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Data Article

Dataset on the assessment of water quality of surface water in Kalingarayan Canal for heavy metal pollution, Tamil Nadu

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ABSTRACT

This data article aimed to investigate the quality of surface water in Kalingarayan Canal for heavy metal pollution, Tamil Nadu. Eight heavy metals like Fe, Cu, Mn, Cr, Zn, Cd, Pb, and Ni were analyzed in the water, for a period of three years, spanning the time frame between January 2014 to December 2016. Eight stations were selected along the Kalingarayan Canal, and water samples were collected on a monthly basis from these stations. The pH of the samples was in the alkaline state (6.88–8.90), whereas conductance was in the range of 394–4276 μs/cm. The average concentration of heavy metals in the surface water ranges from 0.040 to 10.75, 0.030 to 0.890, 0.02 to 0.91, 0.00 to 1.96, 0.00 to 0.01, 0.00 to 0.053, 0.01 to 0.12 and 0.110 to 3.40 mg/L for the metals Fe, Mn, Zn, Cu, Cd, Ni, Pb and Cr respectively. The dominance of various heavy metals in the surface water follows the sequence: Fe > Cr > Cu > Zn > Mn > Pb > Ni > Cd respectively. The canal is affected by anthropogenic activities and industrialization in terms of heavy metals.

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Specification table

Subject Area	Environmental Engineering
More specific subject Area	Water Quality
Type of data	Tables, Figures
How data was acquired	All water samples were analyzed according to the Standard Methods using potentiometer method by digital pH meter (Instrument Model: DPH-500, Global make) for pH, digital conductivity meter (Instrument Model: DCM-900, Global make) for EC and heavy metal analysis using AAS (Agilent, 200 Series, USA)
Data format	Raw, Analyzed
Experimental factors	All water samples were collected in polyethylene bottles and stored in an ice-jacket placed at 4 °C room temperature until the heavy metal analysis.
Experimental features	Water quality and heavy metals analysis of Kalingarayan Canal
Data source location	Kalingarayan Canal, Erode district, Tamil Nadu
Data accessibility	This article contains all the dataset
Related research article	T. Mohanakavitha, T. Meenambal, Assessment of Water Quality Index for the Groundwater in Downstream Side of the Kalingarayan Canal, Erode District, Tamilnadu State, India, 32(02), 2013, pp. 245–249. [1]

Value of the data

- The data provided in this article reflects the heavy metals pollution of the Kalingarayan Canal.
- The dataset article discusses the importance of the heavy metals analyzed and also discusses water quality of the Kalingarayan Canal useful for irrigation purpose and classifies the water based on EC.
- The dataset will help to determine the effects of heavy metals analyzed in the water of Kalingarayan Canal.
- Heavy metals can accumulate in the human body and other living organisms over a long period and may cause adverse effects on human health.
- This information contained herein will be useful to society and can be extended to other canals in terms of water quality particularly to heavy metals.

1. Data

The construction work of Kalingarayan Canal was carried out during the period 1271–1283 AD. The canal starts with Kalingarayan dam on River Bhavani, near Bhavani and flows through Erode before terminating near Kodumudi. It is designed in a circuitous way with as many twists and turns as possible. The canal is in the curvilinear path to cover more land area for irrigation. The length of the canal is 92 km passing entirely through Erode district, Tamil Nadu as per the survey conducted. The mean sea level (MSL) where the canal begins is 534 feet and ends at 412.48 feet. The Kalingarayan Canal is situated on the western bank of the river Cauvery at 77°40′–77°48′ E longitude and 11°16′–11°26′ N with an area of 7621 Sq. km (Fig. 1). Based on the latest population census in Erode district (2011), its population was 521,900. The data contain heavy metal analysis of surface water samples. Eight stations were selected as sampling points in the Kalingarayan Canal for three seasons viz. summer (March–May), Pre-monsoon (June–August) and post-monsoon (December–February). The parameters investigated are pH, EC and heavy metals like Fe, Mn, Zn, Cu, Cd, Ni, Pb, and Cr. The dataset pertaining to pH, EC, and heavy metals, are shown in Tables 2–4. The area is characterized by the tropical climate and the area around the canal is heavily populated and industrialized (Table 1).

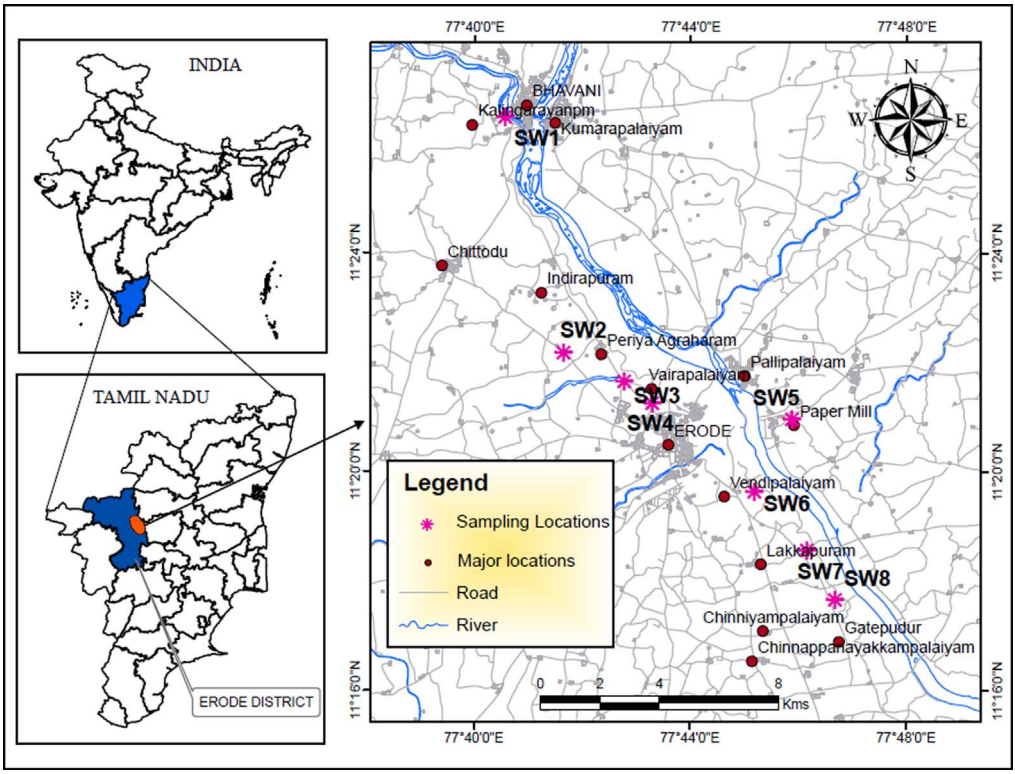

Fig. 1. Locations of the monitoring stations in Kalingarayan Canal.

Table 1
Location of surface water samples in Kalingarayan Canal.

S. no.	Latitude	Longitude	Sample code	Sampling locations (Polluting factors)
1	11°26'26.69"N	77°40'36.27"E	SW1	Kalingarayan Anicut (Agricultural Activities)
2	11°23'13.92"N	77°41'43.78"E	SW2	Chunnambu Oodai (Tanneries)
3	11°21'49.29"N	77°42'43.45"E	SW3	Convent School (Domestic area)
4	11°21'44.96"N	77°43'16.18"E	SW4	Vairapalayam (Dyeing units)
5	11°21'27.98"N	77°44'12.87"E	SW5	Pallipalayam (Paper mills)
6	11°19'37.77"N	77°45'9.56"E	SW6	Vendipalayam (Domestic area)
7	11°18'39.08"N	77°46'13.97"E	SW7	Lakkapuram (Domestic area)
8	11°17'37.41"N	77°46'39.02"E	SW8	Colony Pudur (Domestic area)

There are more than 250 small scale dyeing units and tanneries actively discharging their wastewater either not treated or partially treated.

