SRIWIJAYA Law Review

Editorial Office: Faculty of Law, Sriwijaya University
Jalan Srijaya Negara, Palembang, South Sumatra 30139, Indonesia.
Phone: +62711-580063Fax: +62711-581179
E-mail: sriwijayalawreview@unsri.ac.id| sriwijayalawreview@gmail.com
Website: http://journal.fh.unsri.ac.id/index.php/sriwijayalawreview

ISSN Print: 2541-5298
ISSN Online: 2541-6464

Protecting the Right to Clean Water: Legal Challenges and Solutions for River Pollution in Kurdistan Region of Iraq

Hiwa Rashid Ali[a], Asmar Abdul Rahim [b], Haslinda Mohd Anuar [b]

[a] *Lecturer at the School of Law, University of Garmian, Kurdistan Region, Iraq. Corresponding author Hiwa Rashid. e-mail: hiwa.rashid@garmian.edu.krd*
[b] *Senior Lecturer, School of Law, College of Law, Government & International Studies, Universiti Utara Malaysia, Malaysia. E-mail: asmar@uum.edu.my; haslinda@uum.edu.my*

Article

Keywords:
Climate Change; Environmental Law; River pollution; Tanjero River.

Article History
Received: Dec 28, 2021;
Reviewed: Jan 14, 2025;
Accepted: Jan 28, 2025;
Published: Jan 31, 2025.

DOI:
10.28946/slrev.Vol9.Iss1.1644.pp71-95

Abstract

Access to clean water is a fundamental human right recognised by the United Nations. However, in Iraq, particularly in the Kurdistan region, this right is under significant threat due to severe pollution and contamination of rivers. While the Iraqi Constitution and environmental laws indirectly acknowledge the right to clean water, the legal and institutional framework for river protection remains inadequate. This study focuses on the Tanjero River as a case study to assess Kurdistan region's legal framework and enforcement mechanisms for water resource protection. This study identifies critical gaps in legislation and enforcement through a qualitative and socio-legal methodology, including interviews and analysis of relevant laws such as Law No. 8 (2008) for Environmental Protection and Improvement. The findings reveal that the Tanjero River's pollution is primarily caused by mismanagement of water resources, insufficient legislation, weak enforcement, lack of coordination, and inadequate infrastructure. The Kurdistan Regional Government must prioritise sustainable water resource management, establish a comprehensive legal framework, and implement rigorous enforcement measures to address these issues. These steps are essential to safeguarding the right to clean water, protecting public health, and promoting sustainable development in the region.

INTRODUCTION

Water is an essential resource for the survival of all organisms and the whole ecosystem and is distributed widely on the planet.[1] Although water covers more than 70% of the earth's surface, fresh water only makes up about 2.5%, and only a small portion is accessible since most of it is

[1] Igor A. Shiklomanov, "World Water Resources: A New Appraisal And Assessment For The 21st Century," *UNESCO*, 1998.

stored in glaciers.[2] According to the IPCC report in 2021, a warmer climate is expected to cause more environmental disasters, including severe wet and dry weather and climate events, which will have more implications for flooding and droughts.[3] Furthermore, the IPCC report 2023 mentioned that the size and scope of the effects of climate change are greater than estimated in previous assessments.[4] Therefore, climate change, which is frequently linked to changes in both the quantity and quality of water, exacerbates the rapidly worsening water situation. [5]

The problem of water pollution has now become one of the main environmental issues as a consequence of urbanisation,[6] industrialisation[7] and agriculture activities.[8] Many countries all over the world suffer from various types of water contamination.[9] The world's largely untreated wastewater is dumped back into the environment, causing pollution of rivers, lakes, and oceans, killing more people than war or other types of violence.[10]

Globally, more than 80% of wastewater is discharged directly into the environment without any treatment.[11]For instance, in Latin America, Africa, and Asia, high pathogenic contamination was found in one-third of all rivers. According to the United Nations Environment Programme (UNEP) report, one-seventh of all rivers faced severe organic pollution, while severe and moderate salinity was found in one-tenth of all rivers. As a result, this condition threatens food security, the fishing industry, and the human lifestyle. [12]

The river is a main water source that provides humans with drinking water, waterpower, hydroelectric power, food source, transport, and habitat for species. It is also crucial for agricultural and industrial activities. However, most human activities significantly alter and affect the natural system of rivers,[13] causing floods, erosion, channel incision, pollution and

---

2 Taikan Oki and Shinjiro Kanae, "Global Hydrological Cycles and Freshwater Resources Freshwater," *Science* 313, no. 5790 (2006): 1068–73, https://doi.org/10.1126/science.1128845.

3 Masson-Delmotte et al., *The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2021).

4 Katherine Calvin, "Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change," *IPCC*, 2023, https://doi.org/https://doi.org/10.59327/ipcc/ar6-9789291691647.

5 Sukanya S and Sabu Joseph, "Climate Change Impacts on Water Resources: An Overview," in Visualization Techniques for Climate Change with Machine Learning and Artificial Intelligence," *Elsevier*, 2023, 55–76, https://doi.org/https://doi.org/10.1016/b978-0-323-99714-0.00008-x.

6 Saad M. Potrous, "Assessment of Pollution Level and Its Impacts in the Shatt Al-Arab River in Basra Province, Iraq," *Research Advances in Environment, Geography and Earth Science* 8 (2024): 113–22, https://doi.org/https://doi.org/10.9734/bpi/raeges/v8/2022.

7 Regina Maria Bessa Santos, "A Framework Model to Integrate Sources and Pathways in the Assessment of River Water Pollution," *Environmental Pollution* 347 (2024).

8 Xu Yao, "Distribution, Mobilisation, Risk Assessment and Source Identification of Heavy Metals and Nutrients in Surface Sediments of Three Urban-Rural Rivers after Long-Term Water Pollution Treatment," *Science of The Total Environment* 932 (2024), https://doi.org/https://doi.org/10.1016/j.scitotenv.2024.172894.

9 National Research Council, *River Science at the U.S. Geological Survey* (Washington, DC: The National Academies Press, n.d.), https://doi.org/https://doi.org/10.17226/11773.

10 M Denchak, "Water Pollution: Everything You Need to Know," NRDC, accessed October 24, 2019, https://www.nrdc.org/stories/water-pollution-everything-you-need-know.

11 United Nations Environment Programme (UNEP), "Towards a Pollution -Free Planet Background Report" (Nairobi, 2017).

12 Programme (UNEP).

13 Johnson and Serinity, "5 Major Causes of Water Pollution," accessed October 24, 2019, http://lrwg.com.au/5-major-causes-of-water-pollution/.

loss of biological diversity.[14] Water pollution control is a serious challenge because these pollutants are mainly plastic, pharmaceuticals and other human wastes.[15] Apart from that, everyone's right to access clean water in the present era of climate change is becoming a problematic issue for many governments around the world, including Iraq. As highlighted by some studies, managing water resources from polluted rivers is getting more challenging due to climate change-related events, which has caused more water crises due to severe drought, desertification, floods, increases in temperature, glacier melting, precipitation patterns change, runoff, biodiversity loss, and transboundary conflicts. [16]

Iraq is located in the region between the Middle East and North Africa (MENA region), which is predicted to be the most vulnerable area in the world in terms of climate change impacts, such as higher temperatures, intense heat waves, desertification, decreasing precipitation, shifting distribution patterns, and higher evaporation. [17] As a result, Iraq presently suffers from loss of cultivated land, desertification, recurrent droughts, sandstorms, and decreased agricultural yields, which have become the pattern of change in Iraq's environment. [18] The problem of water contamination in Iraq was reported in Human Rights Watch's (HRW) Report in 2019. Rivers in Kurdistan, particularly the Tanjero River, are facing serious water pollution. The surface and groundwater in the Tanjero River basin area are no longer suitable for drinking.[19] Hence, river pollution is considered a major threat to human health and biodiversity in the Kurdistan Region.[20]

Kurdistan is located in western Asia and is referred to as the land of the Kurds. It consists of a wide area in the Middle East. In July 1923, an agreement between Turkey, the British Empire, and the Allies, the Treaty of Lausanne, divided the original Kurdistan into four separate parts, each in Turkey, Iraq, Syria, and Iran.[21] Subsequently, the Iraqi Constitution of 2005 recognised an autonomous Kurdistan Region to the north of Iraq.[22] Based on recent Iraqi government statistics, the population of Kurds in Kurdistan region alone is more than six million (6,370,668)[23]), while the whole population of Iraq is above forty five million (45,407,895)[24], meanwhile, the total population of Kurds has reached approximately 40 million

---

14 Council, *River Science at the U.S. Geological Survey*.

15 J Gabbatiss, "World Water Day 2019: What Are the Biggest Water Problems Facing the World Today? INDEPENDENT," accessed October 3, 2019, https://www.independent.co.uk/environment/world-water-day-2019-floods-drought-pollution-plastic-waste-a8833616.html.

16 Malin L. Pinsky et al., "Preparing Ocean Governance for Species on the Move," *Science* 360, no. 6394 (2018): 1189–91, https://doi.org/10.1126/science.aat2360.

17 Mohanna Zarei, "The Water-Energy-Food Nexus: A Holistic Approach for Resource Security in Iran, Iraq, and Turkey," *Water-Energy Nexus* 3 (2020): 81–94, https://doi.org/10.1016/j.wen.2020.05.004.

