



UNTAR
Universitas Tarumanagara



TICATE



UNTAR untuk INDONESIA

Tarumanagara International Conference on the Applications of Technology and Engineering 2020

CERTIFICATE OF ACHIEVEMENT

Prof. Dr. Ir. Agustinus Purna Irawan

for the contribution as

PRESENTER

Paper Title :

Study of flood discharge due to land use and population change of Way Pisang watershed

August 3rd - 4th, 2020

Universitas Tarumanagara, Jakarta

Chairman

Dr. Hugeng, S.T., M.T.

Supported by:

Indexed by:

Tarumanagara International Conference on the Applications of Technology and Engineering 2020

Universitas Tarumanagara, August 3rd - 4th, 2020

Keynote Speakers

1. Prof. Ir. Dr. Lee Sze Wei
(Tunku Abdul Rahman University College, Malaysia)

2. Prof.Dr.Ir. Tresna P. Soemardi, S.E., M.S.
(Universitas Indonesia, Indonesia)

Committees

Honorary Chair :

Prof. Agustinus Purna Irawan, Rector of Universitas Tarumanagara, Indonesia
R. M. Gatot Soemartono, Ph.D, Vice Rector of Universitas Tarumanagara, Indonesia

Editorial Board :

Prof. Alexander Ferrein, University of Applied Sciences Aachen, Germany
Dr.-Ing. A. Ruggeri Toni Liang, Karlsruhe Institute of Technology, Germany
Dr. -Ing Stephan Herzog, TU Kaiserslautern, Germany
Dr. Thomas Marconi, Inside Secure, France
Prof. Yifan Chen, University of Waikato, New Zealand
Dr. Soh Sie Teng , Curtin University, Australia
Dr. Channing, Kun Shan Univeristy, Taiwan
Prof. Mohd Zulkifli Abdullah, Universiti Sains Malaysia, Malaysia
Prof. Zaidi Mohd. Ripin, Universiti Sains Malaysia, Malaysia
Dr. -Ing. Joewono Prasetyo, Universiti Tun Hussein Onn, Malaysia
Dr. Filbert H. Juwono, Curtin University, Sarawak Malaysia
Prof. Tresna P. Soemardi, Universitas Indonesia, Indonesia
Dr. -Ing. Eko Adhi Setiawan, Universitas Indonesia, Indonesia
Prof. Jamasri, Universitas Gadjah Mada, Indonesia
Dr. Bambang Kismono Hadi, Bandung Institute of Technology, Indonesia
Prof. Eko Sedyono, Universitas Kristen Satya Wacana, Indonesia
Prof. Tjokorda Gde Tirta Nindhia, Universitas Udayana, Indonesia
Dr. Rianti Ariobimo, Universitas Trisakti, Indonesia
Dr. Richard Napitupulu, Universitas HKBP Nommensen, Indonesia
Prof. Dyah Erny Herwindiati, Universitas Tarumanagara, Indonesia
Prof. Leksmono Suryo Putranto, Universitas Tarumanagara, Indonesia
Harto Tanujaya, Ph.D., Universitas Tarumanagara, Indonesia
Jap Tji Beng, Ph.D., Universitas Tarumanagara, Indonesia
Lina, Ph.D., Universitas Tarumanagara, Indonesia
Dr. Steven Darmawan, Universitas Tarumanagara, Indonesia
Dr. Widodo Kushartomo, Universitas Tarumanagara, Indonesia

*Currently the entire world struggling the Pandemic Covid-19, we have the plan
that the presentation method from the oral presentation to the virtual
presentation / video meetings*

Organizing Committee :

Chairman

Dr. Hugeng, Universitas Tarumanagara, Indonesia

Program

Dr. Fransisca Iriani Roesmala Dewi, Universitas Tarumanagara, Indonesia.
Mei Ie, SE., M.M, Universitas Tarumanagara, Indonesia

Secretary

Bagus Mulyawan, M.M., Universitas Tarumanagara, Indonesia
Wulan Purnama Sari, M.Si., Universitas Tarumanagara, Indonesia

Proceeding & Scientific Session :

Dr. Hetty Karunia Tunjungsari, Universitas Tarumanagara, Indonesia
Sinta Peramita, SIP, M.A, Universitas Tarumanagara, Indonesia
Mariske Myeke Tampi, S.H., M.H, Universitas Tarumanagara, Indonesia

Treasure & Sponsorship

Wulan Purnama Sari, M.Si., Universitas Tarumanagara, Indonesia
Herlina Budiono SE., MM.,

Design & Publication

Maitri Widya Mutiara, S.Ds., M.M, Universitas Tarumanagara, Indonesia
A.R Johnsen, Universitas Tarumanagara, Indonesia

Call For Paper

Academicians, scientists, researchers, scholars, and students are invited
to submit papers on topics which include, but are not limited to :

- Civil and Enviromental Engineering
- Mechanical Engineering and Technology
- Electrical and Electronic Engineering
- Food and Agriculture Technology
- Materials Sciences and Engineering
- Informatic Engineering & Technologies
- Medical & Health Technology

Registration Fee

International Presenters	USD 180
Indonesian Presenters	IDR 2,000,000
Additional Paper	IDR 1,500,000

Participants

International	USD 75
Indonesian	IDR 600,000
Student	IDR 400,000

Important Dates

Tarumanagara International Conference on the Applications of Technology and Engineering
will be held in Campus I, Universitas Tarumanagara, Jakarta, Indonesia
on August 3rd - 4th, 2020.

