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## Supplementary material

### **Soil erosion analysis by RUSLE and sediment yield models using remote sensing and GIS in Kelantan state, Peninsular Malaysia**

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**Table S1. Details of all rainfall stations with their annual rainfall and soil loss.**

Station No.	Station Name	Lat. (°N)	Long. (°E)	Elev. (m)	No. of erosive events	Annual rainfall (mm)	Soil loss (t ha <sup>-1</sup> y <sup>-1</sup> )
S1	Brook	4.68	101.48	624	1612	2143	11389
S2	Lojing	4.60	101.40	1707	1853	2593	19323
S3	Blau	4.77	101.76	224	1294	1885	16134
S4	Ldg. Mentara	4.76	102.02	173	1726	2429	18941
S5	Upper Chiku	4.77	102.17	214	1801	3062	24523
S6	Gunung Gagau	4.76	102.66	976	2007	4261	33822
S7	Hau	4.81	101.57	689	1823	2300	11104
S8	Redip	4.82	101.98	371	1801	2429	16580
S9	Gua Musang	4.88	101.97	92	1666	2338	16742
S10	Chabai	5.00	101.58	372	1536	2362	14507
S11	Lebir, paloh	5.21	102.30	84	1717	2641	20166
S12	Aring	4.94	102.35	99	1673	2679	18696
S13	Gemala	5.10	101.76	147	1431	1926	14282
S14	B. Polis Bertam	5.15	102.05	67	1593	2071	13930
S15	Gob	5.25	101.66	274	1810	2534	16444
S16	Pasik	5.21	101.76	166	1686	2248	15075
S17	Dabong	5.38	102.02	41	1652	2358	16105
S18	Kuala Gris	5.38	102.08	115	1680	2495	18159
S19	Laloh	5.31	102.28	44	1633	2421	17203
S20	Kuala Balah	5.45	101.91	64	288	2988	23431
S21	Lepan Kabu	5.46	102.23	66	1639	2582	16813
S22	Keb.L. Bungor	5.56	101.89	39	1772	3211	25195
S23	Ulu Sekor	5.56	102.01	102	1794	3068	24096
S24	Kuala Nal	5.57	102.16	35	1630	2788	20451
S25	Men. T. K. Krai	5.53	102.20	38	1640	2758	19508
S26	Kerilla	5.68	102.11	32	1798	3208	25306
S27	Chenulang	5.60	102.29	75	167	3575	31300
S28	Gemang Bahru	5.76	101.87	53	1893	3606	33450
S29	Jeli	5.70	101.84	107	1818	3263	22616
S30	Durian Daun	5.78	101.97	25	1837	3552	31200
S31	Jps Machang	5.79	102.22	10	1640	3429	29351
S32	Telusan	5.76	102.32	64	1734	3420	27415
S33	Wakaf Raja	5.77	102.43	29	1704	3415	27850
S34	P. B. Merbau	5.81	102.02	41	1756	3478	32253
S35	Bendang Nyior	5.84	102.07	11	1650	3187	28213
S36	I.B.Tiga Daerah	5.86	102.34	16	663	3244	27035
S37	Cherang Tuli	5.82	102.36	28	1648	3327	27112
S38	P. Pasir Puteh	5.83	102.42	9	1476	2921	53318
S39	Tandak	5.92	102.03	6	1712	4571	65356
S40	I.B. Uban	5.97	102.14	20	1650	3030	24238
S41	P. Melor	5.96	102.29	8	1541	3102	23692
S42	Serdang	5.94	102.34	3	586	3167	24336
S43	Tok Ajam	5.90	102.38	3	1585	3236	24397

S44	R. P.Repek	6.01	102.10	21	1583	3151	27033
S45	R. K. Meranti	6.10	102.11	17	1498	3151	22945
S46	P. Kubor	6.02	102.18	19	1596	3168	27812
S47	Peringat	6.02	102.29	13	1822	2993	22023
S48	C. Tiga Pendek	6.04	102.22	21	1535	2824	23020
S49	Binjai	6.08	102.30	7	1563	3045	22745
S50	Teratak Pulau	6.01	102.36	8	1553	3086	22779
S51	Kuala Jambu	6.15	102.10	3	1372	2635	22548
S52	Kg. Kebakat	6.15	102.21	19	591	2942	25035
S53	C. Ampat	6.16	102.16	6	1564	2707	20599
S54	K. Tumpat	6.20	102.17	7	591	2601	20343
S55	Kota Bharu	6.11	102.26	8	1400	2156	14295