18 Nasrat Adamo et al., "Climate Change : Consequences on Iraq ' s Environment," *Journal of Earth Sciences and Geotechnical Engineering* 8, no. 3 (2018): 43–58.

19 Salwan S Al-hasnawi, "Water Quality Index Of Tanjero River Basin Near Sulaymania City," *Al-Mustansiriyah J. Sci.* 23, no. 8 (2012): 193–200.

20 Nasih Othman, "Environmental Health Assessment in Sulaymaniyah City and Vicinity," no. May (2017), https://doi.org/10.13140/RG.2.2.12898.12483.

21 Ala Jabar Mohammed, "The Politics of Iraqi Kurdistan: Towards Federalism or Secession?" (2013).

22 "Article 117 Paragraph 1" (n.d.).

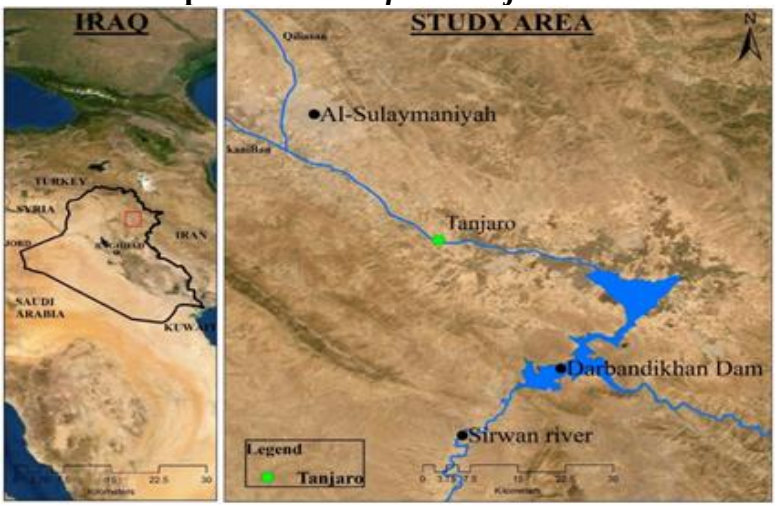
23 Based on new coducted census, 84.0 % of people in the region lives in urban area, and 16.0% lives in rural areas. The growth rate of the Kurdistan Region is 2.48%. Kurdistan Region Statistics Office, Preliminary Results of the 2024 Census of Residents and Population, accessed January 27, 2025, https://krso.gov.krd/en .

24 Step News, Preliminary Results of the 2024 Census of Residents and Population, accessed 27 January, 2025, https://stepagency-sy.net/2024/11/25/ .

in 2018.[25] Geographically, Kurdistan is mountainous, with reservoirs, rivers, streams, springs, and some marshlands. Thus, it is a conducive environment for many varieties of birds (more than 100 types), animals, fishes, plants and other species.[26]

Kurdistan is also wealthy in terms of water resources such as springs, groundwater, and rainwater. About 60% of the total water flow is sourced from within Kurdistan. Five rivers flow across the region: Khapoor, Great Zab, Little Zab, Awaspee, and Serwan. [27]However, river pollution in Kurdistan poses a risk to human health and biodiversity[28] where industrial projects and the sewage system for instance have caused damage to most of the natural resources affecting marine life and the flora and fauna of these areas.[29]

Map 1: ***Location of the Tanjero River***



Source: *Arc GIS 10.3 Software*[30]

The quality of Iraqi water resources has been deteriorating since the 1980s, primarily due to poor management of upstream water resources, insufficient regulation to control water pollution, and lack of enforcement.[31] For instance, in the Basra Governorate, situated in southern Iraq, almost 4 million people do not have access to clean water. As reported by WHO, the Basra Governorate experienced serious water pollution in the spring of 2018, causing health problems for at least 118,000 people. It was reported that 4,000 individuals were compelled to leave their homes in August 2018 because they did not have access to drinkable water.[32] This problem arose because of the federal and local governments' mismanagement of water resources, insufficient water protection and sewer system regulations, and poor water infrastructure. As a result, rivers encountered unprecedented levels of human pollution when more than 500,000 cubic meters of raw sewage were discharged daily into rivers from the

[25] BBC NEWS, "Who Are the Kurds?," bbc.com, accessed September 28, 2019, https://www.bbc.com/news/world-middle-east-29702440 .
[26] Korsh Ararat, Ibrahem M. Abid, and Saman Abdul Rahman, "Key Biodiversity Areas," Iraq Nature, 2010.
[27] Almas Heshmati and Khazal Auzer, "The Role of Natural Resources in Kurdistan Regional," *UKH Journal of Social Sciences* 2, no. 1 (2018): 1–14, https://doi.org/10.25079/ukhjss.v2n1y2018.1-14.
[28] Othman, "Environmental Health Assessment in Sulaymaniyah City and Vicinity."
[29] Ararat, Abid, and Rahman, "Key Biodiversity Areas."
[30] Arc GIS, "10.3 Software," accessed November 20, 2019, https://www.arcgis.com/index.html#.
[31] HRW, "Basra Is Thirsty," www.hrw.org, accessed November 29, 2021, https://www.hrw.org/report/2019/07/22/basra-thirsty/iraqs-failure-manage-water-crisis .
[32] HRW.

industrial and manufacturing sectors, seriously affecting water quality. Consequently, the area's drinking water quality was below the WHO standards.[33]

Although studies have been conducted regarding water resources and river pollution in the Kurdistan region, almost all of them are concerned with a scientific approach. In other words, the existing research is mostly in the legal field.[34] Therefore, there is a lacuna in the legal literature about the legal aspects of the Tanjero River pollution. which requires immediate attention for the river management in the Kurdistan Region; the objective of the paper is to analyse the legal framework and enforcement relating to the Tanjero River pollution. Based on that, the paper highlights the legal shortcomings by examining relevant legislation, such as the Iraqi Constitution, Law No. 8 (2008) for Environmental Protection and Improvement. The qualitative and socio-legal approaches employed to conduct the context analysis include primary and secondary data.

RESEARCH METHODS

The paper employed content analysis to examine the Iraqi Constitution, the environmental laws and other related laws. By adopting a qualitative and socio-legal approach, content analysis from primary and secondary data was done for this paper. The study also employed a semi-structured interview with 10 respondents (see Table 1) who are stakeholders and specialise in this subject to better understand this field by using online interviews through Google Meet. The interview data were transcribed into text form using a thematic approach for the data analysis. Atlas.ti software has been used for data analysis.

Table 1: ***list of interview participants***

No	Name of Participants &Symbol	Position	Method	Date of Int.
1.	Sanger Dawod Mohammed: Symbol: Participant 1	Assistance Professor, Salahadden University, Hawler, Iraq.	Online	8 February 2021
2.	Rezan Omer Rasheed: Participant 2	Assistance Professor, Sulaymaniyah University, Iraq.	Online	19 February 2021
3.	Abdulmutalib Raafat Sarhat: Participant 3	Assistance Professor, Garmian University, Kalar, Iraq.	Face to Face	
4.	Hamdi Hamza: Participant 4	EPI Board, Hawler, Iraq.	Online	18 February 2021
5.	Diyar Gharib Latif: Participant 5	EPIb, Directorate of Sulaymaniyah, Iraq.	Face to Face	25 May 2021
6.	Jalal Mohammed Amen: Participant 6	Kurdistan Parliament	Online	11 February 2021
7.	Muslim Abdullah Rasul: Participant 7	Kurdistan Parliament		9 February 2021
8.	Ranj Ata: Participant 8	KNO.NGO, Sulaymaniyah, Iraq.	Online	29 January 2021
9.	Nabil Ibrahim Musa: Participant 9	Director of Iraqi Water keeper, NGO, Sulaymaniyah, Iraq.	Online	27 January 2021
10.	Rawezh Star Nabi: Participant 10	Legal adviser, KNO.NGO, Sulaymaniyah, Iraq.	Online	31 February 2021

[33] Nadhir A. Al-Ansari, "Management of Water Resources in Iraq: Perspectives and Prognoses," *Engineering* 05, no. 08 (2013): 667–84, https://doi.org/10.4236/eng.2013.58080.

[34] Nizar HamaSalh, "Water Quality Index (WQI) Of Some Wells Located In The Region Of Kani Goma And Kanasura In Sulaimani Governorate," *Journal of Zankoy Sulaimani* 16 (2014): 77.

ANALYSIS AND DISCUSSION

Right to access the clean water

Environmental rights are seen as a third generation of human rights. The first generation was civil and political rights, followed by economic, social, and cultural rights, which came about after the Second World War, such as the right to work and the right to education. In the 1980s, the right to a safe environment appeared as a third-generation right, along with the right to environment, security, and development.[35] The right to a healthy environment for every human being was mentioned in international conferences and conventions after the Second World War, for instance, in the 1972 Stockholm Declaration.[36] Following the Stockholm Declaration, many states adopted environmental rights in their constitutions.

