

Supplementary Material

Modelling Impact of Land Use Changes and Climate on Soil Erosion in the Uma Oya River Basin, Sri Lanka

C. Jayasuriya¹, C. Palliyaguru¹, V. Basnayake², R. K. Makumbura¹, M. B. Gunathilake^{3, 4}, and U. Rathnayake^{5, 6*}

¹ *Water Resources Management and Soft Computing Research Laboratory, Millennium City, Athurugiriya 10150, Sri Lanka*

² *Department of Water Engineering and Management, University of Twente, Enschede 7522 NB, Netherlands*

³ *Hydrology and Aquatic Environment, Division of Environmental and Natural Resources, Norwegian Institute of Bioeconomy and Research, 1431 Ås, Norway*

⁴ *Water, Energy and Environmental Engineering Research Unit, Faculty of Technology, University of Oulu Oulu 90014, Finland*

⁵ *Department of Civil Engineering and Construction, Faculty of Engineering and Design, Atlantic Technological University, Sligo F91 YW50, Ireland*

⁶ *Centre for Mathematical Modelling and Intelligent Systems for Health and Environment (MISHE), Atlantic Technological University, Sligo F91 YW50, Ireland*

Table S1. Location Coordinates of the Rain Gauging Stations

Rain Gauging Station	Coordinates
Diyatalawa Survey Camp	6°49'05.21"N 80°57'28.12"E
Kirklees Estate	6°59'07.90"N 80°56'18.85"E
Nuwara Eliya	6°56'58.98"N 80°47'20.78"E
Walimada Group	6°53'23.21"N 80°54'08.71"E
Kurundu Oya	7°05'46.42"N 80°51'21.27"E

Table S2. LULC features

LULC Type	Features
Vegetation	Grass, shrubs, herbs, scrub lands, sporadic trees, young trees, and meadow.
Waterbodies	Streams, canals, minor/major reservoirs, natural ponds, water holes, rivers, lakes, marsh, swamp, coastal wetlands, and other water containing structures.
Forest	Open forest and dense forest.
Agricultural Land	Agricultural farms, chena, paddy, rubber, tea, abandoned paddy, cropland, irrigated cropland and other cultivated lands.
Built up	Parks, Playgrounds, industrial sites, distorted surfaces, express way, factories, homes, roads and urban areas.

Table S3. Soil Erodibility (K) Factors for UORB (Weerasinghe et al. 2016)

Soil Type	K Factor
Reddish Brown Earths & Immature Brown Looms; rolling, hilly and steep terrain	0.27
Red-Yellow Podzolic soils & Mountain Regosols; mountainous terrain	0.22
Steep rockland & Lithosols	0.25
Red-Yellow Podzolic soils; steeply dissected, hilly and rolling terrain	0.22
Red-Yellow Podzolic soils with dark B horizon & RedYellow Podzolic soils with prominent A1 horizon;rolling terrain	0.22

Table S4. Soil Types and Corresponding Areas of the UORB

Soil Type	Area(km ²)
Reddish Brown Earths & Immature Brown Looms; rolling, hilly and steep terrain	39.56
Red-Yellow Podzolic soils & Mountain Regosols; mountainous terrain	215.94
Steep rockland & Lithosols	17.12
Red-Yellow Podzolic soils; steeply dissected, hilly and rolling terrain	402.69
Red-Yellow Pdzolic soils with dark B horizon & RedYellow Podzolic soils with prominent A1 horizon;rolling terrain	52.68
Total	728

Table S5. Support Practice Factors

LULC Type	C Factor	P Factor
Water Bodies	0.2	0
Agricultural Land	0.43	0.15
Forest	0.5	0.3
Vegetation	0.51	1
Built up	0.73	0

Table S6. Mean Annual Precipitation of the Selected Rain Gauging Stations

Station	Mean Annual Precipitation (mm)
Diyatalawa-survey camp	1562
Kirklees Estate	3039
Nuwara Eliya	1759
Kurundu Oya	2402
Welimada Group	1214

Table S7. Distribution of areas under different erosion hazard classes from 2000 to 2020

Erosion Hazard Classes	Soil Erosion (t ha ⁻¹ yr ⁻¹)	2000 Area (km ²)	2000 (%)	2020 Area (km ²)	2020 (%)	Net change (%)
Low	0-5	524.82	72.29	460.88	63.48	-8.81
Moderate	5-12	165.94	22.86	232.30	32.00	9.14
High	12-25	32.82	4.52	30.25	4.17	-0.35
Very High	25-60	2.05	0.28	2.18	0.30	0.02
Extremely High	>60	0.05	0.007	0.10	0.01	0.003
Total		726	100	726	100	