2. Experimental design, materials, and methods

The locations of samples were chosen according to the industrial, agricultural and domestic activities. The polythene bottles were used to collect the samples in eight different locations in Kalingarayan Canal (Table 1, Fig. 1), after measurement of pH on the spot in the field. The samples collected from each site consisted of 3 composite samples taken at one foot below the water surface

Table 2
Average values of pH, EC, and heavy metals in surface water of Kalingarayan Canal (2014).

Parameters	Season	Average concentration								Statistical data			
		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Min	Max	Mean	SD
pH	Summer	7.50	7.56	7.80	7.16	7.24	7.60	7.45	7.90	7.16	7.90	7.53	0.25
	Pre-monsoon	7.47	7.50	7.40	7.54	7.60	7.25	7.33	7.42	7.25	7.60	7.44	0.11
	Post-monsoon	7.87	7.74	7.52	7.56	7.33	7.30	7.54	7.40	7.30	7.87	7.53	0.20
EC (μS/cm)	Summer	649	938	683	891	759	816	753	639	639	938	766	109
	Pre-monsoon	605	550	470	394	405	480	510	550	394	605	495	73
	Post-monsoon	459	560	507	612	534	546	565	525	459	611	538	44
Fe (mg/L)	Summer	1.991	10.748	5.279	4.095	6.640	1.550	1.449	1.449	1.45	10.75	4.15	3.32
	Pre-monsoon	1.575	2.948	2.192	1.638	0.819	1.260	0.995	0.995	0.82	2.95	1.55	0.72
	Post-monsoon	0.115	1.790	0.152	0.139	0.403	0.115	0.057	0.057	0.06	1.79	0.35	0.59
Mn (mg/L)	Summer	0.517	0.542	0.504	0.328	0.353	0.454	0.315	0.302	0.30	0.54	0.41	0.10
	Pre-monsoon	0.895	0.806	0.529	0.164	0.227	0.302	0.227	0.227	0.16	0.89	0.42	0.29
	Post-monsoon	0.101	0.076	0.088	0.101	0.063	0.076	0.050	0.050	0.05	0.10	0.08	0.02
Zn (mg/L)	Summer	0.082	0.106	0.067	0.103	0.089	0.081	0.029	0.029	0.03	0.11	0.07	0.03
	Pre-monsoon	0.441	0.832	0.645	0.911	0.809	0.660	0.411	0.411	0.41	0.91	0.64	0.20
	Post-monsoon	0.030	0.120	0.140	0.105	0.073	0.106	0.078	0.078	0.03	0.14	0.09	0.03
Cu (mg/L)	Summer	0.021	0.357	0.437	0.537	0.737	0.538	0.381	0.381	0.02	0.74	0.42	0.21
	Pre-monsoon	1.013	1.115	0.942	0.813	0.859	1.962	1.794	1.794	0.81	1.96	1.29	0.48
	Post-monsoon	0.004	0.009	0.120	0.015	0.108	0.005	0.003	0.003	0.00	0.12	0.03	0.05
Cd (mg/L)	Summer	0.010	0.008	0.008	0.009	0.006	0.005	0.004	0.004	0.00	0.01	0.01	0.00
	Pre-monsoon	0.001	0.010	0.010	0.011	0.005	0.004	0.004	0.004	0.00	0.01	0.01	0.00
	Post-monsoon	0.004	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.00	0.00	0.00	0.00
Ni (mg/L)	Summer	0.057	0.067	0.055	0.066	0.066	0.039	0.032	0.032	0.03	0.07	0.05	0.02
	Pre-monsoon	0.044	0.052	0.048	0.044	0.040	0.033	0.025	0.025	0.03	0.05	0.04	0.01
	Post-monsoon	0.026	0.006	0.006	0.008	0.006	0.003	0.003	0.003	0.00	0.03	0.01	0.01
Pb (mg/L)	Summer	0.019	0.019	0.115	0.122	0.116	0.113	0.113	0.113	0.02	0.12	0.09	0.04
	Pre-monsoon	0.019	0.019	0.015	0.015	0.011	0.011	0.011	0.011	0.01	0.02	0.01	0.00
	Post-monsoon	0.008	0.010	0.013	0.013	0.011	0.011	0.011	0.011	0.01	0.01	0.01	0.00
Cr (mg/L)	Summer	1.013	3.399	2.873	3.054	1.966	1.794	1.058	1.058	1.01	3.40	2.03	0.97
	Pre-monsoon	0.357	1.966	1.940	1.436	1.474	0.381	0.381	0.381	0.36	1.97	1.04	0.74
	Post-monsoon	0.176	1.184	0.176	0.863	0.737	0.353	0.353	0.353	0.18	1.18	0.52	0.36

