Water quality indices as an important tool for water quality assessment in industrial areas of Riyadh city, Saudi Arabia

Nadia B.E. Badr, Alexandria University, Egypt

Khairia M. Al-Qahtani, Princess Nourah Bint Abdul-Rahman University, KSA

Sahab O. Alflaij, Princess Nourah Bint Abdul-Rahman University, KSA

Salma F. Al-Qahtani, Center of Excellence for Advanced Materials and Manufacturing, King Abdulaziz City for Science and Technology, KSA

Mohammed A. Al-Saad, Naif Arab University for Security Sciences, KSA

Abstract (300 word limit)

The Riyadh City-Saudi Arabia has undergone rapid development in population, urbanization and industrialization that has posed great pressure on the water quality and ecological environment. The present work was conducted to evaluate the physico-chemical parameters as well as level of nine selected heavy metals in streams affected by discharges from two different industrial locations and one from treated sewage area, Riyadh City. The results revealed a fluctuating behavior of selected parameters throughout the study locations influenced by different discharging sources. Based on the concentration ranges and abundance, heavy metals are ranked in order of magnitude as Zn > Cu > Pb > Cr > Ni > As > Cd > Hg > Co. The increased level of heavy metals concentrations was recorded in water samples collected from discharged industrial effluents into L1 (2nd industrial area) and L2 (3rd industrial area). For all samples, Pearson's correlation matrices among the studied heavy metals and environmental parameters revealed a highly significant positive correlation ($r > 0.86$, $p < 0.05$) that suggesting a common source of these metals. Metal partition coefficient (kd), recorded a high value for Cd, Co, Pb, Cr and As that indicated a significant binding between those metals and the particles in suspension especially for L1 and L2. The mean heavy metal pollution indexes (HPI) of different locations are found far above the critical threshold value of 100 due to anthropogenic origin that includes industrial activities. The Metal Index (MI) was found to fall in range between seriously (L1) and strong (L2) affected areas to pure (L3) area. Studies of health risk assessment indicated that 80 persons out of 200 suffered from sinusitis followed by 70 suffered from nearsightedness, 50 from throat ashes, skin irritation, general fatigue and depression.

Image

Table 7. Water Quality Classification

MI	Characteristics	Class
<0.3	Very pure	I
0.3-1.0	pure	II
1.0-2.0	Slightly affected	III
2.0-4.0	Moderately affected	IV
4.6	Strongly affected	V
>6.0	Seriously affected	VI

Recent Publications (minimum 5)

1. Al-Omran, M. A., El-Maghraby, S. E., Aly, A. A., Al-Wabel, I. M., Al-Asmari, Z. A. Nadeem, M. E (2012). Quality assessment of various bottled waters marketed in Saudi Arabia. Environmental Monitoring and Assessment, 185 (8), 6397–6406.
2. Al-Farraj, A. S., Al-Sewailem, M. S., Anwar, A. A., Al-Wabel, M. I. & El-Maghraby, S. E. (2013). Assessment and heavy metals behaviors of industrial waste water on Riyadh city, Saudi Arabia. Proceedings of the International Academy of Ecology and Science, 3 (3), 266–277.
3. Azumi, D.S., Bichi, M.H (2010). Industrial pollution and heavy metals profile of Challawa River in Kano, Nigeria. Journal of Applied Science in Environmental Sanitation, 5(1), 23-29.
4. Kingdom of Saudi Arabia Standard (KSA). (2003). General presidency of meteorology and environment protection. The General System of Environment and Regulations. Saudi Arabia (In Arabic).
5. Saud, A. G. and Abdullah, S. A (2009). Water Resources and Reuse in Al-Madinah. In: The International Conference on Water Conservation in Arid Regions (ICWCAR'09). Organized by Water Research Center, King Abdulaziz University, Jeddah, Saudi Arabia, 12–14 October 2009.



Biography (150 word limit)

Salma F. Al-Qahtani is an academic researcher at KACST. She received her bachelor's degree in Chemistry from Princess Nourah Bint Abdulrahman University in 2017. She is interested in producing and improving nanomaterials that are used in the field of environment and water purification. Salma is also working in many projects interested with hydrogen production. Her research area covers the manufacture of solar water splitting devices and the design of electrocatalysts.

Email: sfalqahtani@kacst.edu.sa - salmafaihan@gmail,com

Notes/Comments: