

**Review Form 3**

Journal Name:	<b>International Research Journal of Pure and Applied Chemistry</b>
Manuscript Number:	<b>Ms_IRJPAC_123500</b>
Title of the Manuscript:	<b>Geochemical modeling and quality assessment of the surface waters from the Mouhoun River system, Burkina Faso: Implications of water–rock interactions and anthropogenic activities</b>
Type of the Article	

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**PART 1: Review Comments**

<b>Compulsory</b> REVISION comments	Reviewer's comment	Author's Feedback (Please correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
Please write a few sentences regarding the importance of this manuscript for the scientific community. Why do you like (or dislike) this manuscript? A minimum of 3-4 sentences may be required for this part.	The manuscript is relevance for the scientific community as it elucidates the geochemical and anthropogenic influencers over the river system by using various elucidating tools.	
Is the title of the article suitable? (If not please suggest an alternative title)	Yes, it is.	
Is the abstract of the article comprehensive? Do you suggest the addition (or deletion) of some points in this section? Please write your suggestions here.	<p><b>Abstract</b></p> <ol style="list-style-type: none"> <li>1. It is advised to correct the term highlighted in red in the statement <i>Major cation <b>abondance</b> was in the following decreasing order: <math>Ca^{2+} &gt; Na^+ &gt; K^+ &gt; Mg^{2+}</math>, reflecting silicate weathering.</i></li> <li>2. It is advised to correct (grammatically) the phrase highlighted in red in the statement <i>The average <b>heavy metal concentrations</b> in the riverine system were in the following order: <math>Fe_T &gt; Ag &gt; Mn &gt; Zn &gt; Pb &gt; Cu &gt; Ni &gt; As_T &gt; Cr &gt; Hg &gt; Co &gt; Cd</math> with <math>Fe_T</math> and <math>Ag</math> exceeding the World Health Organization permissible limits.</i> [Advised: heavy metals' concentrations]</li> <li>3. It is advised to reframe the sentence <i>Adsorption and speciation models showed that Zn, Ag, Cd, Co, Cr and Ni are likely to remain in their free ionic forms, and <b>that</b> posing serious threats to aquatic life and human health.</i> for better and correct manifestation.</li> <li>4. It is advised to correct (grammatically) the phrase highlighted in red in the statement <i>Ag-Hg-Ni-Cd association around Poura and Tenado on the principal component plot suggested that the widespread artisanal gold mining in these areas may have contributed to these <b>metal loading</b></i> [Advised: metals' loading]</li> <li>5. The abstract could become more striking by upgraded write-up</li> </ol>	
Are subsections and structure of the manuscript appropriate?	Needs revision: the detail comments are given in the general comment box.	
Please write a few sentences regarding the scientific correctness of this manuscript. Why do you think that this manuscript is scientifically robust and technically sound? A minimum of 3-4 sentences may be required for this part.	The manuscript is technically correct but needs minor revision. The comprehensive coverage over the facets affecting the river water chemistry and respective interpretation has made the manuscript of considerable value.	
Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.	Though the references are sufficient, but few recent works are advised to be added in the manuscript justifying the various claims. (Details are given in the general comment box)	