SW: Surface water; Min: Minimum; Max: Maximum; SD: Standard deviation.

using acid washed 500 mL polyethylene bottles to avoid unpredictable changes in characteristics. Water samples collected were placed at 4 °C in an ice-jacket and transported to the laboratory immediately for further analysis. The collected samples were acidified with concentrated nitric acid to a pH below 2.0 to minimize precipitation and adsorption on bottle walls as required by the standard procedure. The concentrations of heavy metals were determined using an Atomic Absorption Spectrometry (Agilent, 200 Series, USA) after the acid-digestion procedure for heavy metals analysis as per APHA [2]. Atomic Absorption Spectrophotometer was used for heavy metal analysis of water while other analysis such as EC was carried out by procedure adopted in standard methods [2–12]. The concentration of hydrogen ion (pH) and electrical conductivity were analyzed with a digital pH meter and digital electrical conductivity meter respectively [13–20].

The samples were collected and tested for a period of three years (2014–2016). Water samples were collected for the three seasons when there was a flow of water in the canal and were tested for

Table 3
Average values of pH, EC, and heavy metals in surface water of Kalingarayan Canal (2015).

Parameters	Season	Average concentration								Statistical data			
		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Min	Max	Mean	SD
pH	Summer	7.38	7.58	7.69	7.61	7.7	7.61	7.7	7.4	7.38	7.7	7.58	0.13
	Pre-monsoon	6.88	7.42	7.56	7.4	7.26	7.8	7.61	7.78	6.88	7.8	7.46	0.3
	Post-monsoon	7.41	7.33	7.1	7.48	7.5	7.4	7.07	7.34	7.07	7.5	7.33	0.16
EC (μS/cm)	Summer	852	2710	2400	2570	2290	1780	1250	1045	852	2710	1862	733
	Pre-monsoon	762	1410	888	936	652	540	432	510	432	1410	766	316
	Post-monsoon	560	1035	790	916	774	791	665	649	560	1035	772	152
Fe (mg/L)	Summer	1.454	7.848	3.855	2.99	4.848	1.132	1.058	1.058	1.06	7.85	3.03	2.42
	Pre-monsoon	1.15	2.153	1.601	1.196	0.598	0.92	0.727	0.727	0.6	2.15	1.13	0.52
	Post-monsoon	0.084	1.307	0.111	0.101	0.294	0.084	0.041	0.041	0.04	1.31	0.26	0.43
Mn (mg/L)	Summer	0.377	0.396	0.368	0.239	0.258	0.331	0.23	0.221	0.22	0.4	0.3	0.07
	Pre-monsoon	0.653	0.589	0.386	0.12	0.166	0.221	0.166	0.166	0.12	0.65	0.31	0.21
	Post-monsoon	0.074	0.055	0.064	0.074	0.046	0.055	0.037	0.037	0.04	0.07	0.06	0.01
Zn (mg/L)	Summer	0.06	0.077	0.049	0.075	0.065	0.059	0.021	0.021	0.02	0.08	0.05	0.02
