

## Supplementary Materials

**Table S1.** Details of data with sources

Data details	Source
Multi Temporal Optical Remote Sensing Data: 1973 and 2018 from Landsat 1 and Landsat 8	United States Geological Survey (USGS) Downloaded from [47] <a href="https://www.usgs.gov/core-science-systems/nli/landsat/landsat-data-access?qt-science_support_page_related_con=0#qt-science_support_page_related_con">https://www.usgs.gov/core-science-systems/nli/landsat/landsat-data-access?qt-science_support_page_related_con=0#qt-science_support_page_related_con</a>
Training data – for remote sensing data classification (LU analysis)	Collected from field using pre-calibrated handheld Global Positioning System [GPS]
Topographic Sheet 1: 50000: For delineation of catchments and administrative boundaries	Survey of India [43] <a href="http://www.soinakshre.uk.gov.in/">http://www.soinakshre.uk.gov.in/</a>
Virtual Globe data: Google Earth and Bhuvan	Google Earth [54], <a href="https://www.google.com/intl/en_in/earth/">https://www.google.com/intl/en_in/earth/</a> Bhuvan, National Remote Sensing Centre [56] <a href="http://bhuvan.nrsc.gov.in/">http://bhuvan.nrsc.gov.in/</a>
Long term Rainfall data : 1901 to 2010 across multiple rain gauge stations within and outside the catchment	India Meteorological Department (IMD) [49], <a href="http://www.imd.gov.in/pages/services_hydromet.php">http://www.imd.gov.in/pages/services_hydromet.php</a>  Karnataka State Natural Disaster Monitoring Centre (KSNDMC), <a href="https://www.ksndmc.org/default.aspx">https://www.ksndmc.org/default.aspx</a> Global Precipitation Climatology Centre (GPCC) [48] <a href="https://www.esrl.noaa.gov/psd/data/gridded/data.cpc.globalprecip.html">https://www.esrl.noaa.gov/psd/data/gridded/data.cpc.globalprecip.html</a>
Evapotranspiration (AET)	Actual Evapotranspiration (AET) using modified Hargreaves Method [56] $AET = PET * K_c$ where $K_c$ is the evapotranspiration coefficient based on land uses (Built-up (0.15), Water (1.05), Open space (0.30), Evergreen forest (0.95), Scrub and grassland (0.80), Forest Plantation (0.85), Agriculture Plantation (0.80), Deciduous forest (0.85)), and PET: Potential evapotranspiration $PET = 0.0023 * (R_a / \lambda) * \sqrt{T_{max} - T_{min}} * \left( \frac{T_{max} + T_{min}}{2} + 17.8 \right)$ $T_{max}$ : Maximum temperature; $T_{min}$ : Minimum temperature; $\lambda$ : latent heat of vapourisation of water (2.501 MJ/kg) and $R_a$ : Extra-terrestrial radiation (MJ/m <sup>2</sup> /day) $R_a$ is as per Indian Agriculture Research Institute, <a href="http://www.iari.res.in">http://www.iari.res.in</a> , <a href="http://wgbis.ces.iisc.ernet.in/energy/paper/prospects_of_solar_energy/analysis.htm">http://wgbis.ces.iisc.ernet.in/energy/paper/prospects_of_solar_energy/analysis.htm</a> <a href="http://wgbis.ces.iisc.ac.in/energy/water/paper/ETR91/SCR48_ETR91_CESTVR_Yettinhole-final.pdf">http://wgbis.ces.iisc.ac.in/energy/water/paper/ETR91/SCR48_ETR91_CESTVR_Yettinhole-final.pdf</a> <a href="http://www.fao.org/docrep/X0490E/x0490e07.htm#latent%20heat%20of%20vaporization%20(l)">http://www.fao.org/docrep/X0490E/x0490e07.htm#latent heat of vaporization (l)</a> [51]
Temperature Data: Long term average (1950 – 2010)	WorldClim [52], <a href="http://www.worldclim.org">http://www.worldclim.org</a>
Population Census: 1991, 2001, 2011	Census of India [45], <a href="http://www.censusindia.gov.in">http://www.censusindia.gov.in</a>
Domestic water demand	The amount of water required per person includes water needed for bathing, washing, drinking, and other basic needs. Domestic water demand is assessed as the function of water requirements per person per day, population, and season (Summer: 150 litres per person per day (lpcd), Monsoon: 125 lpcd, and winter: 135 lpcd).
Livestock Census: 2012	District at a Glance [50] Directorate of Economics and Statistics <a href="http://des.kar.nic.in/">http://des.kar.nic.in/</a>
Livestock water demand	Livestock population details were obtained from the district statistics office [50]. The water requirement for different animals was quantified based on the interviews: cattle (summer: 100 lpcd, monsoon: 70 lpcd, and winter: 85 lpcd), buffalo (summer: 105 lpcd, monsoon: 75 lpcd, and winter: 95 lpcd), sheep, and goats (summer: 22 lpcd, monsoon: 15 lpcd, and winter: 20 lpcd)
Agriculture Cropping Pattern and Water Requirement	Department of Agriculture [50] Directorate of Economics and Statistics, <a href="http://des.kar.nic.in/">http://des.kar.nic.in/</a> <a href="https://eands.dacnet.nic.in/">https://eands.dacnet.nic.in/</a> The crop water requirement for various crops was estimated considering their growth phase and details of the cropping pattern in the catchment (based on the data compiled