Full Paper Submission Deadline	June 30 th , 2020
Acceptance Notification	July 14 th , 2020
Camera Ready (with Payment)	July 21 th , 2020
Conference Date	August 3 rd -4 th , 2020

Contact

Address	: Jl. Let. Jend. S. Parman No.1 Jakarta DKI Jakarta 11440 Indonesia
Contact No	: +622156958751 +6281298022262 (Bagus M) +62815-8433-6033 (Wulan) +62817-752-003 (Hugeng)
Fax Numbers	: +622156958738
Mail Us	: ticate@untar.ac.id
Website	: http://ticate.untar.ac.id

Organized by:



Supported by:

IOP
Publishing

Indexed by:

Scopus

PAPER • OPEN ACCESS

Preface

To cite this article: 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **1007** 011001

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

Preface

On behalf of the organizing committee of the 3rd TICATE 2020, I would like to welcome all delegates to attend this international conference with great pleasure. In the concern of COVID-19 pandemic, this international conference is being held virtually from August 3rd – 4th, 2020 from Campus I of Universitas Tarumanagara at Jl. Letjen S. Parman No. 1, Jakarta 11440, Indonesia. The 3rd TICATE 2020 is organized by Universitas Tarumanagara and technically sponsored by IOP Publishing. The reason why this conference was changed to virtual format is that due to COVID-19 Pandemic, there are travel restrictions and social distancing ruled by almost all governments in the world, including Indonesian government. We still hold partially the physical presentations regarding the healthy protocols suggested by World Health Organization.

Instead of being postponed, we still hold this international conference virtually using Zoom Meeting because this conference is a forum for engineers, academics, practitioners, and students to exchange their experiences and knowledge. Many innovations and developments are being created from the last event to this one. These need to be shared among stake holders in the field of engineering and technology. Therefore, there is an urgent need to publish the newest results of researches in the conference proceedings.

The 3rd TICATE 2020 has attracted many academicians, scientists, engineers, postgraduates and other professionals from many countries. This conference accepted 217 papers from 5 different countries, those are Australia, Taiwan, India, Malaysia, and Indonesia. The aim of the conference is to promote exchange of ideas among engineers, researchers, and scientists active in the related areas of technology and engineering.

Our special thank goes to our Rector, Prof. Dr. Ir. Agustinus Purna Irawan, who has initiate this international conference, to our Plenary Speakers, Prof. Ir. Dr. Lee Sze Wei from Tunku Abdul Rahman University College, Malaysia, and Prof. Dr. Ir. Tresna P. Soemardi, S.E., M.S. from Universitas Indonesia, Indonesia, and to our Invited Speakers, Dr. Ayub Ahmed Janvekar from VIT University, Chennai, India and Prof. Ir. Dr. Mohd Zulkifli Abdullah from Universiti Sains Malaysia, Malaysia. Each keynote speaker will be given 30 minutes to hold his presentation and followed by 15 minutes Q&A session. At the parallel sessions, each presenter is given 15 minutes to present his/her work followed by 10 minutes Q&A session about the related topic. The parallel sessions are opened to all participants. The participants, including presenters at the parallel sessions, are attending this virtual international conference from Indonesia (Jakarta, Bandung, Medan, Yogyakarta, Aceh, Depok, Surabaya, etc.), Kuala Lumpur, Pulau Pinang (Malaysia), Australia, Taiwan, and India.

The virtual format of the 3rd TICATE 2020 still provides very satisfying overall technical quality of the conference, e.g. in presenting the articles. Because we used Zoom Meeting as the platform and a good internet connection to hold this virtual conference, the conference can be attended by about 500 participants from 5 countries without any problem.

We would like also to thank our partner international and national Universities in contributing and participating in this international conference. To all individuals and organizations such as the members of international editorial board, the conference organizers, the reviewers and the authors, for their contribution in making the 3rd TICATE 2020 as a successful international conference and a memorable gathering event. I am also grateful for the support of publication service of IOP Publishing.



We hope that the conference could present you wonderful memories to bring home in addition to new insights and friendship congregated during the event. We truly value your participation and support for the conference. We hope that you will gather many experiences and benefits from this event.

Dr. Hugeng, S.T., M.T. (SMIEEE)

**The 3rd TICATE 2020
Conference Organisation**

INITIATION & ORGANIZING INSTITUTION
Universitas Tarumanagara, Jakarta

Supporting Institution
IOP Publishing

Honorary Chair

Prof. Dr. Agustinus Purna Irawan
R. M. Gatot Soemartono, Ph.D.