	Pre-monsoon	0.322	0.607	0.471	0.665	0.591	0.482	0.3	0.3	0.3	0.67	0.47	0.15
	Post-monsoon	0.022	0.087	0.102	0.076	0.053	0.077	0.057	0.057	0.02	0.1	0.07	0.02
Cu (mg/L)	Summer	0.016	0.26	0.319	0.392	0.538	0.393	0.278	0.278	0.02	0.54	0.31	0.15
	Pre-monsoon	0.74	0.814	0.688	0.593	0.627	1.432	1.31	1.31	0.59	1.43	0.94	0.35
	Post-monsoon	0.003	0.006	0.087	0.011	0.079	0.004	0.002	0.002	0	0.09	0.02	0.04
Cd (mg/L)	Summer	0.007	0.006	0.006	0.006	0.005	0.004	0.003	0.003	0	0.01	0	0
	Pre-monsoon	0.001	0.007	0.007	0.008	0.004	0.003	0.003	0.003	0	0.01	0	0
	Post-monsoon	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0	0	0	0
Ni (mg/L)	Summer	0.041	0.049	0.04	0.048	0.048	0.029	0.023	0.023	0.02	0.05	0.04	0.01
	Pre-monsoon	0.032	0.038	0.035	0.032	0.029	0.024	0.018	0.018	0.02	0.04	0.03	0.01
	Post-monsoon	0.019	0.005	0.005	0.006	0.005	0.002	0.002	0.002	0	0.02	0.01	0.01
Pb (mg/L)	Summer	0.014	0.014	0.084	0.089	0.085	0.083	0.083	0.083	0.01	0.09	0.07	0.03
	Pre-monsoon	0.014	0.014	0.011	0.011	0.008	0.008	0.008	0.008	0.01	0.01	0.01	0
	Post-monsoon	0.006	0.007	0.009	0.009	0.008	0.008	0.008	0.008	0.01	0.01	0.01	0
Cr (mg/L)	Summer	0.74	2.482	2.098	2.23	1.435	1.31	0.773	0.773	0.74	2.48	1.48	0.71
	Pre-monsoon	0.26	1.435	1.417	1.049	1.076	0.278	0.278	0.278	0.26	1.44	0.76	0.54
	Post-monsoon	0.129	0.865	0.129	0.63	0.538	0.258	0.258	0.258	0.13	0.86	0.38	0.27

SW: Surface water; Min: Minimum; Max: Maximum; SD: Standard deviation.

pH, EC, and heavy metal analysis. The pH of water samples were in alkaline range of 6.88 to 8.90 with an overall mean of 7.51. Mean values of pH in different seasons vary from 7.30 in pre-monsoon to 7.92 during summer (Tables 2–4). The data of EC varied from 394 to 4276 μs/cm (Tables 2–4). According to IS: 2296, EC value should not exceed 2250 μs/cm in water used for irrigation [21,22]. The average concentration of heavy metals in the surface water range from 0.040 to 10.75, 0.030 to 0.890, 0.02 to 0.91, 0.00 to 1.96, 0.00 to 0.01, 0.00 to 0.053, 0.01 to 0.12 and 0.110 to 3.40 mg/L for the metals Fe, Mn, Zn, Cu, Cd, Ni, Pb and Cr respectively (Tables 2–4). A heavy metal concentration except Cd and Zn exceeds the limit in all analyzed samples in accordance with two standards, Bureau of Indian Standards and WHO. The dominance of various heavy metals in the surface water follows the sequence: Fe > Cr > Cu > Zn > Mn > Pb > Ni > Cd.

Table 4
Average values of pH, EC, and heavy metals in surface water of Kalingarayan Canal (2016).