	from household surveys and publications such as the district at a glance, Department of Agriculture [50]).
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**Table S2.** Category-wise land use (with accuracy assessment) and forest fragmentation extent (in percentage).

LU Category	1973	2018	Accuracy (%)				Forest fragmentation type	1973	2018
			1973		2018				
			UA	PA	UA	PA			
Evergreen to semi-evergreen forest	71.65	23.95	57.3	57.4	97.0	96.8	Interior Forest	66.3	17.8
Moist deciduous forest	10.26	26.11	75.9	75.9	96.6	97.0			
Dry deciduous forest	0.15	0.61	82.8	82.8	98.3	97.2	Patch	0.41	3.94
Scrub forest/grass land	4.00	0.12	71.0	70.9	94.0	98.5			
Forest Plantations	3.52	11.64	76.6	76.6	78.5	99.9	Transitional	2.63	8.23
Cropland	4.46	16.18	95.4	95.4	92.8	82.8			
Horticulture Crops	3.63	10.39	72.8	72.8	97.0	90.2	Edge	2.54	0.93
Open fields	1.41	3.44	66.8	66.8	98.9	98.4			
Built-up	0.09	4.88	83.7	83.8	98.1	92.4	Perforated	14.2	19.8
Water	0.83	2.69	63.6	63.6	89.2	98.3			
Overall Accuracy (%)			89.77		91		Non-forest	13.94	49.34
Kappa			0.8		0.89				

Note - UA: User accuracy, PA: Producer accuracy, LU: land use

**Table S3.** Sub-basin wise forests and eco-hydrological status.

SB id	Rainfall (mm)	Area - sq.km	Total Forest	Evergreen Forest	Moist Deciduous Forest	Infiltration (mm)	AET (mm)	Eco-hydro index (EHI)
1	2073	175.0	52%	21%	31%	1305.8	1512.8	0.86
2	2960	253.3	57%	16%	41%	1993.2	1490.5	1.34
3	2370	31.2	53%	46%	7%	1589.9	1500.7	1.06
4	2931	150.1	52%	47%	5%	1922.9	1484.9	1.29
5	3561	173.1	60%	52%	8%	2463.5	1476.4	1.67
6	3753	168.4	87%	60%	28%	3038.5	1475.1	2.06
7	3425	134.1	68%	43%	25%	2489.4	1487.5	1.67
8	3169	109.7	88%	66%	22%	2550.6	1483.8	1.72
9	2944	253.7	27%	11%	16%	1803.4	1466.2	1.23

