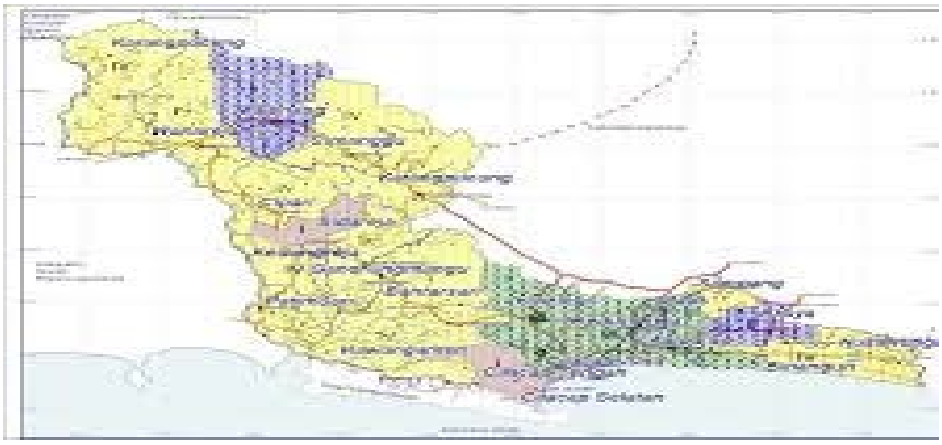

Figure 1 Watershed Areas

2. Research Methodology

The analytical method used to In HEC-RAS version 4.1 the hydraulic analysis provided includes two analyzes, namely steady flow and unsteady flow (Hidayat, Acep . 2017). Steady flow is a flow in which the amount of liquid flowing per second through any part is constant.
Whereas Unsteady Flow is a flow in which the amount of fluid flowing per second through any part is not constant. The analysis was carried out to determine the ability of the channel to drain the discharge (Husain, A, 2017).
The modeling steps are as follows:
a. Make a schematic of the channel network that will be modeled based on the results of field measurements.
b. Enter channel geometry data.
c. Define the boundary conditions to be used in the analysis.
d. Run a modeling program.
e. Print results / output.

3. Result And Analysis

The calculation of flood discharge for the study location was taken using the rational and Haspers method, the calculation shows in Table 1 Rational method and Haspers , which has a horizontal area. Where then the results are compared, which will then take the possible values with the existing environmental conditions. The results to be determined are for flood discharge with return periods of 2, 5, 10, 25, 50, and 100 years.

Table 1 Rational method and Haspers

Return Periode	Rain Plan	Planned Flood Discharge (kubik/sec)	
(years)	(R24) mm	Rasional Method	Haspers Method
2	79.322	3.947	1.232
5	102.756	5.113	1.596
10	115.000	5.722	1.786
25	127.177	6.328	1.973
50	134.203	6.677	2.084
100	139.879	6.960	2.172

Hydraulics Analysis
Flood Water Level Calculation.
The calculation of the flood water level is carried out if the conditions in the field can be calculated based on the survey conducted. However, there are several bridges based on surveys that are carried out in a safe position from flooding by looking at environmental conditions such as crossing rice fields, crossing roads and areas plantation. This is based on a survey conducted in 44 locations in looking shows Table 2 the calculation of flood water in the rivers.