Table S8. Primary conversions of LULC types in UORB

Primary LULC conversion	Changed area (km ²)
Agricultural Land - Forest	9.94
Agricultural Land - Built Up	9.28
Agricultural Land - Vegetation	17.02
Agricultural Land - Water Bodies	2.99
Forest - Agricultural Land	44.87
Forest - Built Up	4.21
Forest - Vegetation	38.90
Forest - Water Bodies	7.77
Built Up - Agricultural Land	30.98
Built Up - Forest	4.03
Built Up - Vegetation	5.70
Built Up - Water Bodies	2.03
Vegetation - Agricultural Land	96.20
Vegetation - Forest	42.55
Vegetation - Built Up	7.64
Vegetation - Water Bodies	2.39
Water Bodies - Agricultural Land	2.30
Water Bodies - Forest	1.23
Water Bodies - Built Up	0.32
Water Bodies - Vegetation	0.21

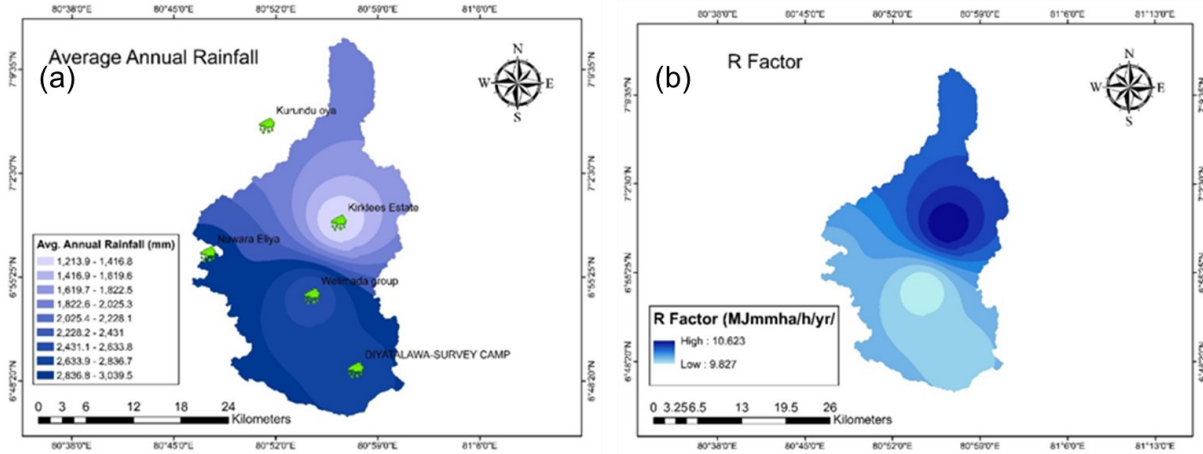


Figure S1. Average annual rainfall (a); R factor maps of UORB (b).

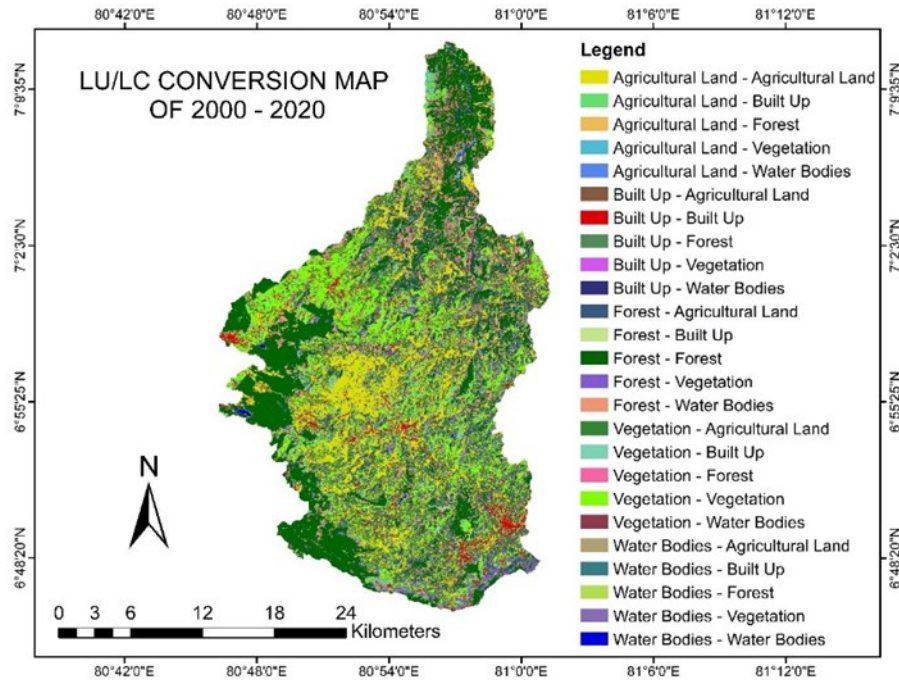


Figure S2. LULC conversion map of 2000 ~ 2020.