**Table S4:** Average values of physicochemical parameters at different sampling sites.

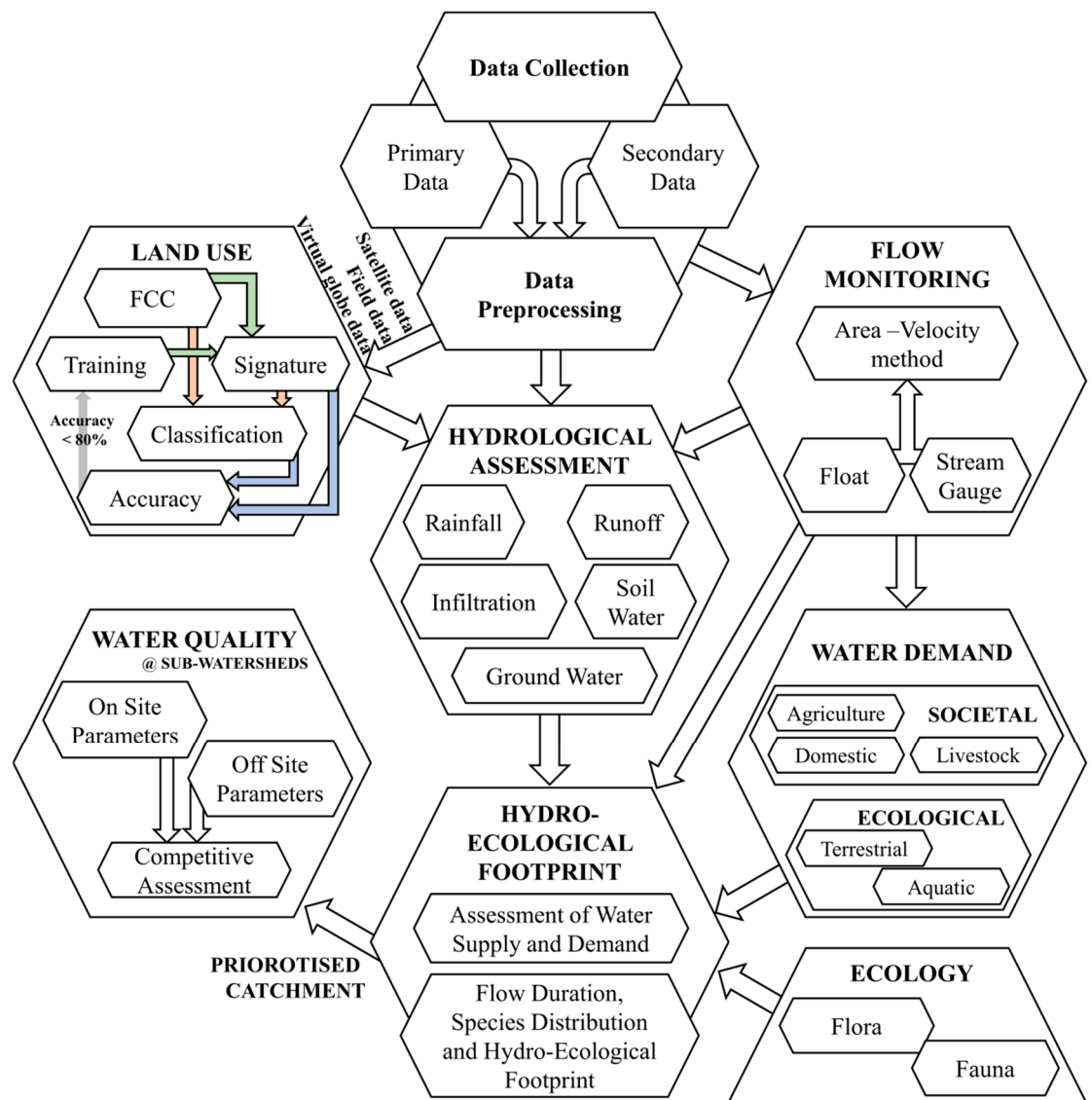
	WT	TDS	EC	pH	TB	DO	BOD	COD	TA	Cl	TH	Ca	Mg	OP	Nitrate	Na	K	Discharge
YK	24.63	71.77	139.62	8	5.07	6.97	13.2	24.05	109.86	17.88	77.53	21.55	5.81	0.2	0.18	8.6	0.69	27.43
YNK	25.07	40.86	78.28	7.8	23.85	7.05	14.05	26.63	76.19	17.74	37.26	8.87	3.69	0.35	0.2	11.38	0.88	40.53
BGT	28.2	35.59	70.09	7.53	8.25	6.3	16.19	32.76	77.33	20.06	34.1	7.68	3.64	0.17	0.16	11.85	0.87	37.63
BE	26.33	30.63	56.68	7.37	6.18	6.29	22	33.78	58.36	18.29	25	4.87	3.13	0.21	0.18	9.25	0.74	10.03
AGT2	27.43	45.34	87.95	7.47	13.83	6.2	13.12	26.38	73.62	17.88	38.57	9.05	3.89	0.22	0.18	10.66	1.01	31.97
AG	27.5	19.9	39.4	6.9	6.67	6.23	18.49	31.89	52	17.61	15.2	2.89	1.95	0.29	0.13	9.14	1.04	43.7
AGT1	28	34.55	51.21	7.45	6.18	6.61	12.1	22.05	51.12	17.18	20.12	3.88	2.55	0.21	0.16	10.61	0.96	49.8
MH	26.2	24.09	48.62	7.45	18.76	6.08	12.47	21.63	53.89	18.11	22.32	4.68	2.6	0.22	0.16	9.59	0.79	25.35
HA	27.4	22.06	44.2	7.1	45.66	6.28	21.55	34.2	57.6	18.74	22	4.97	2.34	0.32	0.21	9.7	1.18	358.4