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<p>Minor REVISION comments</p> <p>Is the language/English quality of the article suitable for scholarly communications?</p>	<p>Needs revision: the detail comments are given in the general comment box.</p>	
<p>Optional/General comments</p>	<p><b>Introduction</b></p> <ol style="list-style-type: none"> <li>1. Check punctuation in the statement <i>However, the quality of these finite resources at any given point and time can be under tremendous pressure from both natural and anthropogenic factors [3,4].</i></li> <li>2. It is advised to reframe the sentence and recheck the in text citation policy of the journal <i>Natural factors such as droughts decrease river water availability and indirectly reduce its quality through competing demands [5], whereas the quality can be directly affected by flooding and sediment accumulation [6,7].</i> for better and correct manifestation.</li> <li>3. It is advised to justify the phrase highlighted in red in the statement <i>Because of their direct contact with various pollution sources and their relative short residence time, river waters are vulnerable to point and non-point pollution sources [11].</i> as it does not justify the vulnerability of river.</li> <li>4. It is advised to justify the word highlighted in red in the statement <i>In order to protect river waters against pollution, the factors that control riverine pollutant mobility and bioavailability should be properly identified and assessed [12,13].</i></li> <li>5. It is advised to recheck the in text citation pattern in the statement <i>In the rivers' long course through highly heterogeneous geological formations, these factors may vary considerably making the interpretation of the water quality difficult (Onderka et al. 2012).</i></li> <li>6. It is advised to cite a work advised below to justify the phrase highlighted in red in the statement <i>In contrast, smaller rivers, such as the Mouhoun River, flow through less diverse geology and climatic zones, and accordingly, the contribution of anthropogenic activities to pollutant loadings can be easily constrained through hydrogeochemical investigations.</i> Advised: Singh, V. B., Madhav, S., Pant, N. C., &amp; Shekhar, R. (Eds.). (2023). <i>Weathering and Erosion Processes in the Natural Environment</i>. John Wiley &amp; Sons. Ganvir PS, and Guhey R, Hydro-geochemical elucidation and its implications in the Wardha valley coalfields of central India. In <i>IOP Conference Series: Earth and Environmental Science</i>, 2022:1032(1);012015. IOP Publishing.</li> <li>7. It is advised to reframe the sentence <i>Once in the fluvial system, the heavy metals may be, depending on the environmental conditions (e.g., pH, mineralogy, redox conditions and the availability of organic and inorganic ligands), immobilized through precipitation or adsorption [26].</i> for better and correct manifestation.</li> <li>8. It is advised to cite an additional work advised below to justify the phrase highlighted in red in the statement <i>Alternatively, the metals could be remained in their ionic forms, and end up in the groundwater system through infiltration [27].</i> Advised: Ganvir PS, and Guhey R, An Implication of Enhanced Rock Weathering on the Groundwater Quality: A Case Study from Wardha Valley Coalfields, Central India. <i>Weathering and Erosion Processes in the Natural Environment</i>, 2023:215-242. <a href="https://doi.org/10.1002/9781394157365.ch9">https://doi.org/10.1002/9781394157365.ch9</a></li> <li>9. It is advised to cite an additional work advised below to justify the phrase highlighted in red in the statement <i>Some heavy metals (e.g., Fe, Mn, Co, Ni, Cu and Zn) are micronutrients that play an important role in enzyme activities, and can be toxic to biota at high concentrations [30], whereas others such as such Cd, Pb, As and Hg are highly toxic even at low concentrations [31].</i> Advised: Ganvir PS, and Papadkar JN, HYDRO-GEOCHEMISTRY AND HUMAN HEALTH: A BRIEF. <i>International Journal of Food and Nutritional Sciences</i>, 2022:11(11); 223-227.</li> <li>10. It is advised to cite an additional work advised below to justify the phrase highlighted in red in the statement <i>Heavy metals are non-biodegradable, and thus they are potentially toxic with serious ecological and human health ramifications</i> Advised: Papadkar JN, Ganvir PS, Nimbarte GR, Patre PP, Barsagade AU and Chandekar RD. A REVIEW OVER THE CAUSAL RELATIONSHIP BETWEEN HYDRO-GEOCHEMISTRY AND BIOACCUMULATION IN SPECIAL REFERENCE TO COALFIELDS. 2023:12(4);15288-15297.</li> <li>11. It is advised to be narrative for the <i>objectives of the present study</i> instead of bulleting/numbering.</li> </ol> <p><b>Material and Methods</b></p>	