Chairman

Dr. Hugeng, S.T., M.T. (SMIEEE)

Secretary

Bagus Mulyawan, M.M.
Wulan Purnama Sari, M.Si.

Program Chair

Dr. Fransisca Iriani Roesmala Dewi
Mei Ie, S.E., M. M.

**Proceedings & Scientific
Session Chair**

Dr. Hetty Karunia Tunjungsari
Sinta Paramita, SIP., M.A.

Mariske Myeke Tampi, S.H., M.H.

Treasurer & Sponsorship

Wulan Purnama Sari, M.Si.
Herlina Budiono, S.E., M.M.

Design & Publication

Maitri Widya Muitar, S.Ds., M.M.
A. R. Johnsen F.

Keynote Speakers

Prof. Ir. Dr. Lee Sze Wei, Tunku Abdul Rahman University College, Malaysia
Prof. Dr. Ir. Tresna P. Soemardi, S.E., M.S., Universitas Indonesia, Indonesia

Invited Speakers

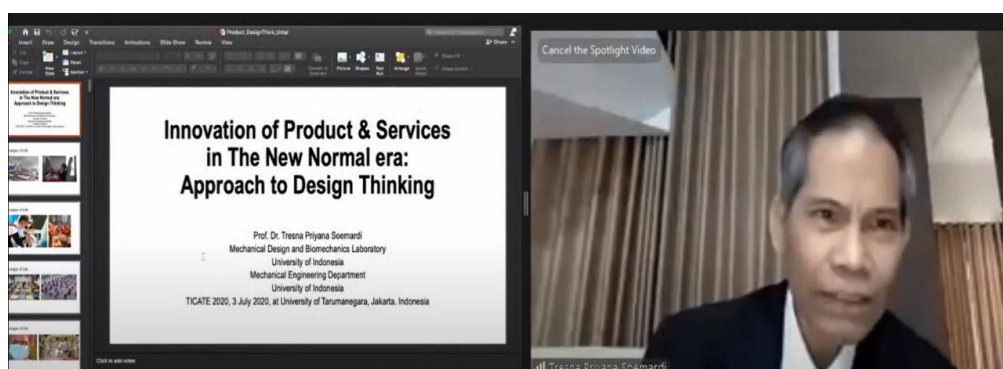
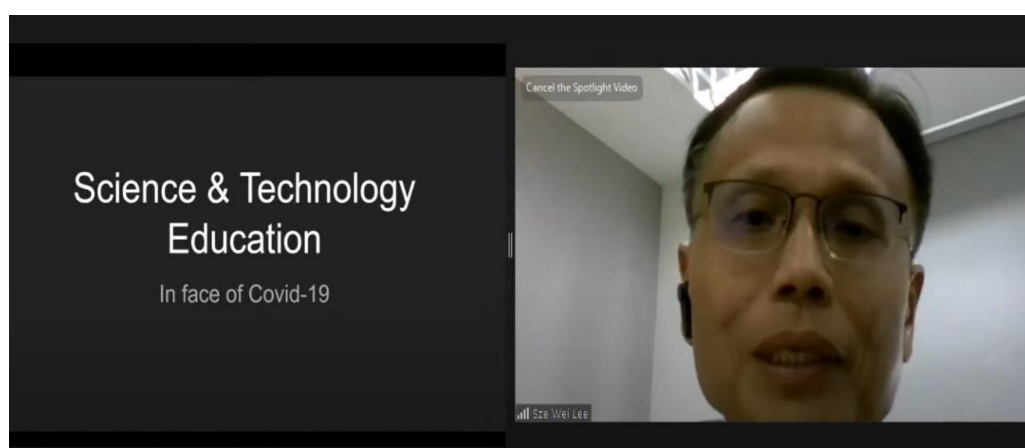
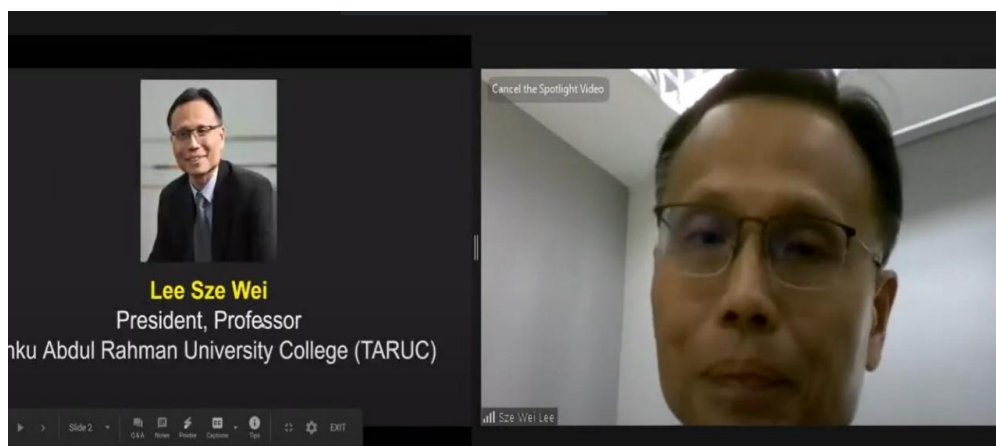
Prof. Ir. Dr. Mohd. Zulkifli Abdullah, Universiti Sains Malaysia, Malaysia
Dr. Ayub Ahmed Janvekar, VIT University, Chennai, India