Before 2010, the right to clean water was not explicitly recognised as a basic human right. The right to clean water and sanitation was only recognised explicitly by the General Assembly of the United Nations (UNGA) as a human right on 28 July 2010 by adopting resolution number 64/292 as follows*:* "The right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights."[37] The resolution makes a state responsible for protecting this right, like any other human right, to provide safe, potable water for its people. Simultaneously, countries and other international organisations are obliged to assist other countries, notably the developing ones, through financial funding, enhanced capacity building and the adoption of modern technology to develop access to clean, safe, affordable potable water and sanitation services for all.[38] This is especially so when the right to clean water is gaining greater consideration in the 2030 Agenda of Sustainable Development Goals (SDGs),[39] Goal number 6 is “Ensure availability and sustainable management of water and sanitation for all.” To accomplish this goal, one related target is “By 2030, achieve universal and equitable access to safe and affordable drinking water for all.”

Since pollution is an impediment to access to safe water, one of the targets of water quality protection is to minimise pollution and prevent waste discharge into water resources. It states, "6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally."

As a result, there is positive progress with regard to the independent right to water. It is further predicted that the right to water could be a subject for a "future customary norm or even a general principle of law and, thus, becomes an independent human right”.[40] Some countries have also started to formulate the right to access clean water as a concept of human rights in their respective constitutions and environmental laws. The constitutional recognition of

---

35 Rajab Mahmood Tahin, *Constitutional Frame for Environmental Right* (Qahira: Dar-AL-Nahzah AL-Arabia, 2008).

36 Jamal Mahmmod AL-Kurdi, *Studies in Environmental Laws* (Qahira: Dar-AL-Nahzah AL-Arabia, 2010).

37 United Nations, “The Human Right to Water and Sanitation,” digitallibrary.un.org, n.d.

38 Nations.

39 UN, “Annex: Global Indicator Framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development,” *Work of the Statistical Commission Pertaining to the 2030 Agenda for Sustainable Development*, 2019.

40 Nehaluddin Ahmad, “Human Right to Water under International Law Regime : An Overview,” *Commonwealth Law Bulletin* 0, no. 0 (2020): 1–25, https://doi.org/10.1080/03050718.2020.1770618.

everyone's right to access clean water is fundamentally crucial for all states. Governments must sustainably manage their water resources and provide everyone safe and affordable access to clean water. The pollution of rivers in Kurdistan is a threat to the right to safe water and, accordingly, requires more attention to the legal content.

Pollution in the Tanjero River

The Tanjero River is located about 7km southwest of Sulaymaniyah City (See Map 1). The Qiliasan and Kani-Ban streams confluence in Kani-Goma village, near Sulaymaniyah City, to form the Tanjero River. Sulaymaniyah City is one of the four governorates of the Kurdistan Region of Iraq (KRI), with a population of about one million. It is located approximately 370 kilometres to the northeast of Baghdad at coordinates 35.557 and 45.443. The city is located in a valley at the foot of Goizha Mountain, which extends over an area of about 470km southwards to the lower lands surrounding the Tanjero River. [41]

The Tanjero River is a source of potable water, agricultural irrigation and other activities.[42] However, this river has suffered from anthropogenic pollution for a long time. According to the study[43] Tanjero River is polluted by heavy metals, significantly impacting its water quality. Nickel (Ni), which is toxic to most species of aquatic plants, has gradually caused serious effects on marine life. The study noted that municipal wastewater is a substantial contributor of Nickel in natural water. Chromium (Cr) is moderately toxic to aquatic organisms, and the main sources of Chromium are rivers, urban runoff, and domestic and industrial wastewater.

The surface and groundwater in the Tanjero River basin area are not suitable for drinking. The study took surface and groundwater samples by applying the water quality index (WQI). The parameters chosen were Ca^{2+}, K^{+}, NO^{3-}, Ni, Pb, Cd, and Zn to analyse the WQI for surface and groundwater samples. The result of this study indicated that the pollution levels were in excess of the WHO water drinking standards. In contrast, Through GIS mapping, the study identified that the wastewater contributed significantly to the contamination of the surface and groundwater of the Tanjero basin area.[44]

The Tanjero River is polluted by different anthropogenic factors, such as untreated sewerage waste from Sulaymaniyah City and various untreated solid waste from the municipality and industries, including medical and agricultural. For instance, untreated solid waste in Sulaymaniyah city is estimated to be about 1250 to 1300 tons and is dumped daily into an area only about 100 meters from the Tanjero River. These materials chiefly contaminated the Tanjero River with poisoning, toxic elements and heavy metals. This pollution of the Tanjero River would then flow into Darbandikhan Lake (see Map 1), which is the main source of drinking water for the population of Darbandikhan town.[45]

---

41 Othman, "Environmental Health Assessment in Sulaymaniyah City and Vicinity."

42 Nizar y. Hama-Salah Nigar A. Aziz, Sabah M. Salih, "Pollution of Tanjero River by Some Heavy Metals Generated from Sewage Wastewater and Industrial Wastewater in Sulaimani District," *Journal of Kirkuk University –Scientific Studies* 7, no. 1 (2012): 67–83.

43 Nigar A. Aziz, Sabah M. Salih.

44 Al-hasnawi, "Water Quality Index Of Tanjero River Basin Near Sulaymania City."

45 Othman, "Environmental Health Assessment in Sulaymaniyah City and Vicinity."

According to some statistics, the region collected about 7000 tons of solid waste daily.[46] Although, a recycling project known as 'Recycling Factory of Sulaymaniyah; was completed in August 2020 for the purpose of solid waste treatment, this project has yet to officially take off and is in fact unable to recycle certain wastes from the medical, sewer and construction sectors.[47] Despite many demonstrations and protests by environmentalist volunteers and green organisations, the Tanjero River remains polluted, causing socio-economic catastrophes. It would seem that the government does not even have a basic plan to overcome this problem.[48]

Socio-economic impacts of pollution in the Tanjero River

The polluted Tanjero River significantly contributed to the high risk of short—and long-term health problems for the residents, farmers, and the animals and aquatic life in the area. The polluted water of the Tanjero River flows directly into Darbandikhan Lake. It is subsequently directed into the Serwan River, which is the main source of drinking water for Kalar City in Kurdistan. It is believed that the high ratio of cancer patients in Kalar City and the Garmian region is caused by river pollution.[49]

There was a marked increase in residents around the Tanjero River suffering from waterborne diseases, in particular diarrhoea and cholera, due to this physical, biological, and chemical contamination.[50] The study shows that in 2018, heavy metal pollution in the Tanjero River caused environmental and health risks, such as "death of aquatic life, algal blooms, habitat destruction and other short and long-term toxicity."[51]

The COVID-19 pandemic brought about more socio-economic challenges for governments around the globe, including the Kurdistan region. Hazardous waste poses risks to the environment, causing water, air, and soil pollution, which requires proper management.[52] Thus, urgent action is needed to solve the root socio-economic problems through sustainable river management based on a comprehensive legal framework.

Legal framework for river protection in the Kurdistan Region, Iraq

The Iraqi Constitution

It is crucial to have a comprehensive, flexible, practical regulatory framework for water resources enhancement, management and protection[53] since everyone's right to clean water has

---

[46] Ranj Sangawe, "Le Gall Ranj Program," www.rudaw.net, accessed March 22, 2021, https://www.rudaw.net/sorani/onair/tv/episodes/episode/lagal-ranj-22032021.

[47] Sangawe.

[48] Sherin Ahmed, "Pollution Threat Thousands of Sulaimnyiha Resedent's Live -No Solution till Now," 2019, 5–7.

Wakaltyaqein, *Yaqein.net*, accessed https://yaqein.net/politics/125890

[50] Othman, "Environmental Health Assessment in Sulaymaniyah City and Vicinity."

[51] Salih N. Majid Majid, Ahmed I. Khwakaram Khwakaram, and Chalang S. H. Gado Gado, "Pollution Status Evaluation of Some Heavy Metals along Some Surface Water Sources by Multivariate Data Analysis at Sulaimani Governorate," *Journal of Zankoy Sulaimani - Part A* 20, no. 1 (2018): 63–80, https://doi.org/10.17656/jzs.10642.

[52] Muhammad Hadin Muhjad, Fakhruddin Razy, and Ahmad Fikri Hadin, "The Problematics of Management Personal Protection Equipment Waste Related to Covid-19 in Indonesia," *Sriwijaya Law Review* 5, no. 2 (2021): 300–308, https://doi.org/10.28946/slrev.Vol5.Iss2.1161.pp300-308.

[53] Salman M A Salman and Daniel D Bradlow, *Regulatory Frameworks for Water Resources Management* (Washington DC: The World Bank, 2006).

been recognised as a human right. Therefore, before discussing the legal framework for river protection in Kurdistan, this study will examine the Iraqi Constitution on recognising the right to clean water. Environmental rights have been adopted as human rights by many countries. For Iraq, this right is stated in Article 33 of the Iraqi Constitution of 2005[54] "Every individual has the right to live in safe environmental conditions." The second paragraph of the same Article further clarifies that the government has a duty to provide a safe environment and protect biodiversity: "The State shall undertake the protection and preservation of the environment and its biological diversity."

Accordingly, based on Article 33, every person has a right to live in a safe environment, and the state shall guarantee preserving the environment and biodiversity. Further, Article 31 of the Constitution states that the Iraqi Government protects public health. It is clear that the Constitution of Iraq inexplicitly recognises the right to clean water and the right to a safe environment. The government has a constitutional commitment to provide a healthy environment for its people by preventing environmental threats such as river pollution that can jeopardise the environment and cause health problems.