**Table S2. The relationship between LULC classes and estimated soil loss categories in terms of area. LULC area are in km<sup>2</sup> and estimated soil loss category area in percentage**

Df, dense forest; Fo, forest; Mx, mixed horticulture; Uc, uncultivated land; Pa, palm oil; Sc, scrub; St, settlement area; Wb, waterbody; Ws, wasteland

Estimate soil loss categories range are in t ha<sup>-1</sup> y<sup>-1</sup>

Watershed	LULC classes									Estimated soil loss				
	Df	Fo	Mx	Pa	Uc	Sc	St	Wb	Ws	0-100	100-200	200-300	300-400	>400
W1	269.11	4.86	1.51	-	21.31	8.61	1.72	0.65	-	57.81	15.38	7.09	3.86	15.86
W2	221.53	2.94	5.63	-	1.26	0.05	0.62	0.66	-	51.94	18.03	9.03	5.17	15.83
W3	91.89	7.55	1.53	-	2.82	1.93	-	0.25	-	67.45	14.50	5.92	2.89	9.24
W4	6.54	6.88	-	-	0.29	-	0.00	0.39	-	69.53	15.48	5.56	2.40	7.02
W5	98.39	0.09	-	-	7.23	-	0.74	0.26	-	61.77	15.59	6.60	3.49	12.54
W6	59.07	-	-	-	0.16	-	-	0.12	-	35.08	0.40	0.42	0.47	63.64
W7	49.74	1.29	0.07	-	4.04	3.84	0.37	0.75	-	56.96	15.45	7.33	4.32	15.94
W8	239.41	6.80	4.17	1.95	76.65	54.33	3.95	2.94	-	59.25	10.15	4.55	2.94	23.12
W9	177.20	-	-	-	3.03	-	-	0.90	-	52.83	18.17	8.84	5.23	14.94
W10	293.16	-	-	-	3.82	-	-	0.70	-	42.64	15.84	10.73	6.60	24.20
W11	142.35	13.33	21.81	1.35	47.04	69.14	4.06	1.37	0.74	54.05	10.46	5.63	3.62	26.24
W12	51.47	0.87	1.84	0.76	11.33	23.82	1.03	0.15	-	55.81	11.37	6.72	4.33	21.77
W13	64.40	-	-	14.59	1.13	0.22	-	-	-	61.42	16.24	7.29	3.82	11.24
W14	14.00	-	0.29	3.50	4.10	23.76	1.44	0.57	-	44.92	9.19	6.70	5.59	33.61
W15	90.38	-	-	-	0.49	1.32	-	0.92	-	48.50	18.77	9.82	5.85	17.06
W16	78.18	-	0.09	5.44	1.75	1.49	-	0.55	-	60.43	15.60	7.03	3.88	13.05
W17	100.44	23.80	7.69	24.18	15.92	8.09	6.70	0.67	-	56.41	15.27	7.94	4.48	15.91
W18	57.40	197.50	25.30	72.24	67.03	11.75	9.13	1.85	-	64.31	11.22	5.24	3.11	16.13
W19	139.47	-	-	-	-	-	-	0.21	-	60.72	16.01	7.68	4.05	11.54
W20	-	0.23	0.27	-	0.59	5.03	2.49	0.15	-	49.65	12.70	8.87	5.55	23.25
W21	-	2.08	0.37	0.94	0.88	7.02	3.76	0.19	-	51.81	11.75	7.84	5.42	23.19
W22	470.53	-	-	0.41	0.03	-	-	1.86	-	59.32	16.25	7.60	4.32	12.50
W23	232.76	17.80	8.81	112.45	44.55	15.41	2.72	1.76	-	58.52	13.76	6.73	3.93	17.06
W24	191.89	45.82	11.49	113.86	43.99	53.54	4.96	3.48	-	58.33	12.99	6.69	4.21	17.78
W25	18.37	31.60	4.27	4.27	0.37	7.58	0.52	0.28	-	66.24	13.13	5.57	2.79	12.27