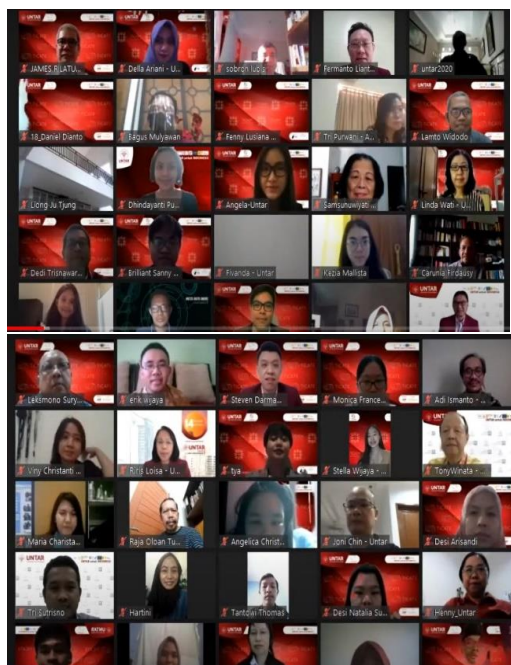
Editorial Board / Reviewers:

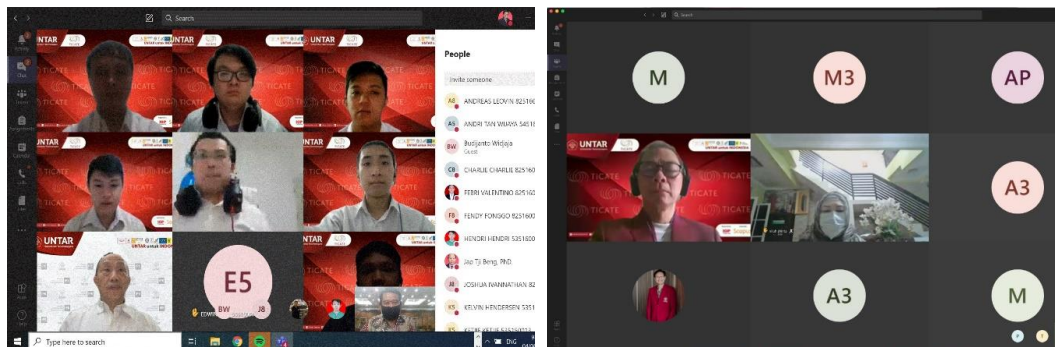
Prof. Dr. rer. nat. Alexander Ferrein, University of Applied Sciences Aachen, Germany
Dr.-Ing. A. Ruggeri Toni Liang, Karlsruhe Institute of Technology, Germany
Dr. -Ing Stephan Herzog, TU Kaiserslautern, Germany
Dr. Thomas Marconi, Inside Secure, France
Prof. Yifan Chen, Ph.D., University of Waikato, New Zealand
Dr. Soh Sie Teng, Curtin University, Australia
Dr. Channing Chuang, Kun Shan University, Taiwan
Prof. Mohd Zulkifli bin Abdullah, Universiti Sains Malaysia, Malaysia
Prof. Zaidi Mohd. Ripin, Universiti Sains Malaysia, Malaysia
Dr. -Ing. Joewono Prasetijo, Universiti Tun Hussein Onn, Malaysia
Dr. Filbert H. Juwono, Curtin University, Sarawak Malaysia
Prof. Dr. Tresna P. Soemardi, Universitas Indonesia, Indonesia
Dr. -Ing. Eko Adhi Setiawan, Universitas Indonesia, Indonesia
Prof. Dr. Jamasri, Universitas Gadjah Mada, Indonesia
Dr. Bambang Kismono Hadi, Bandung Institute of Technology, Indonesia
Prof. Eko Sedyono, Universitas Kristen Satya Wacana, Indonesia
Prof. Tjokorda Gde Tirta Nindhia, Universitas Udayana, Indonesia
Dr. Rianti Ariobimo, Universitas Trisakti, Indonesia

