

Watershed Prioritization of Kaeng Lawa Sub-Watershed, Khon Kaen Province using the Morphometric and Land-Use Analysis: A Case Study of Heavy Flooding Caused by Tropical Storm Podul

Katawut Waiyasusri ¹, and Srilert Chotpantarat ^{2,3*}

¹ Geography and Geo-Informatics Program, Faculty of Humanities and Social Sciences, Suan Suandha Rajabhat University, 1 U-Thong Nok Road, Dusit, Bangkok 10300 Thailand; katawut.wa@ssru.ac.th

² Department of Geology, Faculty of Science, Chulalongkorn University, Phayathai Road, Pathumwan, Bangkok 10330, Thailand

³ Research Unit Control of Emerging Micropollutants in Environment, Chulalongkorn University, Bangkok, Thailand

* Correspondence: Srilert.C@chula.ac.th

Table S1. Geometry parameters of the KLs area.

KL	Area	P	Lb	Lu	Nu	Rl	Rb	RHO
KL01	222.92	81.12	21.57	226.40	129.00	1.00	0.99	1.01
KL02	90.86	53.92	15.80	86.47	45.00	1.01	0.98	1.03
KL03	40.76	36.45	11.60	40.44	26.00	1.03	0.96	1.06
KL04	29.82	32.04	8.47	33.25	18.00	1.03	0.95	1.09
KL05	76.84	52.60	15.11	84.39	46.00	1.01	0.98	1.03
KL06	45.20	50.97	11.95	42.92	23.00	1.02	0.96	1.07
KL07	65.35	57.71	13.20	60.68	34.00	1.02	0.97	1.05
KL08	108.10	70.94	18.92	100.02	55.00	1.01	0.98	1.03
KL09	85.04	59.02	15.97	86.01	39.00	1.01	0.98	1.04
KL010	323.51	140.47	40.06	315.59	158.00	1.00	0.99	1.01
KL011	162.27	87.52	27.73	169.97	84.00	1.01	0.99	1.02

Table S2. Areal morphometric parameters of the KLs area.

KL	Dd	T	Fs	Re	Rc	Ff	Lg
KL01	1.02	1.59	2.95	3.63	0.43	0.95	0.48
KL02	0.95	0.83	7.23	2.71	0.39	0.89	0.53
KL03	0.99	0.71	16.12	2.12	0.39	0.79	0.50
KL04	1.11	0.56	22.03	2.12	0.36	0.92	0.45
KL05	1.10	0.87	8.55	2.55	0.35	0.84	0.46
KL06	0.95	0.45	14.54	2.19	0.22	0.80	0.57
KL07	0.93	0.59	10.05	2.51	0.25	0.90	0.59
KL08	0.93	0.78	6.08	2.70	0.27	0.79	0.60
KL09	1.01	0.66	7.73	2.60	0.31	0.82	0.49
KL010	0.98	1.12	2.03	3.21	0.21	0.20	0.61

KL011 1.05 0.96 4.05 2.73 0.27 0.21 0.47

Table S3. Relief morphometric parameters of the KLs area.

KL	Rr	Ihyp	Rn
KL01	0.004	0.90	0.25
KL02	0.004	1.06	0.23
KL03	0.006	1.10	0.23
KL04	0.005	2.25	0.21
KL05	0.006	0.95	0.27
KL06	0.008	0.91	0.24
KL07	0.008	0.86	0.24
KL08	0.004	1.14	0.21
KL09	0.005	1.00	0.24
KL010	0.003	0.84	0.07
KL011	0.003	1.03	0.25

Table S4. Sensitivity index of Watershed Prioritization in KLs output to input parameters.

Sub-watershed	Sensitivity index ranking												
	Drainage system				Conformation analyst					Terrain analyst			
	Rl	Rb	RHO	Dd	T	Fs	Re	Rc	Ff	Lg	Rr	Ihyp	Rn
KL01	0.49	0.49	0.49	0.68	0.00	1.03	1.11	0.00	0.44	0.05	0.20	0.34	0.00
KL02	0.23	0.28	0.17	0.06	0.06	0.06	0.00	0.06	0.17	0.06	0.11	0.11	0.00
KL03	0.57	0.16	0.17	0.08	0.00	0.17	0.00	0.08	0.33	0.00	0.08	0.08	0.00
KL04	0.72	0.00	0.00	0.08	0.00	0.08	0.16	0.00	0.16	0.00	0.00	0.00	0.00
KL05	0.21	0.36	0.36	0.07	0.00	0.28	0.07	0.07	0.15	0.07	0.14	0.07	0.00
KL06	0.57	0.07	0.29	0.00	0.00	0.00	0.00	0.14	0.14	0.00	0.14	0.15	0.00
KL07	0.39	0.19	0.32	0.00	0.00	0.32	0.13	0.00	0.07	0.00	0.13	0.26	0.00
KL08	0.12	0.42	0.36	0.06	0.00	0.12	0.00	0.12	0.06	0.06	0.00	0.18	0.00
KL09	0.31	0.25	0.12	0.06	0.00	0.18	0.00	0.12	0.30	0.00	0.18	0.00	0.00
KL10	0.00	0.55	0.18	0.48	0.00	1.00	1.02	0.06	0.00	0.00	0.12	0.00	0.00
KL11	0.06	0.50	0.12	0.42	0.00	0.00	1.01	0.00	0.12	0.00	0.12	0.12	0.00