**Table S2.** (continued)

Watershed	LULC classes									Estimated soil loss				
	Df	Fo	Mx	Pa	Uc	Sc	St	Wb	Ws	0-100	100-200	200-300	300-400	>400
W26	39.04	15.00	3.99	25.10	6.09	24.65	1.13	0.72	-	59.40	13.09	7.03	4.33	16.14
W27	354.72	-	-	-	2.88	-	-	1.87	-	48.87	18.62	9.43	5.69	17.39
W28	20.06	-	-	-	-	1.03	-	0.37	-	53.94	17.63	8.86	4.85	14.73
W29	18.25	-	-	-	-	0.36	-	0.79	-	62.51	16.77	7.39	3.64	9.70
W30	239.24	-	-	-	1.59	-	-	1.02	-	42.45	16.00	10.14	6.74	24.67
W31	355.37	-	-	-	2.87	-	-	1.25	-	38.87	11.94	11.53	6.85	30.80
W32	97.11	50.83	-	-	2.86	0.60	1.16	0.95	-	71.98	11.93	4.95	2.71	8.42
W33	183.07	10.48	-	-	4.34	0.12	-	1.37	0.05	68.72	12.74	5.58	3.02	9.93
W34	190.83	2.24	-	-	0.80	1.57	-	0.71	-	65.02	14.56	6.53	3.59	10.30
W35	35.00	12.42	1.13	-	1.09	1.89	-	0.69	-	68.52	12.25	5.37	3.14	10.73
W36	6.38	16.72	-	-	0.09	-	-	0.19	-	80.45	9.65	3.29	1.65	4.96
W37	98.50	18.26	4.20	106.32	15.72	38.93	2.20	2.29	-	57.34	13.44	7.02	4.24	17.96
W38	34.10	31.58	-	8.64	1.58	22.35	0.24	0.18	-	63.03	10.52	5.14	3.25	18.07
W39	164.68	39.86	-	-	3.18	-	3.06	1.16	-	62.11	15.64	7.28	3.88	11.09
W40	38.99	6.26	-	-	0.04	-	-	-	-	63.88	15.63	6.84	3.87	9.78
W41	14.21	1.68	0.09	4.65	3.12	0.36	-	0.45	-	65.01	12.73	4.96	2.64	14.67
W42	48.63	-	-	0.93	-	4.17	-	0.97	-	60.67	15.24	6.96	3.70	13.43
W43	273.74	7.11	-	-	3.20	2.00	-	2.35	0.12	57.42	16.65	8.06	4.50	13.37
W44	162.05	0.61	-	2.83	3.76	16.14	-	0.57	-	63.66	13.99	6.06	3.27	13.02
W45	85.64	20.57	1.09	3.88	7.29	16.84	1.23	0.52	-	64.76	12.09	5.35	3.07	14.74
W46	121.38	53.48	13.14	169.28	50.88	21.49	7.74	2.84	-	58.86	14.12	6.89	4.01	16.13
W47	136.94	116.98	1.30	6.70	15.73	20.84	4.37	3.93	-	65.51	12.64	5.66	3.01	13.18
W48	-	3.14	-	-	0.20	-	-	0.19	-	79.48	8.88	3.93	2.01	5.70
W49	114.12	4.69	0.06	-	1.12	0.04	0.29	0.69	-	58.27	16.31	8.09	4.49	12.84
W50	145.91	16.74	-	-	1.59	0.43	0.03	3.10	-	56.01	16.41	8.32	4.89	14.37