Dr. Richard Napitupulu, Universitas HKBP Nommensen, Indonesia
Prof. Dr. Dyah Erny Herwindiati, Universitas Tarumanagara, Indonesia
Prof. Dr. Leksmono Suryo Putranto, Universitas Tarumanagara, Indonesia
Harto Tanujaya, Ph.D., Universitas Tarumanagara, Indonesia
Jap Tji Beng, Ph.D., Universitas Tarumanagara, Indonesia
Lina, Ph.D., Universitas Tarumanagara, Indonesia
Dr. Steven Darmawan, Universitas Tarumanagara, Indonesia
Prof. Dr. Srikantappa A. S., Cauvery Institute of Technology, Mandya, India
Prof. Yasuyuki Nemoto, Ph.D., Ashikaga University, Japan









PAPER • OPEN ACCESS

Study of flood discharge due to land use and population change of Way Pisang watershed

To cite this article: Lilik Ariyanto and Agustinus Purna Irawan 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **1007** 012171

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

Study of flood discharge due to land use and population change of Way Pisang watershed

Lilik Ariyanto^{1*}, Agustinus Purna Irawan²

¹Department of Civil Engineering, Universitas Tarumanagara, Indonesia

²Faculty of Engineering, Universitas Tarumanagara, Indonesia

*slilikaryanto@saburai.ac.id

Abstract. In some areas in Indonesia, especially those around rivers that develop into urban areas are always faced with the problem of flooding in each rainy season. Soil surface characteristics can affect surface runoff in some areas. In general, human activities will increase along with the rate of population growth which results in increased land conversion activities to meet the economic needs of an area. This study will examine the level of population growth around the Way Pisang watershed in South Lampung Regency in 2007 and 2019, which is expected to influence land use change as a result of activities to meet economic needs, which in turn will have an impact on changes in the drainage coefficient resulting in an increase flood discharge in the watershed. The results of this study can be concluded that from 2007 to 2019, population growth in the Way Pisang Watershed increased by an average of 9.62%. With population growth accompanied by changes in land use where forest area has decreased 81.39%, paddy fields 52.90% and shrubs 85.54%. While the area of settlements increased by 56.10% and dry agricultural land/gardens increased to 147.62%. This resulted in an increase in drainage coefficient of 102.18% which in turn resulted in an increase in flood discharge on average by 28.82%. Keywords: flooding, flow coefficient, population growth.

1. Introduction

In every region in Indonesia, especially those around rivers that develop into urban areas are always faced with the problem of flooding in each rainy season. The condition of land cover will affect the surface flow from rainfall that falls in a watershed in a certain time and eventually flows into the natural drainage channel / river. To be able to anticipate flood events, one of them needs to know the magnitude of drainage coefficient based on land use. The Way Pisang River hydrologically located in the Seputih-Sekampung River Region which is a national strategic River Region. While administratively crossing South Lampung Regency [1-5].

Every year in the rainy season at certain points the Way Pisang River experiences floods with low to moderate intensity and with varying inundation impacts at each flood location. To find out the amount of surface runoff in a watershed (DAS), it is necessary to observe and analyze activities on land use as land cover in a watershed [4], [6-10]]. Each type of land cover has a surface runoff coefficient value which states the estimated amount of rain that will flow on the surface of the land leading to a larger drainage channel. Land cover that has a high level of infiltration will help reduce the surface flow that occurs, and vice versa if the land cover has a low infiltration, then the surface flow that occurs will be even greater.

Flood events in the Way Pisang River Basin are floods that occur every year, on the other hand the growth rate of the population who live in the surrounding areas is increasingly dense, this



is evident from the increasing number of houses and buildings erected around the Way Pisang River.

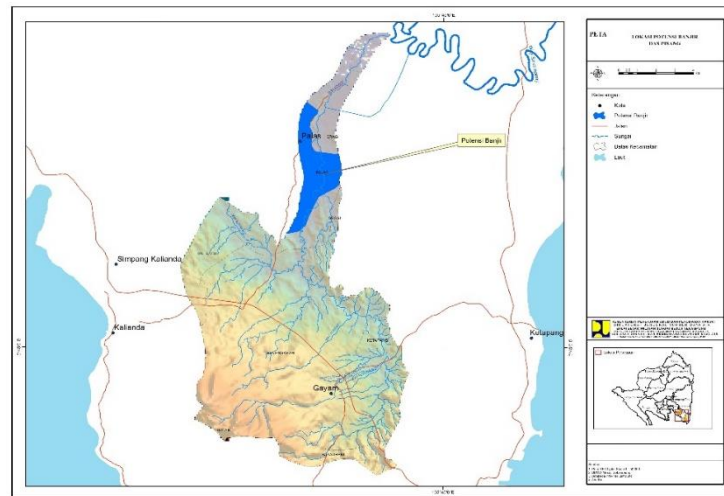


Figure 1. Location of Potential Floods in the Way Pisang Watershed

The objectives to be achieved in this study are knowing the growth rate of the population that affects changes in land use in the Way Pisang Watershed, knowing the changes in the value of the runoff coefficient in the Way Pisang watershed as a result of changes in land cover and knowing changes in flood discharge in the Way Pisang Watershed from 2007 to 2019 [11-14].