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1. The subsections 2.1 and 2.2 titled Geographical and geological setting and Anthropogenic settings respectively does not suits the section of Material and Method section. Reconsider it as new section.
2. It is advised to revise the statement *This basin consists of nine sandstone-dominated geological formations mainly composed of dolerites and fine pink and schistose sandstones* as the dolerite is an igneous rock with zero sandstone domination and vagueness in the other mentioned rock types.
3. It is advised to recheck the punctuation and spaces in within the digits in the statements:
  - *The basin is subdivided into three sub-basins namely Sourou (15, 225 km<sup>2</sup>), Lower Mouhoun (54, 802 km<sup>2</sup>) and Upper Mouhoun (20, 978 km<sup>2</sup>) sub-basins*
  - *According to the last census in 2006, the populations were 48, 694 in Tenado, 14,885 in Boromo and 12,026 in Poura. The urbanization rate was 45,8 % in Samendeni and Kou, 16,4 % in Tenado, 9,6 % in Boromo and Poura in 2019.*
4. The subsection Anthropogenic settings needs redrafting with inclusion of few new citations.
5. Overall, the subsections Geographical and geological setting and Anthropogenic settings needs a through reconsideration.
6. It is advised to recheck the need of acidification for the determination of major cation as per mentioned in the statement *The filtered water samples were split into two portions. One portion was acidified with ultrapure nitric acid to a pH less than 2, and was subsequently used to determine major cation and heavy metal concentrations, whereas major anion concentrations were measured in non-acidified portion.*
7. It is advised to justify the usage of AAS for the measurement of major cation (i.e., Ca<sup>2+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup> and K<sup>+</sup>) as other traditional methods are also available.
8. It is advised to mention the standards used for analysis and details of AAS and ICP-MS used.
9. It is advised to revise the caption of figure 2 as per the details given in the figure.
10. It is advised to revise the pattern of citation in the statements
  - *These indices were calculated using Visual MINTEQ (Ver. 3.1), a chemical equilibrium code developed by [55],*
  - *Average concentrations (mol/L) of hydrous ferric oxide (Fe(OH)<sub>3</sub> and individual heavy metals (i.e., Cd<sup>2+</sup>, Cr<sup>3+</sup>, Cu<sup>2+</sup>, Ni<sup>2+</sup>, Pb<sup>2+</sup> and Zn<sup>2+</sup>) and ionic strength (IS in mol/L) were used in MINEQL+ a chemical equilibrium modeling system [56] (Schecher and McAvoy 1998) to model the metal adsorption onto Fe(OH)<sub>3</sub> at different pH (4.5–8.5).*
  - *Fitting of the data with Two-Layer model was described by [57].*
  - *Based on the MI values, the following classes have been used to characterized surface water and groundwater quality [61,62] to very pure (MI<0.3), pure (0.3<MI<1.0), slightly affected (1.0<MI<2.0), moderately affected (2.0<MI<4.0), seriously affected (4.0<MI<6.0) and strongly affected (MI>6.0).*
11. It is advised to recheck and confirm the various terms/units/equations and procedures used in the statistical methods.

#### Result and Discussion

1. It is advised to mention the detail legend elucidating the different fields in the Piper plot (Figure 4) and also advised to replace it with one having higher resolution.
2. It is advised to revise the pattern of citation in the statement *whereas the average concentrations of As<sub>T</sub>, Cd, Cr, Cu, Ni, Pb and Zn were higher in the Rhine River compared to the Mouhoun River system (Heinrichs 1975).*
3. Caption of Figure 5 is missing.
4. It is advised to revise the pattern of citation in the statement *In general, cadmium (Cd(II)) precipitates around pH 8 in the form of hydroxides (Nakaya et al. 2018),*
5. Though the result and discussion part has covered a comprehensive illustration, the authors are advised to reframe section with the results and discussion as separate section, which will have higher impact on the readers.
6. The in text placements of tables and plots needs to be done carefully and properly.
7. A plots need to be clearer (resolution wise).
8. There is a scope to enhance descriptions and discussion based on plots and tabulation with systematic write-up.

#### General

1. The manuscript needs a minor grammar and punctuation checks.
2. The recheck over the page setup is also required.
3. It is advised to duly recheck the references and respective in text citations, the pattern of in text citation, etc.

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**PART 2:**

	<b>Reviewer's comment</b>	<b>Author's comment</b> <i>(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)</i>
<b>Are there ethical issues in this manuscript?</b>	<i>(If yes, Kindly please write down the ethical issues here in details)</i>	

**Reviewer Details:**

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