QSWAT IDENTIFICATION FOR WATERSHED MANAGEMENT MODEL
IN KAMUNDAN WATERSHED, PAPUA BARAT, INDONESIA

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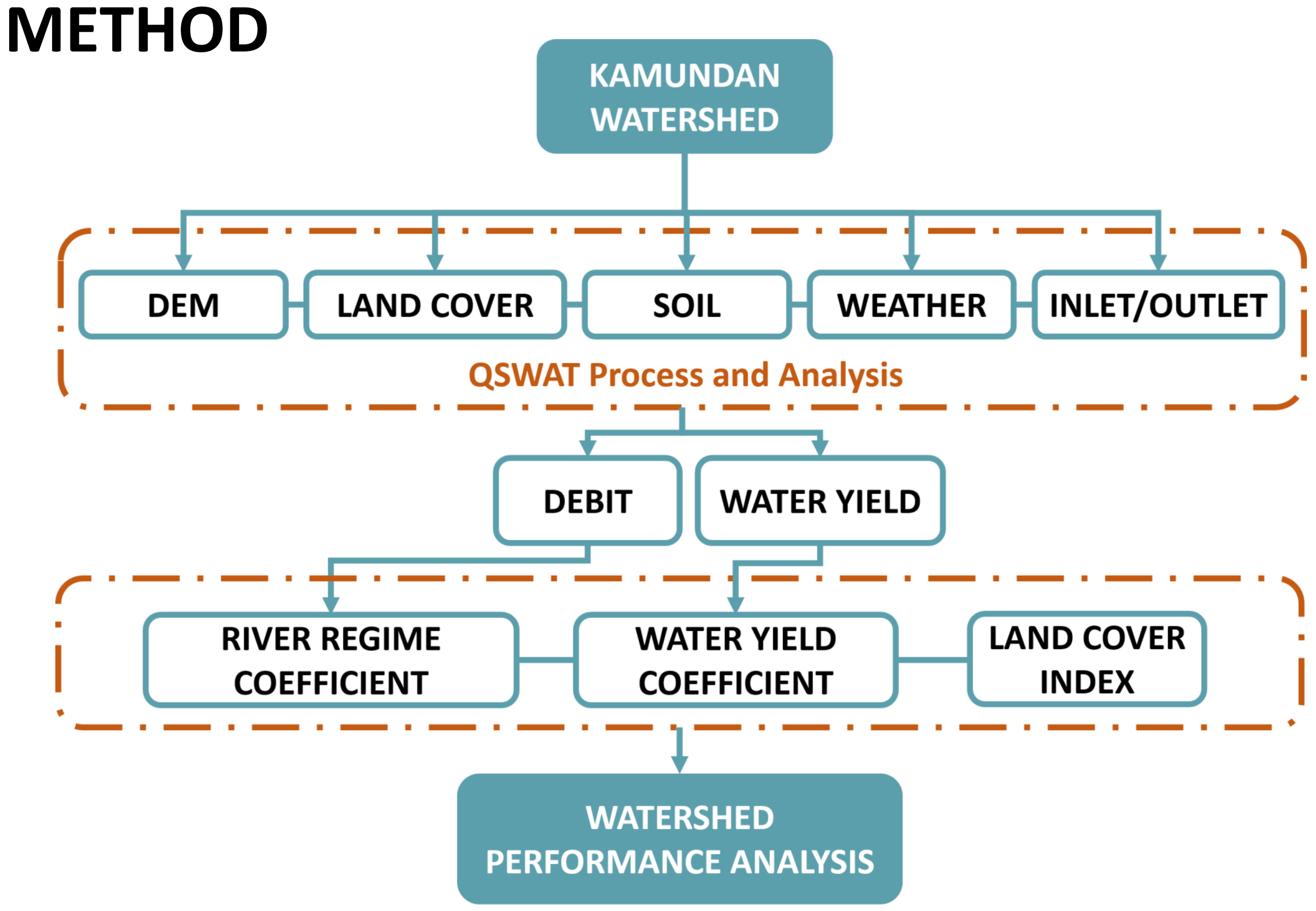
INTRODUCTION