Table S5 Matrix of land-use changes in KLS area, 2002–2017 (km²)

Table 35: National land-use changes in 2002-2017 (km ²)																					
		Land-use 2017																			
	LU	A1	A201	A202	A203	A204	A302	A304	A4	A5	A7	A9	F	M1	M2	M3	M4	M5	M7	U	W
Land-use 2002	A1	495.83	2.48	0.01	37.81	43.16	0.72	7.52	2.78	0.33	1.89	1.62	5.69	20.25	12.17	0.34	0.69	0.36	0.01	26.64	15.24
	A201	1.69	0.00	0.00	0.09	0.25	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01
	A203	0.82	0.00	0.00	1.77	5.95	0.03	0.18	0.02	0.00	0.01	0.00	0.04	0.00	0.00	0.14	0.00	0.00	0.00	0.27	0.09
	A204	51.23	2.30	0.04	61.61	108.79	1.82	11.82	4.89	0.05	0.97	0.08	5.09	9.74	0.23	0.67	0.09	0.00	0.00	7.43	1.97
	A304	0.08	0.00	0.00	0.45	0.70	0.00	0.17	0.00	0.00	0.00	0.00	0.94	0.10	0.00	0.00	0.04	0.00	0.00	0.63	0.07
	A4	0.22	0.08	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.07	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.81	0.00
	F	25.02	0.90	0.00	7.84	14.72	0.54	10.55	1.08	0.02	0.60	0.05	20.18	11.70	0.14	0.67	0.25	0.00	0.04	4.36	1.36
	M2	16.74	0.23	0.06	2.37	4.93	0.10	2.22	0.52	0.01	0.16	0.18	3.57	8.26	7.30	0.15	0.01	0.00	0.04	4.24	3.59
	U	15.39	0.36	0.00	2.18	2.45	0.11	0.65	0.20	0.05	0.10	0.07	1.51	1.58	0.15	0.00	0.00	0.00	0.01	36.37	1.66
	W	7.24	0.01	0.00	0.42	0.09	0.00	0.11	0.04	0.02	0.01	0.39	0.29	1.65	11.71	0.00	0.05	0.99	0.00	3.22	47.08

Table S6 Matrix of proportion land-use changes in KLS area, 2002–2017

Land-use 2017																					
Land-use 2002	LU	A1	A201	A202	A203	A204	A302	A304	A4	A5	A7	A9	F	M1	M2	M3	M4	M5	M7	U	W
	A1	0.73	0.00	0.00	0.06	0.06	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.03	0.02	0.00	0.00	0.00	0.00	0.04	0.02
	A201	0.82	0.00	0.00	0.04	0.12	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	A203	0.09	0.00	0.00	0.19	0.64	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.01
	A204	0.19	0.01	0.00	0.23	0.40	0.01	0.04	0.02	0.00	0.00	0.00	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.03	0.01
	A304	0.03	0.00	0.00	0.14	0.22	0.00	0.05	0.00	0.00	0.00	0.00	0.30	0.03	0.00	0.00	0.01	0.00	0.00	0.20	0.02
	A4	0.17	0.06	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.05	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.61	0.00
	F	0.25	0.01	0.00	0.08	0.15	0.01	0.11	0.01	0.00	0.01	0.00	0.20	0.12	0.00	0.01	0.00	0.00	0.00	0.04	0.01
	M2	0.31	0.00	0.00	0.04	0.09	0.00	0.04	0.01	0.00	0.00	0.00	0.07	0.15	0.13	0.00	0.00	0.00	0.00	0.08	0.07
	U	0.24	0.01	0.00	0.03	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.58	0.03
	W	0.10	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.16	0.00	0.00	0.01	0.00	0.04	0.64