Regarding the region's constitution, Kurdistan has yet to have its own constitution. However, the existing draft[55] has included the protection of environmental rights as a main obligation of the government, private sectors, and individuals. Therefore, the main duty of Kurdistan's legislature is to adopt this constitutional principle by regulating a legal framework to protect environmental rights. Thus, it is recommended that a provision be added to explicitly recognise everyone's right to clean water and sanitation in the forthcoming constitution of the region.

Assessment of Environmental Legislation Towards Water Pollution Prevention in Kurdistan

Regarding the legal framework for water resources protection in the Kurdistan Region of Iraq (KRI), Law No. 8 (2008) is an act for the Kurdistan Region-Iraq Environmental Protection and Improvement as the basic environmental law on water resources protection, including rivers. The study attempts to discuss the context of the law to examine the legal framework of river protection through both library-based sources and fieldwork by interviewing relevant stakeholders to discuss those issues.

Law No. 8 (2008) is the main environment law in Kurdistan. One of the main purposes of this law is to preserve and improve Kurdistan's environment and to prevent pollution. Para 1 of Article 2 states, "Maintaining the region's environment, protecting, improving, developing and preventing it from pollution." Following the intention of Article 2, this law should meticulously consider all factors that threaten water pollution. However, the existing literature that appraises this law on water protection is presently limited.

[54] Constitute, "Iraqi Constitution," Constitute, accessed August 12, 2021, https://www.constituteproject.org/constitution/Iraq_2005.pdf?lang=en.

[55] The Kurdistan Parliament has not officially promulgated the constitution of the Kurdistan region; it is still being developed.

Some legal scholars[56] criticised the claim that Law No. 8 (2008) does not include any incentive to protect the environment, for example, allowing tax exemptions, providing facilities or encouraging the establishment of a green industry that is environmentally friendly to reduce carbon dioxide emission and to combat other forms of pollution. Further, despite Articles 44 and 45 of Law No. 8 (2008) empowering the Council of Ministers to issue regulations to facilitate the execution of the law, those powers have yet to be exercised. As a result, the government and the courts are hindered from implementing the law on many environmental issues. The Article reads as follows:

> "Article 44: The Council of Ministers, depending on the Ministry's suggestion, can issue the required regulations for executing the rules of this law. Article 45: The Minister can issue the required instructions for executing the rules of this law."

In terms of water protection, one of the weaknesses of Law No. 8 (2008) Environmental Protection and Improvement is that there are only three articles relating to the maintenance of water resources in Kurdistan, namely Articles 22, 23 and 24 as follows:

> "Article 22: The exertion and discharging of any harmful substances, liquid, gaseous, radioactive or thermal, into water sources or their streams is prohibited if they are not treated according to usual standards. Article 23: Determination of regional standards for surface, ground, and drinking water will be set by regulation. Article 24: The Ministry determines the measurement for the pollution level that is permissible in water used for drinking, irrigation, industrial, and services, with returning to this measurement when needed."

Additionally, the provisions on the protection of water in Law No.8 (2008) Environmental Protection and Improvement in Kurdistan are extremely brief and insufficient as they do not tackle significant issues such as waste disposal, wastewater, waste dumping into the water, or any attack on aquatic life. [57]

According to one of the participants, who is an expert in environmental law, Law No.8 (2008) requires further specific regulations on water resources protection. He said:

> "The legal problem of Law No.8 (2008) EPI is that this law merely states the general rules and principles which actually require the issuance of specific regulations and instructions to clarify the implementation of these general rules, but at the moment, there is none."[58]

Based on his opinion, the absence of such regulations and instructions is a challenge for the enforcement of this law. However, according to another participant[59] of the study, Law No.8 (2008) is outdated and needs a fresh revision to overcome this problem.

He further highlighted the problem of safeguarding water resources under Kurdistan's environmental law (Law No.8 / 2008) since the law does not provide a comprehensive legal framework for water resources management and protection, even though the region is rich in

---

[56] Sangar Dawd Mohammed, "Critical Remarks on the Law of Protection and Improvement of the Environment in the Kurdistan Region - Iraq No. (8) of (2008)," *Qalaai Zanist Scientific Journal* 4, no. 3 (2019): 836–64, https://doi.org/10.25212/lfu.qzj.4.3.19.

[57] Mohammed.

[58] Participant 1.

[59] Participant 7. He is a member of the Kurdistan Parliament with 10 years' experience on the Board of the Committee of Health, Environment and Consumer Rights Affairs and is also of the opinion that: "Law No. 8 (2008) is a basic environmental law which will need to adapt to the evolution of time and geographic developments and definitely needs a revision. Therefore, we had a meeting with the EPI Board about the amendment of the law. Even though this law has some positive provisions, it also has some shortcomings in terms of the administrative and enforcement aspects."

water resources. [60] Similarly, another parliamentarian emphasised the insufficiency of the laws and the necessity to enhance Law No.8 (2008) to provide sufficient protection. He said[61]:

> ".In addition, a former legal expert[62] of Environmental Protection and Improvement Board (EPIB) elaborated on the insufficiency of Law No.8(2008), criticising Article 22 for not mentioning "river." On the other hand, he also said that "after about 13 years of its promulgation, this law has still not taken effect in the region." For instance, Articles 23 and 24, which concern creating regional standards for water, are still not enforced properly by the Environmental Board(EPIB).

Environmental organisations and water activists have been calling for the development of Law No.8 (2008) to guarantee the protection of water resources from anthropogenic factors and face anticipated environmental challenges, including neighbouring water projects of Turkey and Iran and climate change. [63]

Likewise, another participant who is a legal adviser in the same NGO criticised Law No.8 (2008): " Although we do not have specific laws on rivers, Law No.8 (2008) is about the environment, which includes water. Unfortunately, this law is more concerned with wildlife, forests, and projects compared to water protection."[64] Meanwhile, one of the participants from the Water Keepers Iraq- NGO[65] believes that although the environmental legislation in the region is somewhat better than the Iraqi equivalent, its enforcement is an obstacle to protecting rivers in Kurdistan. He said that "the environmental legislation in Kurdistan is better compared to the Iraqi environmental law in this regard. The problem is in its enforcement. We would be grateful if KRG could enforce even a quarter of Law No.8 (2008). I do not need the law without its enforcement."

Based on the discussion, most respondents share the same view on the inadequacy of Law No.8 (2008) as the general environmental law to protect rivers in that it does not comprehensively regulate the protection of water resources. Hence, an urgent amendment to the existing law is required to overcome environmental challenges in the region in the climate change era, including the problem of river pollution, such as the Tanjero River. Apart from the legal framework, lack of enforcement is a considerable obstacle to protecting the environment, including rivers in the region. Accordingly, the role of governmental institutions in protecting water resources and enforcement challenges in KRI are discussed below.

Institutional responsibility for river protection

---

60 Participant 7.

61 Participant6. He said that: "Law No.8 (2008) has a problem with its objectives and provisions. This law is not specific or comprehensive enough, particularly regarding water quality and quantity protection, it needs to be amended and improved".

62 Participant 4.

63 Participant 8, as a volunteer in environmental NGOs, also said, "Law No.8 (2008) was issued in 2008 due to the efforts from the NGOs, academics and other environmentalists at that time. I can say it was good law then. However, with regard to water, we noted that this law is silent about water resources as one of the significant elements of the environment compared to other environmental elements such as soil, forest, illegal hunting for wildlife and other biological diversity."

64 This participant(No.10) elaborated further and said that "Law No.8(2008) does not mention river pollution nor does it highlight special penalties for specific depths and types of river pollution and other degradation of water resources… Instruction No.7 (2013) issued by the Board about drilling wells is inadequate as it does not include water-related issues such as pollution, destruction, or river direction changes. Therefore, Law No.8 (2008) has weaknesses and shortcomings regarding the current water situation."

65 Participant9.

According to Law No.3 (2010) for the Environmental Protection and Improvement Board of Kurdistan Region (EPIB), EPIB is the main institution responsible for preserving and enhancing the environment, including rivers. Article 8 stipulates that a council called the Council of Environmental Protection and Improvement is to be established in every governorate.

Although Law No.8 (2008) makes a reference to the Ministry of Environment, the current Kurdistan Region Government (KRG) did not establish such a ministry. Instead, there is only a Board of Environment. Subsequently, in 2015, the Council of Ministers of the federal government of Iraq decided to combine the Ministry of Environment (MoE) and the Ministry of Health (MoH) to become the Ministry of Health and Environment due to financial difficulties. However, based on the announcement by the MoE on August 5, 2021, the MoE, both administratively and financially, has been separated from the MoH based on Article 44 of the Law of Public Health Warranty of 2020.[66] Further, work is still ongoing to dedicate a special budget for MoE to enable the Ministry to manage its tasks based on Law No.37 (2008) for the Ministry of Environment.[67] If enforced, this will be a crucial step towards enabling an independent MoE to handle the impacts of climate change and river protection in Iraq.

The establishment of the EPIB in the Kurdistan region and the combination of the MoE with the MoH caused a further marginalisation of environmental issues. This was because EPIB did not have executive powers but was merely an oversight institution, solely in charge of monitoring the performance of other ministries and the impacts on the environment. In addition, it was not sufficiently independent as it is based on Article 2 of Law No.3 (2010) and is subordinate to the Council of Ministers. Therefore, the Federal Government and KRG should not hesitate to prioritise the environmental issues by establishing specific institutions, such as the MoE, to address the various environmental challenges in Iraq, including the Kurdistan Region.