2. Method

In carrying out this research will be divided into several stages of activities as follows:

- Analyzing the distribution of the locations of Rainfall Observation Posts around the Way Pisang Watershed;
- Conduct an analysis of the Regional Maximum Rain (Rainfall Area) on the Way Pisang Watershed using the Polygon Thiessen method;
- Calculate the flood discharge of the Way Pisang Watershed design;
- Compile research conclusions on changes in design flood discharge from 2007 to 2019 as a result of changes in land use caused by population growth that is expanding its activities with land conversion activities in the Way Pisang River Basin [11-12].

3. Result and Discussion

- Long of Way Pisang River

Based on the results of data collection on the measurement of the Way Pisang River it is known that the Way Pisang River Length is 27.32 km.

- Area of Way Pisang Watershed

Based on the results of data collection and measurements on the Way Pisang watershed map has an area of 155.34 km².

- Land Use of Way Pisang Watershed

Based on the map of the Way Pisang watershed in 2007 and 2019, the following types of land use can be identified:

Table 1. Way Pisang Watershed Land Use in 2007

No	Land Use	Area (km ²)	%
1	Forest	74.03	47.66
2	Residential	3.44	2.21
3	Rice fields	19.85	12.78
4	Dry land agriculture /gardens	50.8	32.70
5	Thicket	7.22	4.65
Total		155.34	100

Table 2. Way Pisang Watershed Land Use in 2019

No	Land Use	Area (km ²)	%
1	Forest	13.78	8.87
2	Residential	5.37	3.46
3	Rice fields	9.35	6.02
4	Dry land agriculture / gardens	125.79	80.98
5	Thicket	1.04	0.67
Total		155.34	100

d. Population in Way Pisang Watershed

Based on data obtained from the Central Statistics Agency (BPS) in South Lampung Regency, it can be seen data on population in the Way Pisang Watershed as follows:

Table 3. Way Pisang Watershed Population in 2007

No	sub-district	Area (km ²)	Area in Watershed (km ²)	Population
1	Bakauheni	57.13	7.20	806
2	Kalianda	226.06	10.37	5321
3	Ketapang	180.93	4.02	1178
4	Palas	173.56	34.92	12243
5	Penengahan	97.59	97.59	25450
6	Sragi	93.44	1.24	262
Total		155.34		45260

Table 4. Way Pisang Watershed Population in 2019

No	sub-district	Area (km ²)	Area in Watershed (km ²)	Population
1	Bakauheni	57.13	7.20	1133
2	Kalianda	226.06	10.37	6346
3	Ketapang	180.93	4.02	1385
4	Palas	173.56	34.92	13814
5	Penengahan	97.59	97.59	26648
6	Sragi	93.44	1.24	289
Total		155.34		49615

e. Rainfall Observation Post around the Way Pisang Watershed

Based on the results of data collection and analysis there are 4 (four) Rainfall Observation Posts around the Way Pisang Watershed as can be seen in Table 5 below.

Table 5. Rainfall Observation Post around the Way Pisang Watershed

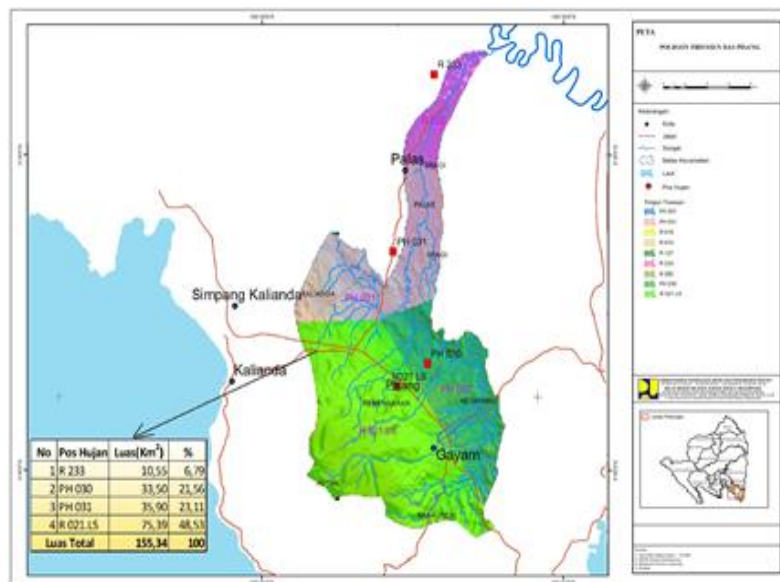
No	Name of Post	LS	BT	Data Availability
1	PH030 - Klaten	5°44'4.5562"	105°41'33.0431"	2008 - 2019
2	PH 031 - Purwodadi	5°40'58.700"	105°40'28.4000"	2008 - 2019
3	R 021 - Pasuruhan	5°44'42.500"	105°40'35.3000"	2008 - 2019
4	R 233 - Palas	5°36'4.1000"	105°41'44.8000"	2008 - 2019

f. Distribution of Rain Observation Posts in the Way Pisang Watershed

Based on the results of GIS analysis data, it can be seen the distribution of Rainfall Observation Post locations in the Way Pisang Watershed as can be seen in Figure 2.