Kamundan Watershed is one of the greatest watersheds in Papua Barat Province and has become Indonesia's National Strategic River Regions. It covers around 586,579 ha area which dominated by 79% primary forest and 13% wetland. Besides, Indonesia's government has planned to escalate investment in Papua Barat and its high potential to drive ecosystem and land cover change. Spatial plan along Kamundan Watershed was planned into cultivation regions for 52% that was allocated for production forest/logging 24%, plantation 5%, farm 14%, settlement 2%, and other needs 7% from the watershed total area. This study proposes a watershed assessment model for identifying a set of parameters using QSWAT output and formulating it into a watershed management model. The simulation has been developed using rainfall, land cover, river network, DEM, and soil type data. Parameterization and performance scoring have been assigned for the basis of parameter impact on output. The analysis and methodology of this study can be useful for planning, monitoring, and evaluation of watersheds..

METHOD



- River Regime Coefficient (RRC)

$RRC = \frac{Qmax}{Qmin}$ where: Qmax (m^3/s) = Maximum daily year average debit

Qmin (m^3/s) = Minimum daily year average debit

Source: Keputusan Menteri Kehutanan No 52/Kpts-II/2001

Table 1. RRC classification and scoring

No.	RRC Value	Class	Score
1	<50	Good	1
2	50-120	Fair	3
3	>120	Poor	5

- Water Yield Coefficient (WYC)

$WYC = \frac{WY}{PRE}$ Where: WY (mm) = Water Yield

PRE (mm) = Precipitation

Source: Suxiao Li, 2018

$WYCnorm = \frac{WYC - WYCmin}{WYCmax - WYCmin}$ Where: WYCnorm = Normalized WYC

WYC (mm) = Water Yield Coefficient value

WYC max (mm) = maximum value of WYC

WYC min (mm) = minimum value of WYC

Source: Xiaoqing Shi, 2017.

Table 2. WYC classification and scoring

No.	WYC Value	Class	Score
1	1-0	Good	1
2	0	Fair	3
3	0-(-1)	Poor	5

- Land Cover Index (LCI)