EPIB was formed according to Law No. 3 (2010) as the Environmental Protection and Improvement Board in the Kurdistan Region. According to Article 3, the main objective of EPIB is to maintain and enhance Kurdistan's environment and prevent pollution and activities that are dangerous to the ecosystem and human health. EPIB has a legal status as well as financial and administrative independence. Moreover, according to Article 2, EPIB is associated with the presidency of the Council of Ministers to manage its administrative tasks.

This law accorded powers to EPIB to enable it to achieve its goals of protecting the environment and abating environmental threats. For instance, its main objectives include making proposals to the Council of Ministers regarding public environmental policies to save the environment and prevent pollution, drawing up short and long-term environmental plans, and issuing environmental instructions and rules to control and oversee projects that may affect the environment to ensure the protection of the environment while taking into account related international conventions and executive laws.[68]

---

66 NAS, "Environment Return as the Independent Federal Ministry," nasnews.com, accessed December 22, 2021, https://www.nasnews.com/view.php?cat=66729 .

67 NAS.

68 Law No. 3 Article 4, "The Environmental Protection and Improvement Board in Kurdistan Region" (2010).

However, EPIB is still facing obstacles in achieving its objectives, as confirmed by several participants[69] who believed that the legal status of EPIB is weak and requires legislative reinforcement to enable it to deal with the challenges to its enforcement powers. A participant[70] who is a member of the Kurdistan Parliament, summarised the legal status of EPIB as a "follow-up agency" since it was not authorised with the enforcement power, which was fragmented across other institutions.[71]

Further, another participant[72] with about 13 years of experience on EPIB, confirmed that the public is not fully aware of the functions of EPIB, which also creates a problem in terms of coordination between EPIB and the other agencies, such as "Environment Peshmerga and Forest Policy" He suggested that the government should have a separate ministry for the environmental management and protection. In addition, EPIB encountered barriers, including insufficient human, technical and financial resources. At the governorate level, the EPIB has its own directorate called the Directorate of Environment Protection and Improvement in Sulaymaniyah, confirming its aforementioned shortcomings. [73]

Therefore, it is vital to establish an independent MoE with sufficient jurisdiction and financial budget to be an effective executive institution to protect rivers and minimise environmental threats through efficient coordination with the other relevant ministries.

Fragmentation of river management

The multidisciplinary nature of rivers makes it necessary to involve multiple agencies with a common commitment to the maintenance and improvement of rivers in KRI. Therefore, in addressing the legal problems relating to the pollution of the Tanjero River, it is necessary to conduct research with respect to the legal framework of related agencies by clarifying their legal responsibilities, as shown in Table 2.

Table 2: ***Involvement of different institutions in river protection in KRI***

Institution	Law	Scope
Environmental Protection and Improvement Board in the Kurdistan Region-Iraq.	Law No.3 (2010) An act for the Kurdistan Region-Iraq Board for the Protection and Enhancement of the Environment.	The main objective is to maintain and enhance Kurdistan's environment and prevent pollution or other activities which endangers the ecosystem and human health.
Ministry of Agriculture and Water Resources.	Law No.6 (2010) An act for the Kurdistan Regional Government-Iraq, Ministry of Agriculture and Water Resources.	Setting strategic plans and policies to invest in and improve agriculture and water resources, including protecting the water quality and preventing pollution.
Ministry of Municipalities and Tourism of the Kurdistan Region-Iraq.	Law No.12 (2010) on the Ministry of Municipalities and Tourism of the Kurdistan Region-Iraq.	The Ministry's main objective is to provide municipal and tourism services to secure the residents' needs for drinking water, sewerage and drainage systems, and filtered stations or water treatment plants.

[69] Participants 4, 5 and 7.

[70] Participant 7.

[71] In this regard, this participant said, "The Environmental Protection and Improvement Board in Kurdistan is a monitoring and follow-up agency. It does not have the power to enforce the law and regulations, which is instead assigned to other institutions. In other words, the environmental-related powers are fragmented. It is imperative that all necessary powers relevant to the environmental issues of projects be given to the Board. In addition, the Board should have a special policy to enable it to enforce the law."

[72] Participant 4.

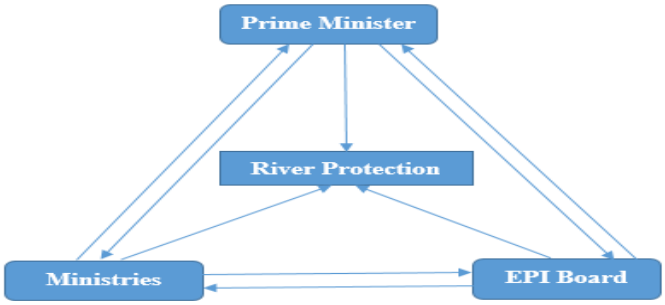
[73] Participant 5.

Ministry of Natural Resources	Law No.21 (2007) An act for the Kurdistan Regional Government-Iraq Ministry of Natural Resources. Law No.22 (2007) An act for the Kurdistan Region-Iraq Oil and Gas.	The Ministry should develop the oil industry in a way that reduces environmental damage for a sustainable economy.
Ministry of Trade and Industry	Law No. 10(2010) of the Ministry of Trade and Industry in the Kurdistan Regional Government-Iraq.	The main objective is to develop and implement trade and industry policies that will achieve economic and social development in the region.
Ministry of Health	Law No.15 (2007) An act for the Kurdistan Regional Government-Iraq Ministry of Health.	To protect the safety and health conditions of the people in the Kurdistan Region through measures and tools to prevent and curb diseases.

Source: *Collected by researcher*

The EPIB has relationships with other relevant ministries, as can be seen in Figure 1. Its council consists of representatives of ministers such as the Ministry of Agricultural and Water Resources (MoAWR), the Ministry of Health (MoH), and the Ministry of Municipalities and Tourism (MoMT).[74]

Figure 1: ***Environmental Protection and Improvement Board in KRG***



Source: *Researcher*

In KRG, river protection is very fragmented and involves many different agencies, as can be seen in Table 2. Since the activities of these ministries impact the environment, including rivers, they are empowered under their respective laws to combat pollution. For example, MoAWR is responsible for the development of agriculture and water resources, including river quality, usage, and irrigation, among others.[75] Meanwhile, MoMT, under Law No. 12 (2010) on the Ministry of Municipalities and Tourism of the Kurdistan Region-Iraq, is also accountable for significant environmental preservation issues. MoMT's main objective is to provide municipal and tourism services. As paragraph 1 of Article 2 states, "Providing municipal and tourism services to ensure the residents' needs of clean drinking water, sewerage system for heavy water (water waste), rainwater and its filtering station."

The Ministry of Natural Resources (MoNR) is responsible for oil and gas management, and its jurisdiction includes monitoring and controlling oil projects from the initial stage of oil and gas discovery up to its exporting, marketing and selling[7677]. The Ministry should work "to ensure that the petroleum industry is developed in a way that minimises damage to the natural environment, is economically sustainable, promotes further investment and contributes to the Region's long-term development; and is reasonable and consistent with good oil industry

[74] Article 4, the Environmental Protection and Improvement Board in Kurdistan Region.
[75] The Law No.6, “Ministry of Agriculture and Water Resources” (2010).
[76] Law No.21, “The Ministry of Natural Resources” (2007).
[77] Law No.21 (2007) the Ministry of Natural Resources.

practices".[78] In addition, Law of Oil and Gas No. 22 (2007) authorises the MoNR to manage this task by introducing regulations to protect the environment in oil and gas projects.[79] Simultaneously, Article 30 of Law No.8 (2008) states that "The Ministry with coordination with the related agencies, puts suitable environmental conditions for the activities of exploration, mining, quarries, smasher, washers, mines, extraction of petroleum resources and others in a form that protects the natural resources in the region from pollution and depletion".

Oil project practices have caused an alarming rate of environmental degradation in the Kurdistan region.[80] Although Law No. 22 (2007) for Oil and Gas authorises the MoNR to enact specific environmental regulations for oil and gas projects in Kurdistan (as mentioned above), special environmental regulations to control oil pollution do not exist.[81] The existence of illegal oil refineries in the Tanjero River area is a contributing factor to the frequent oil truck accidents that cause oil spills into the Tanjero River. For instance, between 2013 and 2014, a total of 38 oil truck accidents occurred (see Image 2), with each truck carrying approximately 36000 litres of fuel. This caused soil and water contamination as almost all of the fuel flowed directly into the Serwan River.[82]

All the interviewed participants emphasised on the oil pollution crisis in the region, and one of the participants[83] shed light on the impact of oil projects on river pollution in the region, particularly illegal oil refineries in the Tanjero River area, which pose risks to the river and surrounding ecosystem.[84]

Image 1: ***Oil truck accident near the Darbandikhan Dam and Serwan River***

Source: *(KNO ,2017)*[85]

[78] Law of Oil and Gas No.22 Article 7, "Kurdistan Region-Iraq" (2007).

[79] Law of Oil and Gas No. 22 Article 53/sixth, "Kurdistan Region-Iraq" (2007).