**Table S2.** (continued)

Watershed	LULC classes									Estimated soil loss				
	Df	Fo	Mx	Pa	Uc	Sc	St	Wb	Ws	0-100	100-200	200-300	300-400	>400
W51	5.02	62.13	-	-	10.17	19.70	1.34	0.15	-	63.23	11.06	5.19	3.16	17.37
W52	97.84	89.50	-	5.01	9.82	0.17	3.29	0.80	-	68.37	12.54	5.46	2.94	10.69
W53	1.25	34.70	0.11	31.15	15.43	3.22	0.04	0.68	0.08	58.25	11.95	6.15	3.66	19.99
W54	96.23	15.31	0.08	3.76	3.90	0.22	0.16	0.85	-	69.00	14.40	5.73	2.86	8.01
W55	47.61	22.09	0.01	-	6.91	0.06	0.45	0.58	0.03	60.92	13.86	6.36	3.56	15.30
W56	23.01	30.23	3.05	8.74	5.80	8.94	5.03	0.19	0.18	68.23	12.03	5.59	3.36	10.79
W57	4.45	26.72	3.07	39.63	11.98	18.66	6.99	1.04	0.77	64.88	11.93	5.98	3.65	13.56
W58	115.66	9.99	0.02	-	6.30	0.06	-	0.71	-	61.20	15.53	6.85	3.72	12.70
W59	37.91	11.23	7.81	2.70	37.48	68.00	13.68	0.17	0.75	52.55	11.77	7.93	5.33	22.42
W60	515.63	221.88	0.53	45.14	38.57	36.31	8.82	10.44	0.08	56.64	15.12	7.50	4.42	16.32
W61	75.86	109.79	19.70	54.60	34.28	101.18	17.51	7.25	0.54	54.61	11.60	7.03	4.89	21.87
W62	1.36	3.18	67.20	66.55	74.40	273.98	31.94	7.40	0.15	47.69	10.60	8.13	5.89	27.69
W63	130.86	71.46	2.17	6.32	14.45	6.87	0.66	1.83	1.73	63.33	13.46	6.11	3.22	13.88
W64	12.93	15.29	7.77	15.84	14.62	46.35	6.88	0.79	0.50	52.31	10.84	7.31	5.33	24.21
W65	84.60	46.15	40.04	9.34	193.75	122.55	38.85	15.38	7.45	61.29	12.53	7.36	4.47	14.36
W66	-	0.52	25.34	0.39	113.31	58.96	28.86	4.04	1.09	55.40	13.46	8.45	5.15	17.54
W67	-	-	57.08	4.23	200.42	172.14	151.37	36.28	6.21	66.51	12.81	6.24	3.52	10.92
W68	112.36	107.60	14.97	2.77	18.09	33.59	2.25	4.26	-	67.20	10.87	4.73	2.79	14.40
W69	6.85	24.39	0.27	-	9.54	6.27	2.35	1.07	-	62.80	7.97	3.57	2.38	23.28
W70	33.69	66.19	4.58	36.07	9.30	0.32	0.41	1.82	-	66.47	12.03	5.75	3.23	12.51
W71	4.63	15.30	0.04	-	1.52	1.15	2.26	1.00	-	64.25	12.07	5.42	3.47	14.79
W72	44.90	12.51	6.28	-	4.11	7.32	1.12	1.37	0.01	70.55	11.95	4.85	2.61	10.03
W73	67.99	97.55	-	0.14	4.99	2.76	0.17	3.59	0.07	70.84	13.25	5.23	2.59	8.09
W74	60.78	196.08	10.57	-	27.15	13.07	8.15	2.03	0.10	69.19	11.33	4.90	2.79	11.79
W75	1.50	6.25	1.14	1.14	0.46	2.75	-	0.29	-	67.25	9.89	4.22	2.55	16.08

**Table S2** (continued)

Watershed	LULC classes									Estimated soil loss				
	Df	Fo	Mx	Pa	Uc	Sc	St	Wb	Ws	0-100	100-200	200-300	300-400	>400
W76	-	1.31	-	12.84	3.11	4.47	1.17	0.72	0.45	67.04	10.24	5.41	3.36	13.95
W77	3.10	16.34	0.80	3.56	5.50	11.24	2.85	1.05	0.20	64.54	10.65	6.10	3.96	14.74
W78	11.16	39.52	15.16	15.43	9.73	37.73	4.58	4.17	0.59	61.78	11.03	6.16	3.99	17.03
W79	1.28	18.18	1.22	1.22	1.68	2.92	1.02	1.83	0.19	72.91	9.96	4.29	2.45	10.40
W80	-	1.33	1.48	0.55	0.89	5.92	0.87	0.75	0.02	50.60	11.88	8.78	5.65	23.09
W81	12.69	4.82	8.00	11.33	13.18	44.56	7.79	3.24	1.80	52.26	11.24	7.85	5.44	23.23
W82	14.53	11.00	12.31	0.99	35.76	57.93	23.85	5.87	3.15	52.35	12.20	8.02	5.39	22.04