$LCI = \frac{LVP}{LDAS}$ Where: LVP (Ha) = Permanent vegetation coverage area

LDAS (Ha) = watershed or sub basin coverage area

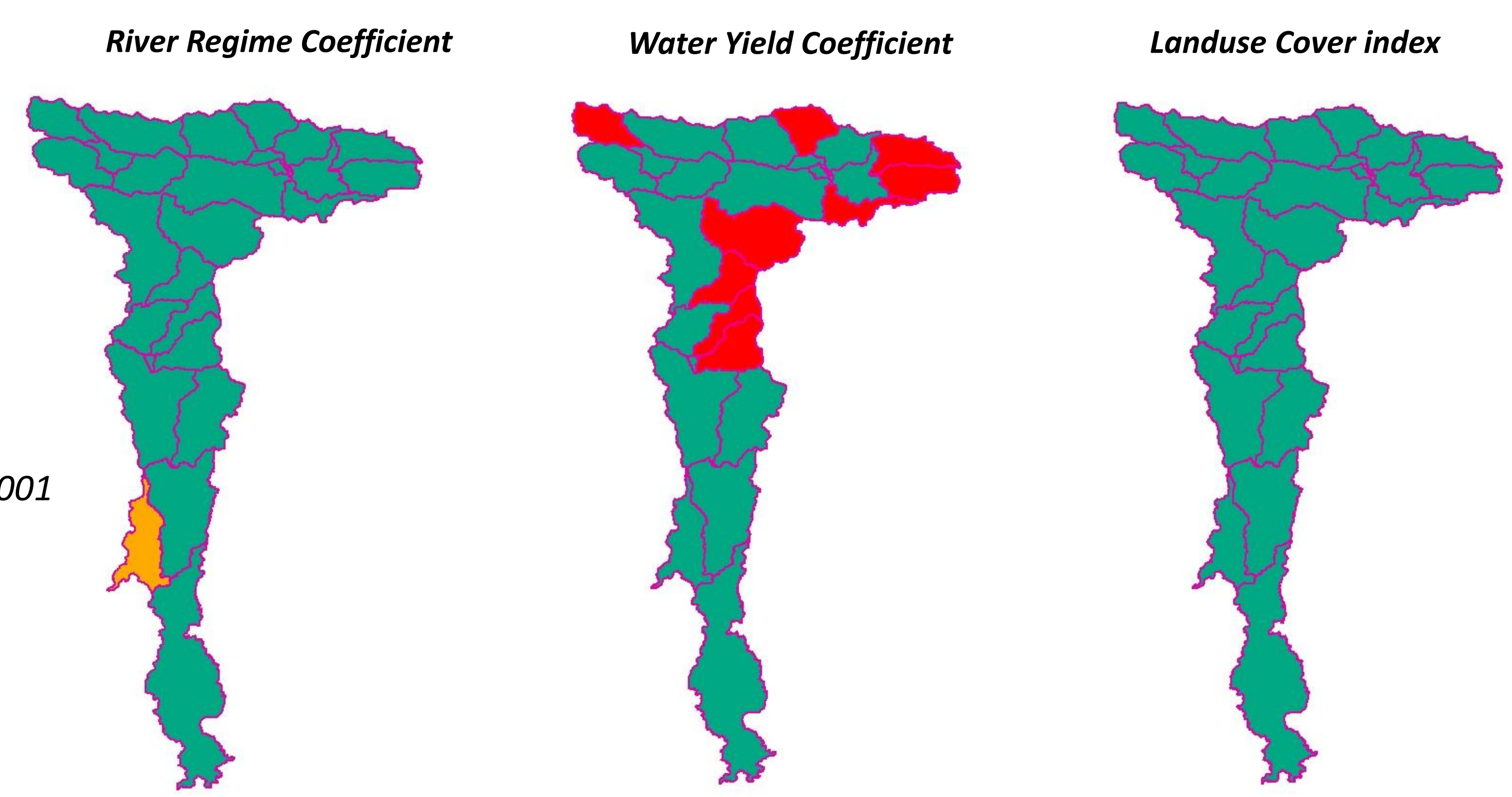
Source: Keputusan Menteri Kehutanan No 52/Kpts-II/2001