[80] Arez Mohammed Sediq Othman, "Legal and Ethical Obligations of Oil Companies in Preserving Natural Environment; a Case Study of the Kurdistan Regional Government's Production Sharing Contracts," *Journal of University of Human Development* 2, no. 4 (2016): 390–98, https://doi.org/10.21928/juhd.20161225.15.

[81] Othman.

[82] Hiwa Rashid, "The Role of Administrative Authority in Protecting Environment from the Harms of Oil Projects" (Alexandria University, 2016).

[83] Participant 8.

[84] She said that, "In Kurdistan, the manner of extracting, refining, and transporting crude oil is unsystematic. Oil transportation by trucks and the discharge of water waste directly from the oil refineries into water resources cause river pollution and other environmental damage. For instance, illegal oil refineries in the Tanjero River cause water pollution to the river."

[85] NATURE IRAQ, "Kurdistan Nature Organization," 2017.

The Ministry of Trade and Industry (MoTI) is responsible for formulating and implementing trade and industry policies to ensure economic and social development in the region.[86] Based on Article 3 of Law No.10 (2010), the MoTI is entrusted with several tasks relevant to the trade and industry sector, from the initial stages to the establishment of industrial projects, granting permission and controlling and monitoring the practices of these projects. However, industrial waste remains a principal factor in environmental pollution, including rivers.

The same participant[87] also mentioned the existence of illegal factories in the vicinity of the Tanjero River, which is a considerable factor in the Tanjero River pollution. Other participants[88] have also referred to the dangers of industrial wastes causing deteriorating water quality in the Tanjero River and its impact on humans, animals and all biodiversity. According to him, "There are many industries and 27 oil refineries in the Tanjero area, which release their liquid wastes (including several types of chemical and heavy metals) without any pretreatment into the Tanjero River and usually in the months of July and August, thousands of fishes are found dead." [89]

Apart from that, the post 2003 economic development has resulted in a noticeable growth of industrial activities in the region,[90] for instance, quarry activities, which also contribute to river pollution in Kurdistan such as the Tanjero River, the Serwan River and the Little Zab. As a result, the Iraqi Legislature issued Law No. 91 (1988) for the Regulation of Mineral Investment, which is also enforceable in Kurdistan. This law aims to implement a scientific method and more comprehensive supervision over mineral investment to guarantee a high-quality investment by the public and private sectors in relation to the mineral fields while protecting the environment and natural resources. Although this law has some mechanism in place in Article 3 to reduce the environmental consequences of quarry activities, these provisions are still inadequate. For example, Para 2 of Article 3 protects environmental elements such as forests, dams, and agricultural lands. However, there is no explicit provision for protecting rivers from the impact of mineral activities. Most quarry activities are near rivers, including Tanjero, Great Zab and Little Zab. The study participants have confirmed the impact of mining projects on rivers, particularly quarry activities. One of them, a prominent water activist in Kurdistan[91] said, "Quarry activities are considered one of the main factors that

[86] Law No. 10 Article 2, "Of the Ministry of Trade and Industry in Iraqi Kurdistan Region" (2010).

[87] Participant 8. She clarified further in this regard and said, "In Tanjero, some factories were illegally erected, including oil refineries, plastic factories, cork factories, and iron factories, because the owners of these factories either hold high positions in a powerful political party or have strong ties with those in high positions in the government or political parties. The Board and its committee are powerless over these people and are unable to close down their industries or remove it from the area surrounding the river or residential area. For instance, one of our organisations has data regarding one of such factories that discharge 60,000 litres of dangerous wastewater monthly directly into the Tanjero River".

[88] Participant 9.

[89] Nevertheless, this participant also mentioned the impacts of the polluted water of the Tanjero River and said that, "The polluted water of the river reached the Darbandikhan Dam, then used for agricultural purposes and even as drinking water. After that, polluted water from the Tanjero River reaches the Serwan River and thereafter to other Iraqi areas in Dyala and south of Iraq."

[90] H.M. Issa, "An Initial Environmental Assessment for the Potential Risk of the Developing Industry Impact on the Surface Water Resources in the Kurdistan Region - Iraq," *Journal of Garmyan University* 1 (2014): 35–48.

[91] Participant 9.

causes river degradation. For instance, if you look at the Tanjero Bridge downstream of the river, you will see a big quarry factory along the Tanjero River."

A water expert from Garmian University,[92] shares the same thought and emphasises the occurrence of destruction of rivers caused by mining activities such as illegal quarries without taking effective legal prosecution against them.[93]

It is also evident that water pollution poses a critical health risk for humans all over the globe.[94] Poor water quality contributes to 50% of child fatalities and 80% of illnesses globally.[95] Based on the report (2022) by "WHO", 1 million humans are estimated to die from diarrhoea every year as a result of drinking polluted water, poor hand hygiene, and sanitation. However, if these risk factors were addressed, diarrhoea would be mostly preventable, and 395,000 children under the age of five would not die each year.[96]

WHO also estimated that environmental risk factors, such as air, water and soil pollution, chemical exposures, climate change, and ultraviolet radiation, pose risks to more than 100 types of diseases and injuries.[97] Therefore, the Ministry of Health (MoH) is also indirectly challenged by the pollution of rivers.

Law No. 15 (2007) An act for the Kurdistan Regional Government-Iraq Ministry of Health primarily compels the MoH to ensure the people's safety and protect their health through certain measures and tools to prevent and curb diseases. In terms of the environment, MoH has an arduous responsibility of maintaining the people's health and safety of the environment and dealing with transmitted diseases and other health threats in the region. This problem was confirmed by one of the participants of the study, an academic researcher from Sulaymaniyah University[98] who highlighted the negative impacts of industrial wastes on aquatic life and human health in Kurdistan.[99]

Further, she also points out the impact of the polluted Tanjero River as a source of disease among the residents: "We noted some water-related diseases among residents in the Tanjero River area. We also found the negative impacts of polluted water on animals and agriculture."

---

92 Participant 3.

93 He further elaborated on that and said, "There are factories and activities such as quarries along the Serwan River. These projects have a dire impact on the river. They break the law in different ways. For instance, they operate outside their designated areas, destroy the natural trees and herbs along the river and change the river direction, which causes a reduction in the water quantity and damages the water quality of the river without having to face any appropriate legal prosecution against them by the relevant institutions."

94 Preethi Babuji, "Human Health Risks Due to Exposure to Water Pollution: A Review," *Water* 15, no. 14 (2023): 2532, https://doi.org/https://doi.org/10.3390/w15142532.

95 Li Lin, Haoran Yang, and Xiaocang Xu, "Effects of Water Pollution on Human Health and Disease Heterogeneity: A Review," *Frontiers in Environmental Science* 10 (2022), https://doi.org/Frontiers in Environmental Science 10 (June 30, 2022), https://doi.org/10.3389/fenvs.2022.880246.

96 World Health Organization, "Drinking Water-Water and Health," accessed January 17, 2025, https://www.who.int/news-room/fact-sheets/detail/drinking-water .

97 WHO, "An Estimated 12.6 Million Deaths Each Year Are Attributable to Unhealthy Environments," accessed November 29, 2021, https://www.who.int/news/item/15-03-2016-an-estimated-12-6-million-deaths-each-year-are-attributable-to-unhealthy-environments.

98 Participant 2.

99 According to her, polluted water causes threats to human health and other marine life. "In our study of the Tanjero River, we found the existence of industrial wastes such as heavy metals. This waste contaminated the water and damaged aquatic life, killing thousands of fish and other organic life. Even if the rate of heavy metal is low, the bioaccumulation in the body of the fish will cause harm to the fish itself and those who consume it. Similarly, water polluted with industrial wastes affects the quality of water in the Darbandikhan Dam, which is the main source of drinking water for the population of Darbandikhan city."

Medical wastes, including expired medicine, were also discovered to be another source of pollution in the Tanjero River (See Image 2).

Lack of proper medical waste management, especially during the COVID-19 pandemic, can adversely affect human health, animals and the whole environment.[100] For instance, it can lead to sharp injuries, toxic exposure from pharmaceutical products, particularly antibiotics, the release of cytotoxic drugs into the environment, leakage of substances such as mercury and dioxin, and increased air pollution and thermal injuries as a result of open burning and the operation of clinical waste and radiation burns.[101] Based on recent reports, medical wastes from Sulaymaniyah City is estimated to be about 60 tons monthly, including approximately 15 tons from private hospitals. [102]

Currently, the Health Directorate of the City only has six incinerators, two of which are not operating due to technical problems. The deficiency and the lack of access to 24-hour electricity for these devices are a reason for the surge in the amount of undisposed medical waste in the vicinity of the incinerators, which is causing environmental pollution.[103] Some of these medical wastes are inevitably abandoned near the Tanjero River or sent into the municipality's landfills. Consequently, when it rains, these wastes are absorbed into the ground, polluting the Tanjero River, the groundwater, and the Darbandikhan Dam, which is the main source of drinking water for the people of the Southlands in Darbandikhan town.[104]

Image 2: ***Dumping expired medicine in the Tanjero River area***.

Source: *(KNO:2021)*[105]

Based on the report by the Kurdistan Nature Organization (KNO) for 2021, about 19 persons are diagnosed with cancer daily, of which eight of them are from Sulaymaniyah City. This shows that poor waste management, including medical waste in the Tanjero River area,

[100] Muhjad, Razy, and Hadin, "The Problematics of Management Personal Protection Equipment Waste Related to Covid-19 in Indonesia."