Parameters	Season	Average concentration								Statistical data			
		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Min	Max	Mean	SD
pH	Summer	7.38	7.58	7.69	7.61	7.7	7.61	7.7	7.4	7.38	7.7	7.58	0.13
	Pre-monsoon	6.88	7.42	7.56	7.4	7.26	7.8	7.61	7.78	6.88	7.8	7.46	0.3
	Post-monsoon	7.41	7.33	7.1	7.48	7.5	7.4	7.07	7.34	7.07	7.5	7.33	0.16
EC (μS/cm)	Summer	852	2710	2400	2570	2290	1780	1250	1045	852	2710	1862	733
	Pre-monsoon	762	1410	888	936	652	540	432	510	432	1410	766	316
	Post-monsoon	560	1035	790	916	774	791	665	649	560	1035	772	152
Fe (mg/L)	Summer	1.454	7.848	3.855	2.99	4.848	1.132	1.058	1.058	1.06	7.85	3.03	2.42
	Pre-monsoon	1.15	2.153	1.601	1.196	0.598	0.92	0.727	0.727	0.6	2.15	1.13	0.52
	Post-monsoon	0.084	1.307	0.111	0.101	0.294	0.084	0.041	0.041	0.04	1.31	0.26	0.43
Mn (mg/L)	Summer	0.377	0.396	0.368	0.239	0.258	0.331	0.23	0.221	0.22	0.4	0.3	0.07
	Pre-monsoon	0.653	0.589	0.386	0.12	0.166	0.221	0.166	0.166	0.12	0.65	0.31	0.21
	Post-monsoon	0.074	0.055	0.064	0.074	0.046	0.055	0.037	0.037	0.04	0.07	0.06	0.01
Zn (mg/L)	Summer	0.06	0.077	0.049	0.075	0.065	0.059	0.021	0.021	0.02	0.08	0.05	0.02
	Pre-monsoon	0.322	0.607	0.471	0.665	0.591	0.482	0.3	0.3	0.3	0.67	0.47	0.15
	Post-monsoon	0.022	0.087	0.102	0.076	0.053	0.077	0.057	0.057	0.02	0.1	0.07	0.02
Cu (mg/L)	Summer	0.016	0.26	0.319	0.392	0.538	0.393	0.278	0.278	0.02	0.54	0.31	0.15
	Pre-monsoon	0.74	0.814	0.688	0.593	0.627	1.432	1.31	1.31	0.59	1.43	0.94	0.35
	Post-monsoon	0.003	0.006	0.087	0.011	0.079	0.004	0.002	0.002	0	0.09	0.02	0.04
Cd (mg/L)	Summer	0.007	0.006	0.006	0.006	0.005	0.004	0.003	0.003	0	0.01	0	0
	Pre-monsoon	0.001	0.007	0.007	0.008	0.004	0.003	0.003	0.003	0	0.01	0	0
	Post-monsoon	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0	0	0	0
Ni (mg/L)	Summer	0.041	0.049	0.04	0.048	0.048	0.029	0.023	0.023	0.02	0.05	0.04	0.01
	Pre-monsoon	0.032	0.038	0.035	0.032	0.029	0.024	0.018	0.018	0.02	0.04	0.03	0.01
	Post-monsoon	0.019	0.005	0.005	0.006	0.005	0.002	0.002	0.002	0	0.02	0.01	0.01
Pb (mg/L)	Summer	0.014	0.014	0.084	0.089	0.085	0.083	0.083	0.083	0.01	0.09	0.07	0.03
	Pre-monsoon	0.014	0.014	0.011	0.011	0.008	0.008	0.008	0.008	0.01	0.01	0.01	0
	Post-monsoon	0.006	0.007	0.009	0.009	0.008	0.008	0.008	0.008	0.01	0.01	0.01	0
Cr (mg/L)	Summer	0.74	2.482	2.098	2.23	1.435	1.31	0.773	0.773	0.74	2.48	1.48	0.71
	Pre-monsoon	0.26	1.435	1.417	1.049	1.076	0.278	0.278	0.278	0.26	1.44	0.76	0.54
	Post-monsoon	0.129	0.865	0.129	0.63	0.538	0.258	0.258	0.258	0.13	0.86	0.38	0.27

SW: Surface water; Min: Minimum; Max: Maximum; SD: Standard deviation.

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Transparency document. Supplementary material

Transparency data associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2019.01.010.

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