g. Extent of Effect of Rain Observation Post on Way Pisang Watershed

Based on the results of GIS analysis data collection, the area of influence of each Rainfall Observation Post in the Way Pisang Watershed is as follows:

**Figure 2.** Map of the Distribution of Rain Posts in the Way Pisang Watershed**Table 6.** Extent of Effect of Rain Observation Post on Way Pisang Watershed

No	Name of Post	Area (km ²)	% Area
1	PH030 - Klaten	33.5	21.566
2	PH 031 - Purwodadi	35.9	23.111
3	R 021 - Pasuruhan	75.39	48.532
4	R 233 - Palas	10.55	6.792
Total		155.34	100

h. Way Pisang Surface runoff coefficient

Based on the type of land cover in Way Pisang River Basin, it can be seen that the drainage coefficient values in the Way Pisang River Basin are as follows:

Table 7. Runoff Coefficient of Way Pisang Watershed in 2007

No	Land Use	Area (km ²)	%	C	L.C
1	Forest	74.03	47.66	0.02	1.48
2	Residential	3.44	2.21	0.6	2.06
3	Rice fields	19.85	12.78	0.15	2.98
4	Dry land agriculture / gardens	50.8	32.70	0.4	20.32
5	Thicket	7.22	4.65	0.07	0.505
Total		155.34	100		27.35
C Average					0.18

Table 8. Average Flow Coefficient Based on the Way Pisang Land Use Land Use in 2007

Period	Runoff coefficient (C)							Average
	2	5	10	20	25	50	100	
Rain	0.83	0.66	0.58	0.52	0.51	0.47	0.43	
TGL	0.18	0.18	0.18	0.18	0.18	0.18	0.18	
Average	0.50	0.42	0.38	0.35	0.34	0.32	0.30	0.37

Table 9. Runoff Coefficient of Way Pisang Watershed in 2019

No	Land Use	Area (km ²)	%	C	L.C
1	Forest	13.78	8.87	0.02	0.28
2	Residential	5.37	3.46	0.6	3.22
3	Rice fields	9.35	6.02	0.15	1.40
4	Dry land agriculture / gardens	125.79	80.98	0.4	50.32
5	Thicket	1.04	0.67	0.07	0.073
Total		155.34	100		55.29
C rata-rata					0.36

Table 10. Average Flow Coefficient Based on the Way Pisang Land Use Land Use in 2019

Period	Runoff coefficient (C)							Average
	2	5	10	20	25	50	100	
Rain	0.74	0.62	0.56	0.51	0.5	0.47	0.44	
TGL	0.36	0.36	0.36	0.36	0.36	0.36	0.36	
Average	0.55	0.49	0.46	0.43	0.43	0.41	0.40	0.45

i. Design Flood of the Way Pisang Watershed

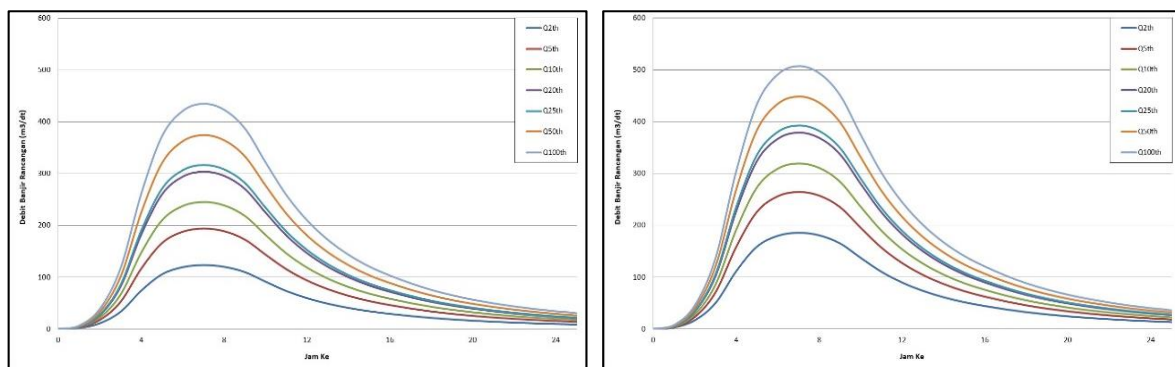
By using the Nakayasu unit hydrograph, it can be seen that the Way Pisang River Design Flood according to the time of return is as follows:

Table 11. Way Pisang Watershed Design Flood in 2007

Period	Design Flood in 2007 (m ³ /s)
KU – 2 year	123.65
KU – 5 year	193.58
KU – 10 year	245.48
KU – 20 year	303.72
KU – 25 year	316.93
KU – 50 year	374.22
KU – 100 year	434.98