[101] P. Agamuthu and Jayanthi Barasarathi, "Clinical Waste Management under COVID-19 Scenario in Malaysia," *Waste Management and Research*, no. 5 (2020), https://doi.org/10.1177/0734242X20959701.

[102] Xendan, "Warning about Dumping of Medical Wastes in Sulaymaniyah," n.d., https://www.xendan.org/detailnews.aspx?jimare=133772&babet=1&relat=1024&fbclid=IwAR1yzlpgrWokLAT_l9pAFHLFjoJKqUD155Xj4B-9VjTSTnMbBN-AQJl_s8s.

[103] Xendan.

[104] ROJ News, "Tons of Medical Wastes Dumped in Tanjero Area," accessed November 29, 2021, https://rojnews.news.

[105] NATURE IRAQ, "Kurdistan Nature Organization," 2021.

poses health risks.[106] Thus, the MoH, along with other governmental institutions, has a huge responsibility to manage the disposal of medical waste properly.

Findings

The right to access clean water is a basic human right that is faced with multiple challenges due to anthropogenic factors and poor management of water resources in the Kurdistan Region of Iraq. Based on the above discussion, different levels of administrative institutions in Kurdistan deal with water resource preservation.

In the case of the Tanjero River, insufficient legal protection of the river as well as weaknesses in the implementation of the law and poor coordination between the EPIB and other related institutions are among the contributing factors to the escalation of pollution.[107] It is clear that the pollution of the Tanjero River is caused by different types of human wastes from the agricultural, industrial, medical, and petroleum sectors. The absence of comprehensive environmental legislation to protect water resources, including rivers (as mentioned earlier), and poor implementation of the law, such as Environment Law No.8 (2008), contributed immensely to the increase in the contamination of the Tanjero River area, among others.[108] In addition, the weak enforcement of laws against polluters and inadequate legal punishments are among the main challenges in protecting the environment for many countries, including Kurdistan.

Due to the limited power of the Kurdistan environmental authorities, particularly EPIB, the Tanjero River remains polluted. An urgent call and action to develop the EPIB's capacity to combat various pollution factors is necessary. The lack of professional staff and technical and financial support to the Environmental Protection and Improvement Directorates needs to be tackled effectively. Furthermore, based on Article 8 of Law No. 3 (2010), a council called the Council of Environmental Protection and Improvement should be established in every governorate. However, this has yet to be done.

To overcome this problem, KRG needs to adopt various mechanisms, such as establishing an effective controlling system, conducting an Environment Impact Assessment (EIA) for every industry, encouraging the green industry, recycling and reuse, and reducing water consumption by offering incentives or tax allowances for the industrial sector. Singapore can be a good model for Kurdistan. In 1983, Singapore was reported to have reduced the investment tax by 50% for industries that could significantly lessen their water consumption or develop a water treatment system.[109] A better coordination between the ministries in KRG also needs to be set up. The Ministry of Planning (MoP) should be responsible for coming up with development strategies for Kurdistan, while the water sector may be put under an independent

[106] IRAQ.

[107] Alessandro Tinti, "Water Resources Management in the Kurdistan Region of Iraq," *The Institute of Regional and International Studies*, 2017.

[108] Mohammed, "Critical Remarks on the Law of Protection and Improvement of the Environment in the Kurdistan Region - Iraq No. (8) of (2008)."

[109] Cecilia Tortajada and Yugal K. Joshi, "Water Demand Management in Singapore: Involving the Public," *Water Resources Management* 27, no. 8 (2013): 2729–46, https://doi.org/10.1007/s11269-013-0312-5.

water agency or under the MoAWR with the MoMT[110] to avoid the overlapping of power and jurisdiction among the ministries.

KRG has failed to provide a sustainable water management system in the region.[111] Although there were attempts, there is still no clear strategy to balance the water supply and demand as the region has a poor sewerage system and sanitation infrastructure. There are also no wastewater treatment plants for sewer wastewater. Hence, a substantial amount of industrial waste is dumped into the river without pretreatment. As a result, water, farming lands, and food chain are faced with serious pollution[112] which is causing a colossal threat to public health and the whole ecosystem in Kurdistan.

Therefore, establishing an independent water agency is vital to dealing with this Kurdistan problem. A lot can be learned from Singapore's experience in water management. There, the whole water management was placed under the control of a single institution, the Public Utilities Board (PUB), which is empowered with adequate legal support. [113]This helps to enhance the entire water policy, including water quality and quantity protection, which is particularly required for the Tanjero River.

CONCLUSION

The right to clean water imposes on the state's government the responsibility to ensure that all citizens can access clean water without any fear. As the Tanjero River is one of the water sources, its pollution is critical and requires KRG's urgent attention. Although there is an existing legal framework in KRG to protect the right to clean water, the lacuna in that legislation is an obstacle to effectively combatting the pollution of the rivers. The EPIB in Kurdistan also struggles with its limited power. Furthermore, poor coordination, lack of rigorous law enforcement and inadequate legal punishments are among the main challenges in protecting rivers, including the Tanjero River. Thus, KRG should provide efficient safeguards for everyone's clean water. The lack of professional staff and technical and financial support to the Environmental Protection and Improvement Directorates needs to be tackled effectively. Kurdistan also needs to scale up efforts to build a sustainable management system for water resources to avoid the anticipated water shortage due to the consequences of climate change. An adequate legal framework, clear water policy, effective water institution coordination among ministerial sectors, and stricter enforcement are also crucial for the successful and sustainable management of water resources. Finally, future studies may focus on evaluating air pollution control under Law No.8(2008) Environmental Protection and Improvement in the Kurdistan Region of Iraq.

Declaration of competing interest

No potential conflict of interest was reported by the author(s).

[110] Tinti, "Water Resources Management in the Kurdistan Region of Iraq."
[111] Heshmati and Auzer, "The Role of Natural Resources in Kurdistan Regional."
[112] Tinti, "Water Resources Management in the Kurdistan Region of Iraq."
[113] Cecilia Tortajada, "Water Management in Singapore," *International Journal of Water Resources Development* 22, no. 2 (2006): 227–40, https://doi.org/10.1080/07900620600691944.

REFERENCES

Adamo, Nasrat, Nadhir Al-ansari, Varoujan K Sissakian, and Sven Knutsson. "Climate Change : Consequences on Iraq ' s Environment." *Journal of Earth Sciences and Geotechnical Engineering* 8, no. 3 (2018): 43–58.

Agamuthu, P., and Jayanthi Barasarathi. "Clinical Waste Management under COVID-19 Scenario in Malaysia." *Waste Management and Research*, no. 5 (2020). https://doi.org/10.1177/0734242X20959701.

Ahmad, Nehaluddin. "Human Right to Water under International Law Regime : An Overview." *Commonwealth Law Bulletin* 0, no. 0 (2020): 1–25. https://doi.org/10.1080/03050718.2020.1770618.

Ahmed, Sherin. "Pollution Threat Thousands of Sulaimnyiha Resedent's Live -No Solution till Now," 2019, 5–7.

Al-Ansari, Nadhir A. "Management of Water Resources in Iraq: Perspectives and Prognoses." *Engineering* 05, no. 08 (2013): 667–84. https://doi.org/10.4236/eng.2013.58080.

Al-hasnawi, Salwan S. "Water Quality Index Of Tanjero River Basin Near Sulaymania City." *Al- Mustansiriyah J. Sci.* 23, no. 8 (2012): 193–200.

AL-Kurdi, Jamal Mahmmod. *Studies in Environmental Laws*. Qahira: Dar-AL-Nahzah AL-Arabia, 2010.

Ararat, Korsh, Ibrahem M. Abid, and Saman Abdul Rahman. "Key Biodiversity Areas." Iraq Nature, 2010.

Article 117 Paragraph 1 (n.d.).

Article 2, Law No. 10. of the Ministry of Trade and Industry in Iraqi Kurdistan Region (2010).

Article 4, Law No. 3. the Environmental Protection and Improvement Board in Kurdistan Region (2010).

Article 53/sixth, Law of Oil and Gas No. 22. Kurdistan Region-Iraq (2007).

Article 7, Law of Oil and Gas No.22. Kurdistan Region-Iraq (2007).

Babuji, Preethi. "Human Health Risks Due to Exposure to Water Pollution: A Review." *Water* 15, no. 14 (2023): 2532. https://doi.org/https://doi.org/10.3390/w15142532.

Calvin, Katherine. "Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change." *IPCC*, 2023. https://doi.org/https://doi.org/10.59327/ipcc/ar6-9789291691647.

Constitute. "Iraqi Constitution." Constitute. Accessed August 12, 2021. https://www.constituteproject.org/constitution/Iraq_2005.pdf?lang=en.

Council, National Research. *River Science at the U.S. Geological Survey*. Washington, DC: The National Academies Press, n.d. https://doi.org/https://doi.org/10.17226/11773.

Denchak, M. "Water Pollution: Everything You Need to Know." NRDC. Accessed October 24, 2019. https://www.nrdc.org/stories/water-pollution-everything-you-need-know.

Gabbatiss, J. "World Water Day 2019: What Are the Biggest Water Problems Facing the World Today? INDEPENDENT." Accessed October 3, 2019. https://www.independent.co.uk/environment/world-water-day-2019-floods-drought-pollution-plastic-waste-a8833616.html.