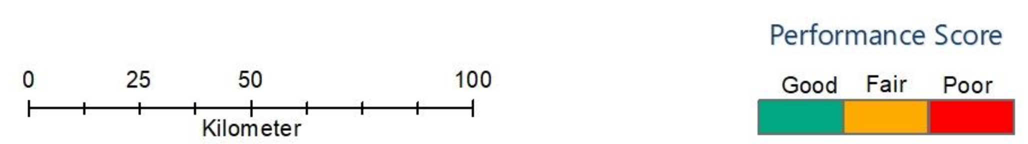
Table 3. LCI classification and scoring

No.	LCI Value	Class	Score
1	>75%	Good	1
2	30-75%	Fair	3
3	<30%	Poor	5

RESULT

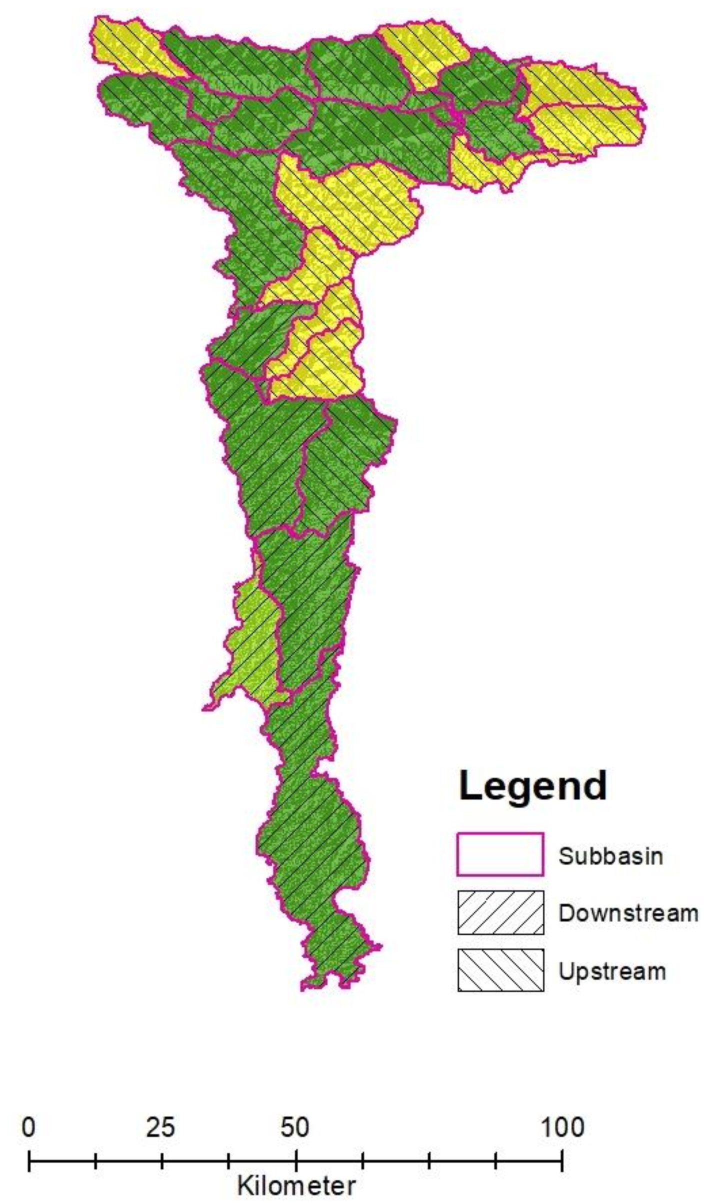
Indexing and Classification





Parameterization	Good	Fair	Poor
RRC	<50	50-120	>120
WYC	1-0	0	0-(-1)
LCI	>75%	30%-75%	<30%

Watershed Performance Analysis



WYC	RRC					LCI
		1	3	5		
	1	3	5	7	1	
	3	7	9	11	3	
	5	11	13	15	5	

Conservation Prioritization

High — Low

Our research comes up with an option to analyze the performance of each sub-basin based on RRC, WYC, and LCI. The main concept is to facilitate rapid response to hydrological change with spatial analysis tools. Every value that we have calculated was overlaid and spatially joined. From the three new parameters (RRC, WYC, and LCI), we summarized and made a new classification.

The best option to manage HRU's in every sub-basin is to conserve its original nature. Then we name it as a Conservation Prioritization Class. The higher value is for well balance ecology and environment of a sub-basin where its function is vital for a whole system, otherwise, a lower value is for isolated sub-basin that has a low contribution to the watershed system.

Particularly, Kamundan Watersheds' performance tends to approach the higher value of the class. Which means it would be better to conserve the watersheds. If any stakeholder intends to change or develop the watershed, it would be better to choose the sub-basin with lower performance and considering spatial and hydrology principles.

CONCLUSION

The major findings of this review can be summarized as follows:

•QSWAT is able to simulates debit and water yield in a holistic view within Kamundan watershed

•QSWAT is able to provide spatial information due to its location, pattern, and database analysis.

•We come up with a watershed management model in a performance analysis model based on SWAT output data.

These findings lead to several recommendations:

•A conceptual framework to manage a watershed.

•This study will lead to further study to standardize the threshold for every parameter.

•This study could advise sustainable development from a spatial perspective.

Keputusan Menteri Kehutanan No 52/Kpts-II/2001

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Shi, X., Qin, T., Yan, D., Sun, R., Cao, S., Jing, L., Wang, Y., Gong, B. 2017. Analysis of Change in the Water Yield Coefficient over the Past 50 Years in the Huang-Huai-Hai River Basin, China. Hindawi: Advances in Meteorology. https://doi.org/10.1155/2018/6302853