**Table S5.** Correlation coefficient matrix of water quality parameters of streams.

	WT	TDS	EC	pH	TB	DO	BOD	COD	TA	Cl	TH	Ca	Mg	OP	Nitrate	Na	K
WT																	
TDS	-0.57																
EC	-0.61	<b>0.98</b>															
pH	-0.67	<b>0.86</b>	<b>0.83</b>														
TB	0.00	-0.36	-0.29	-0.24													
DO	-0.65	0.68	0.63	0.73	-0.09												
BOD	0.19	-0.48	-0.43	-0.59	0.32	-0.34											
COD	0.33	-0.41	-0.33	-0.53	0.25	-0.32	<b>0.91</b>										
TA	-0.59	<b>0.93</b>	<b>0.97</b>	<b>0.80</b>	-0.21	0.63	-0.32	-0.17									
Cl	0.30	-0.13	-0.04	-0.03	0.18	-0.32	0.36	0.58	0.16								
TH	-0.65	<b>0.96</b>	<b>0.99</b>	<b>0.82</b>	-0.23	0.63	-0.37	-0.29	<b>0.98</b>	0.01							
Ca	-0.66	<b>0.95</b>	<b>0.98</b>	<b>0.80</b>	-0.21	0.63	-0.36	-0.30	<b>0.97</b>	-0.01	<b>1.00</b>						
Mg	-0.61	<b>0.97</b>	<b>0.99</b>	<b>0.87</b>	-0.30	0.61	-0.38	-0.28	<b>0.97</b>	0.07	<b>0.98</b>	<b>0.96</b>					
OP	-0.22	-0.33	-0.29	-0.27	0.67	0.25	0.27	0.21	-0.22	-0.29	-0.26	-0.23	-0.34				
Nitrate	-0.39	0.25	0.27	0.36	0.69	0.37	0.19	0.13	0.29	0.12	0.30	0.29	0.31	0.40			
Na	0.38	-0.09	-0.12	0.18	0.09	0.09	-0.28	0.02	-0.04	0.38	-0.18	-0.22	-0.05	0.01	0.12		
K	0.63	-0.54	-0.53	-0.69	0.59	-0.33	0.29	0.35	-0.49	-0.01	-0.54	-0.51	-0.60	0.53	0.10	0.20	
Discharge	0.23	-0.34	-0.31	-0.41	<b>0.87</b>	-0.15	0.50	0.42	-0.22	0.23	-0.23	-0.19	-0.33	0.50	0.54	-0.08	0.71

**Table S6.** Loadings of 17 variables extracted from PCA.

Variables	PC 1	PC 2	PC 3	PC 4
Water quality parameters				
EC	0.87	0.26	0.22	-0.22
pH	0.95	0.21	0.06	0.09
TB	-0.43	0.78	-0.28	-0.06
DO	0.65	0.43	-0.05	0.43
BOD	-0.73	0.29	0.55	0.00
COD	-0.63	0.23	0.65	-0.01
TA	0.81	0.35	0.27	-0.25
TH	0.84	0.32	0.20	-0.29
OP	-0.38	0.62	-0.37	0.47
Nitrate	0.12	0.87	0.17	0.13
Land use				
BU	-0.61	0.67	-0.05	-0.32
EF	0.95	-0.11	-0.13	0.19
DF	-0.92	0.26	0.10	-0.23
FP	-0.57	-0.77	-0.13	0.02
Horti	0.12	-0.60	0.63	0.10
Agri	-0.70	0.11	0.48	0.50
Catchment characteristics				
FlowD	0.88	0.02	0.33	0.18



Supplementary **Figure S1**. Method for eco-hydrological and environmental regime assessment.

## References

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