GIS, Arc. "10.3 Software." Accessed November 20, 2019. https://www.arcgis.com/index.html#.

HamaSalh, Nizar. "Water Quality Index (WQI) Of Some Wells Located In The Region Of Kani Goma And Kanasura In Sulaimani Governorate." *Journal of Zankoy Sulaimani* 16 (2014): 77.

Heshmati, Almas, and Khazal Auzer. "The Role of Natural Resources in Kurdistan Regional." *UKH Journal of Social Sciences* 2, no. 1 (2018): 1–14. https://doi.org/10.25079/ukhjss.v2n1y2018.1-14.

HRW. "Basra Is Thirsty." www.hrw.org. Accessed November 29, 2021. https://www.hrw.org/report/2019/07/22/basra-thirsty/iraqs-failure-manage-water-crisis .

IRAQ, NATURE. "Kurdistan Nature Organization," 2017.

———. "Kurdistan Nature Organization," 2021.

Iraq, Kurdistan Region Statistics Office. Preliminary Results of the 2024 Census of Residents and Population. Accessed January 27, 2025. https://krso.gov.krd/en .

Issa, H.M. "An Initial Environmental Assessment for the Potential Risk of the Developing Industry Impact on the Surface Water Resources in the Kurdistan Region - Iraq." *Journal of Garmyan University* 1 (2014): 35–48.

Johnson, and Serinity. "5 Major Causes of Water Pollution." Accessed October 24, 2019. http://lrwg.com.au/5-major-causes-of-water-pollution/.

Lin, Li, Haoran Yang, and Xiaocang Xu. "Effects of Water Pollution on Human Health and Disease Heterogeneity: A Review." *Frontiers in Environmental Science* 10 (2022). https://doi.org/Frontiers in Environmental Science 10 (June 30, 2022), https://doi.org/10.3389/fenvs.2022.880246.

Majid, Salih N. Majid, Ahmed I. Khwakaram Khwakaram, and Chalang S. H. Gado Gado. "Pollution Status Evaluation of Some Heavy Metals along Some Surface Water Sources by Multivariate Data Analysis at Sulaimani Governorate." *Journal of Zankoy Sulaimani - Part A* 20, no. 1 (2018): 63–80. https://doi.org/10.17656/jzs.10642.

Masson-Delmotte, P. Zhai V., A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, et al. *The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, 2021.

Mohammed, Ala Jabar. "The Politics of Iraqi Kurdistan: Towards Federalism or Secession?," 2013.

Mohammed, Sangar Dawd. "Critical Remarks on the Law of Protection and Improvement of the Environment in the Kurdistan Region - Iraq No. (8) of (2008)." *Qalaai Zanist Scientific Journal* 4, no. 3 (2019): 836–64. https://doi.org/10.25212/lfu.qzj.4.3.19.

Muhjad, Muhammad Hadin, Fakhruddin Razy, and Ahmad Fikri Hadin. "The Problematics of Management Personal Protection Equipment Waste Related to Covid-19 in Indonesia." *Sriwijaya Law Review* 5, no. 2 (2021): 300–308. https://doi.org/10.28946/slrev.Vol5.Iss2.1161.pp300-308.

NAS. "Environment Return as the Independent Federal Ministry." nasnews.com. Accessed December 22, 2021. https://www.nasnews.com/view.php?cat=66729 .

Nations, United. "The Human Right to Water and Sanitation." digitallibrary.un.org, n.d.

NEWS, BBC. "Who Are the Kurds?" bbc.com. Accessed September 28, 2019. https://www.bbc.com/news/world-middle-east-29702440 .

News, ROJ. "Tons of Medical Wastes Dumped in Tanjero Area." Accessed November 29, 2021. https://rojnews.news.

Nigar A. Aziz, Sabah M. Salih, Nizar y. Hama-Salah. “Pollution of Tanjero River by Some Heavy Metals Generated from Sewage Wastewater and Industrial Wastewater in Sulaimani District.” *Journal of Kirkuk University –Scientific Studies* 7, no. 1 (2012): 67–83.

No.21, Law. the Ministry of Natural Resources (2007).

No.6, The Law. Ministry of Agriculture and Water Resources (2010).

Oki, Taikan, and Shinjiro Kanae. “Global Hydrological Cycles and Freshwater Resources Freshwater.” *Science* 313, no. 5790 (2006): 1068–73. https://doi.org/10.1126/science.1128845.

Organisation, World Health. "Drinking Water-Water and Health." Accessed January 17, 2025. https://www.who.int/news-room/fact-sheets/detail/drinking-water .

Othman, Arez Mohammed Sediq. “Legal and Ethical Obligations of Oil Companies in Preserving Natural Environment; a Case Study of the Kurdistan Regional Government’s Production Sharing Contracts.” *Journal of University of Human Development* 2, no. 4 (2016): 390–98. https://doi.org/10.21928/juhd.20161225.15.

Othman, Nasih. “Environmental Health Assessment in Sulaymaniyah City and Vicinity,” no. May (2017). https://doi.org/10.13140/RG.2.2.12898.12483.

Pinsky, Malin L., Gabriel Reygondeau, Richard Caddell, Juliano Palacios-Abrantes, Jessica Spijkers, and William W.L. Cheung. “Preparing Ocean Governance for Species on the Move.” *Science* 360, no. 6394 (2018): 1189–91. https://doi.org/10.1126/science.aat2360.

Potrous, Saad M. “Assessment of Pollution Level and Its Impacts in the Shatt Al-Arab River in Basra Province, Iraq.” *Research Advances in Environment, Geography and Earth Science* 8 (2024): 113–22. https://doi.org/https://doi.org/10.9734/bpi/raeges/v8/2022.

Programme (UNEP), United Nations Environment. “Towards a Pollution -Free Planet Background Report.” Nairobi, 2017.

Rashid, Hiwa. “The Role of Administrative Authority in Protecting Environment from the Harms of Oil Projects.” Alexandria University, 2016.

S, Sukanya, and Sabu Joseph. “Climate Change Impacts on Water Resources: An Overview,” in Visualization Techniques for Climate Change with Machine Learning and Artificial Intelligence.” *Elsevier*, 2023, 55–76. https://doi.org/https://doi.org/10.1016/b978-0-323-99714-0.00008-x.

Salman, Salman M A, and Daniel D Bradlow. *Regulatory Frameworks for Water Resources Mangement*. Washington DC: The World Bank, 2006.

Sangawe, Ranj. “Le Gall Ranj Program.” www.rudaw.net. Accessed March 22, 2021. https://www.rudaw.net/sorani/onair/tv/episodes/episode/lagal-ranj-22032021.

Santos, Regina Maria Bessa. “A Framework Model to Integrate Sources and Pathways in the Assessment of River Water Pollution.” *Environmental Pollution* 347 (2024).

Shiklomanov, Igor A. “WORLD WATER RESOURCES: A NEW APPRAISAL AND ASSESSMENT FOR THE 21ST CENTURY.” *UNESCO*, 1998.

Step News. Preliminary Results of the 2024 Census of Residents and Population. Accessed 27 January, 2025. https://stepagency-sy.net/2024/11/25/ .

Tahin, Rajab Mahmood. *Constitutional Frame for Environmental Right*. Qahira: Dar-AL-Nahzah AL-Arabia, 2008.

Tinti, Alessandro. “Water Resources Management in the Kurdistan Region of Iraq.” *The*

Institute of Regional and International Studies, 2017.

Tortajada, Cecilia. "Water Management in Singapore." *International Journal of Water Resources Development* 22, no. 2 (2006): 227–40. https://doi.org/10.1080/07900620600691944.

Tortajada, Cecilia, and Yugal K. Joshi. "Water Demand Management in Singapore: Involving the Public." *Water Resources Management* 27, no. 8 (2013): 2729–46. https://doi.org/10.1007/s11269-013-0312-5.

UN. "Annex: Global Indicator Framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development." *Work of the Statistical Commission Pertaining to the 2030 Agenda for Sustainable Development*, 2019.

WHO. "An Estimated 12.6 Million Deaths Each Year Are Attributable to Unhealthy Environments." Accessed November 29, 2021. https://www.who.int/news/item/15-03-2016-an-estimated-12-6-million-deaths-each-year-are-attributable-to-unhealthy-environments.

Xendan. "Warning about Dumping of Medical Wastes in Sulaymaniyah," n.d. https://www.xendan.org/detailnews.aspx?jimare=133772&babet=1&relat=1024&fbclid=IwAR1yzlpgrWokLAT_l9pAFHLFjoJKqUD155Xj4B-9VjTSTnMbBN-AQJl_s8s.

Yao, Xu. "Distribution, Mobilisation, Risk Assessment and Source Identification of Heavy Metals and Nutrients in Surface Sediments of Three Urban-Rural Rivers after Long-Term Water Pollution Treatment." *Science of The Total Environment* 932 (2024). https://doi.org/https://doi.org/10.1016/j.scitotenv.2024.172894.

Zarei, Mohanna. "The Water-Energy-Food Nexus: A Holistic Approach for Resource Security in Iran, Iraq, and Turkey." *Water-Energy Nexus* 3 (2020): 81–94. https://doi.org/10.1016/j.wen.2020.05.004.