Tabel 2 Calculation of flood water

No	Nama Sungai	KM	DAS	Panjang Sungai	Kemiringan Dasar	Lebar sungai		Kecepatan	Debit	Luas	Depth	elevasi dasar	Elevasi Muka	Keterangan
						bawah (b	Atas (B)	Aliran	Banjir	Penampang	(h)	sungai	Air Banjir (MAB)	
			(Km^2)	(Km)	Sungai	(m)	(m)	(m/det)	(m^3/det)	(m^2)	(m)	(m)	Hitungan	
1	BH-1436	311+269	25.50	35.10	0.022	8.00	8.00	7.29	92.78	12.73	1.59	+21.50	+23.09	
2	BH-1438	312+173	25.40	40.30	0.023	4.50	4.50	6.46	77.72	12.02	2.67	-	-	saluran warga
3	BH-1440	314+257	4.40	20.20	0.018	2.00	2.00	6.46	21.38	3.31	1.65	-	-	sal.irigasi
4	BH-1441	317+201	45.07	17.83	0.016	8.00	10.00	8.06	276.05	34.25	3.81	-	-	sal.induk
5	BH-1443	319+392	10.45	12.54	0.019	4.00	5.00	6.68	71.44	10.70	2.38	-	-	sal.tersier
6	BH-1444	320+670	3.20	40.81	0.017	0.80	1.50	3.97	7.01	1.76	1.53	-	-	sal.tersier
7	BH-1446	322+629	3.30	25.60	0.018	2.00	2.00	6.46	13.68	2.12	1.06	-	-	sal.tersier
8	BH-1447	323+478	10.20	32.30	0.018	5.00	5.00	6.46	36.20	5.60	1.12	-	-	sal.sekunder
9	BH-1447a	324+000	1.20	48.40	0.008	0.40	0.60	6.89	3.39	0.49	0.98	-	-	sawah
10	BH-1448	324+572	0.76	32.90	0.011	0.40	0.80	4.81	2.19	0.45	0.76	-	-	tegalan
11	BH-1448a	325+338	1.10	30.08	0.018	0.60	0.80	4.81	3.36	0.70	1.00	-	-	tegalan
12	BH-1449	325+877	1.20	35.30	0.024	0.60	0.80	6.25	3.92	0.63	0.90	-	-	tegalan
13	BH-1450	326+476	0.90	55.10	0.024	0.50	0.50	7.68	2.51	0.33	0.65	-	-	pemukiman
14	BH-1451	327+076	0.98	36.80	0.018	0.80	0.80	4.81	2.61	0.54	0.68	-	-	jalan pemukiman
15	BH-1452	327+432	23.20	58.60	0.017	0.75	0.80	6.25	30.95	4.95	6.39	+2.99	+9.38	sungai
16	BH-1453	329+631	26.20	34.70	0.019	5.00	5.00	6.68	80.88	12.11	2.42	-	-	saluran sawah
17	BH-1458a	331+505	0.83	42.30	0.011	0.50	0.50	4.81	2.02	0.42	0.84	-	-	tegalan
18	BH-1467	335+030	15.30	0.63	0.019	5.00	5.00	7.29	64.46	8.84	1.77	+6.67	+8.44	Sungai
19	BH-1468	335+307	48.20	20.60	0.020	15.00	15.00	8.24	272.13	33.01	2.20	+5.09	+7.29	sungai
20	BH-1469	336+106	0.70	7.10	0.018	1.00	1.00	6.46	6.85	1.06	1.06	-	-	sawah
21	BH-1470	337+173	37.20	19.60	0.021	10.00	10.00	6.46	184.49	28.54	2.85	+3.87	+6.72	sungai
22	BH-1471	338+236	0.90	26.70	0.014	0.50	0.50	5.56	3.28	0.59	1.18	-	-	tegalan
23	BH-1473	339+120	0.80	15.80	0.014	0.80	0.80	5.56	4.14	0.75	0.93	-	-	jalan
24	BH-1474	339+464	23.20	12.60	0.022	10.00	10.00	7.29	176.43	24.20	2.42	+4.67	+7.09	sungai
25	BH-1475	340+242	0.56	27.60	0.015	0.50	0.50	4.81	1.81	0.38	0.75	-	-	sawah
26	BH-1477	340+523	49.20	81.00	0.024	15.00	15.00	6.25	211.36	33.84	2.26	+4.24	+6.50	sungai
27	BH-1480	342+404	0.93	24.30	0.014	0.80	0.80	5.56	3.61	0.65	0.81	-	-	tegalan
28	BH-1481	343+209	0.87	28.60	0.011	0.50	0.50	4.81	2.75	0.57	1.14	-	-	sawah
29	BH-1482	344+741	0.46	37.60	0.011	0.40	0.40	4.81	1.21	0.25	0.63	-	-	sawah
30	BH-1483	344+545	23.40	29.30	0.019	13.00	13.00	6.68	137.24	20.55	1.58	+1.08	+2.66	sungai
31	BH-1486	345+593	20.20	30.40	0.021	5.00	5.00	7.09	64.46	9.09	1.82	+1.11	+2.93	sungai
32	BH-1488	347+842	38.60	18.50	0.022	15.00	15.00	8.06	241.28	29.94	2.00	+0.12	2.12	sungai
33	BH-1489	347+842	31.40	35.60	0.022	12.00	12.00	7.29	155.70	21.35	1.78	-2.23	-0.45	sungai
34	BH-1490	349+259	35.20	19.70	0.022	15.00	15.00	8.06	201.69	25.02	1.67	-0.61	+1.06	sungai
35	BH-1491	350+239	0.87	22.70	0.011	0.50	0.50	4.81	3.21	0.67	1.33	-	-	jalan
36	BH-1494	354+279	2.20	17.50	0.011	2.00	2.00	5.32	10.33	1.94	0.97	-	-	jalan
37	BH-1494a	357+014	2.90	23.40	0.022	0.80	0.80	7.29	13.84	1.90	2.37	-	-	sawah
38	BH-1495	357+285	95.20	11.70	0.020	20.00	20.00	9.96	891.21	89.48	4.47	+0.50	+4.97	sungai
39	BH-1496	359+100	0.45	23.40	0.011	0.50	0.50	4.81	1.63	0.34	0.68	-	-	tegalan,pemukiman
40	BH-1497	359+720	0.35	22.60	0.014	0.50	0.50	5.56	1.43	0.26	0.51	-	-	tegalan
41	BH-1498	360+200	46.20	24.60	0.019	10.00	10.00	7.68	220.89	28.75	2.88	-+0.90	+1.98	sungai
42	BH-1499	361+258	3.02	27.60	0.012	2.00	2.00	5.07	10.12	2.00	1.00	-	-	sawah
43	BH-1503	364+042	93.20	18.60	0.022	15.00	15.00	8.24	563.46	68.35	4.56	-0.98	+3.58	sungai
44	BH-1509	373+600	45.80	12.60	0.021	30.00	30.00	9.47	394.35	41.65	1.39	-4.60	-3.21	sungai