Table 12. Way Pisang Watershed Design Flood in 2019

Period	Design Flood in 2019 (m ³ /s)
KU – 2 year	185.34
KU – 5 year	264.35
KU – 10 year	319.61
KU – 20 year	379.22
KU – 25 year	392.41
KU – 50 year	448.70
KU – 100 year	506.91

**Figure 3.** Way Pisang Watershed Design Flood in 2007 and 2019

4. Conclusion

Based on the results of the analysis and calculations that have been carried out in this study, the following conclusions can be obtained: The population in the Way Pisang Watershed from 2007 to 2019 increased by 4,355 inhabitants (9.62%), while the type of land cover experienced a significant change where forest area decreased 81.39%, settlement area increased 56.10%, paddy area experienced 52.90% decrease, dry land/garden area increased 147.62% and shrub land decreased by 85.54%, with the land cover condition causing drainage coefficient to increase by 102.18% so that it affected the amount of design flood discharge which experienced an average increase of 28.82 %.

References

- [1] Balai Besar Wilayah Sungai Mesuji Sekampung, 2018, *Way Pisang River Border Study*.
- [2] Triatmodjo, B., 2013, *Hidrologi Terapan*. (Beta Offset: Yogyakarta)
- [3] Balai Besar Wilayah Sungai Mesuji Sekampung, 2015, *Search and Audit of the Way Pisang*, (PT. Prana Kurnia Pratama).
- [4] Anggun Citra Putrinda, 2012, *Surface Flow Coefficient in Sekampung watershed in Lampung Province in 1995-2010: Lampung*
- [5] Balai Besar Wilayah Sungai Mesuji Sekampung, 2015, *Pattern of Water Resources Management for the Seputih Sekampung River Basin*.
- [6] Indarto, 2016, *Hidrologi*. (Bumi Aksara: Jakarta).
- [7] M. Ridhwan. 2012, *Modeling of Flood Areas in Jambi City: Jambi*
- [8] Iin Widiatni Widyaningsih, 2008, *Influence of Land Use Change in the Keduang Sub-Watershed in Hydrological Aspects: Wonogiri*

- [9] Hartono Himawan, 2015, *Alternative Management of Deli River Flood Using the Water Tunnel Model: Medan*
- [10] Dessy Rosliani, dkk, 2013, *Study of Channel Design Optimization in the Context of Flood Control in Upper Citarum: West Java*
- [11] M. Rogger, M. Agnoletti, G. Bloschl, 2017, *Land use change impacts on floods at the catchment scale: Challenges and opportunities for future research.* (AGU Publications).
- [12] P. M. Kundu, L. O. Olang, 2011, *The impact of land use change on runoff and peak flood discharges for the Nyando River in Lake Victoria drainage basin, Kenya.* (WIT Transactions on Ecology and The Environment, Vol 153, © 2011 WIT Press).
- [13] Suyono, T., Pranoto, W.A., Irawan, A.P. 2019 *IOP Conference Series: Materials Science and Engineering* **508**-1-012035
- [14] Benjamin Rabb, 2011, *Integrated modelling of climate and land use change impacts on groundwater flooding risk in a Chalk catchment.* (UMI U516908 Published by ProQuest LLC 2013. Copyright in the Dissertation held by the Author. Microform Edition © ProQuest LLC)



Source details

IOP Conference Series: Materials Science and Engineering

Scopus coverage years: from 2009 to Present

ISSN: 1757-8981 E-ISSN: 1757-899X

Subject area: [Engineering: General Engineering](#) [Materials Science: General Materials Science](#)

Source type: Conference Proceeding

[View all documents >](#) [Set document alert](#) [Save to source list](#) [Source Homepage](#)

CiteScore 2020

0.7



SJR 2019

0.198



SNIP 2020

0.484



[CiteScore](#) [CiteScore rank & trend](#) [Scopus content coverage](#)

Improved CiteScore methodology

CiteScore 2020 counts the citations received in 2017-2020 to articles, reviews, conference papers, book chapters and data papers published in 2017-2020, and divides this by the number of publications published in 2017-2020. [Learn more >](#)

CiteScore 2020

$$0.7 = \frac{49,696 \text{ Citations 2017 - 2020}}{68,224 \text{ Documents 2017 - 2020}}$$

Calculated on 05 May, 2021

CiteScoreTracker 2021

$$0.7 = \frac{44,231 \text{ Citations to date}}{62,141 \text{ Documents to date}}$$

Last updated on 04 June, 2021 • Updated monthly

CiteScore rank 2020

Category	Rank	Percentile
Engineering		
General Engineering	#228/297	23rd
Materials Science		
General Materials Science	#381/455	16th

[View CiteScore methodology >](#) [CiteScore FAQ >](#) [Add CiteScore to your site](#)

About Scopus

[What is Scopus](#)
[Content coverage](#)
[Scopus blog](#)
[Scopus API](#)
[Privacy matters](#)

Language

[日本語に切り替える](#)
[切换到简体中文](#)
[切换到繁體中文](#)
[Русский язык](#)

Customer Service

[Help](#)
[Contact us](#)