4. Conclusion

1. Starting from the upstream pattern of surface runoff is very small, seeing the conditions around the river there are still many hard plants so that the runoff is very small and the biggest is infltration.
2. The more downstream the runoff occurs, considering that the land use pattern is changing, where around the river, there are smaller plants around the riverbank, which results in greater runoff and a very large volume increase in the river.

References

Hidayat, Acep, Optimization Analysis of Irigation Water Using Linear Program ,*International Journal of R Research in Civil and Mechanical Engineering* (IJRRCME), 2017

Hidayat, Acep, Analysis of Characteristics Soil to Drainage Capacity ,*International Journal of Civil and Structural Enginering Research* ISSN 2348-7607, 2017

Husain, A, 'Flood Modelling by Using HEC-RAS', *Internasional Hournal of Engineering Trends and Technology (IJETT)*, Vol. 50, No. 1, hh. 1-7Munawar, Ahmad. 2015. Traffic Impact Development of Shopping Center Development (Case Study of Plaza Ambarukmo), 2017

Lily Montarcih Limantara, Evaluation of Roughness Constant of River in Synthetic Unit Hydrograph *World Applied Sciences Journal* 7 (9): 1209-1211, 2009 ISSN 1818-4952, 2009

Lily Montarcih Limantara, Suitable Synthetic Unit Hydrograph at Rungu ISSN 2090-4304 *Journal of Basic and Applied Scientific Research* www.textroad.com n Hulu Sub-Watershed, Centre Kalimantan of Indonesia, 2009

Sari, I, Hidayat, A, Indah, N, 'Identification of Renewable Energy Potential in Ciberang River, Cisarua Village, Bogor, West Java', *IOP Conf. Series: Material Science and Engineering* 343, 2018

Biographies

Acep Hidayat, born in Jakarta on 23 June 1975 in Indonesia. He is Head of study program of Civil Engineering of Mercu Buana University. He earned his Bachelor Degree in Civil Engineer from Mercu Buana University in 1994 with the title of his Mitigation structure with SAP 90 Programme. Then he earned his master degree in Civil Engineer with concentration in Water Resources from Institute Tecnhlogy Bandung,ITB in 2019 with the title of thesis is optimation water in Irigation with Fuzzy programa linear. He also teaches several courses such as Hidrology, Mechanical Fluida and Hidrolika and Water Resources Development

Muhammad Isradi., born in Kandangan on 18 August 1972. He is secretary of study program of Civil Engineering of Mercu Buana University. He earned his Bachelor Degree in Civil Engineer from Muhammadiyah Malang University in 1998 with the title of his thesis is One Way Flat Plate Planning at Ratu Plaza Madiun. Then he earned his master degree in Civil Engineer with concentration in Transportation from Brawijaya University in 2001 with the title of thesis is Model Analysis of Family Movement Awakening in Resident Area Sawojajar Malang. He also teaches several courses such as Pavement Planning, Road Geometric Planning, Transportation Planningm and Environmental Engineering.

Dr.-Ing. Joewono Prasetijo, born in Pontianak on 18 October 1969. He earned his Engineer title in Civil Engineering in Tanjungpura University, Pontianak, Indonesia in 1993. He earned his Master of Science in Road and Transportation Engineering from Delft University of Technology, The Netherlands in 1996. He earned his Doctor Ingenieur from Ruhr-Universität Bochum, Germany in 1996. Now he is a Head Of Department of Rail Transportation Engineering Technology, Faculty of Engineering Technology, Univerisity Tun Hussein Onn Malaysia

Rudi Hendrawan is Director Restu CIpta Persada company Water Resources, Indonesia.