This manuscript discusses an interesting question in urban water management where green infrastructure is integrated into multiple cities' water supply operations. The authors approach this problem by developing an agent-based modeling (ABM) framework to discuss cross-scale interactions among city and watershed water managers (i.e., agents) and explore water equity and policy implication through imposing a penalty for overdraft.

I appreciate the authors ambition to take on the challenge of solving the complex urban water problem and efforts in developing an integrated modeling tool. The introduction effectively highlights the importance of integrated water management at watershed scale and the need for integrated modeling approaches. I believe the scope of this study will be of great interest to the HESS community. That being said, the current manuscript suffers several major flaws that make it difficult to follow and obscure its contributions and intellectual merits. I am fully committed to helping elevate the quality of this manuscript. If any comments arise from my lack of knowledge on specific points, please accept my apologies in advance. Below are the summaries of my comments and suggestions followed by the specific comments.

My first comment is about the writing. The current manuscript is difficult to follow due to the excessive technical terms and ambiguous language. For example, IGWM (short for integrated green infrastructure and water resources management) was applied in describing models, agents, and agents' decisions, which gave me a headache. Other examples include WM (water manager), UWM (urban water manager), and HUWS (hybrid urban water system). Some technical terms are not well-defined. For example, ABM (agent-based model) and MAS (multi-agent system) are often used interchangeably in the literature, but it was presented in this manuscript as two distinct modeling approaches applied for building two models (i.e., city-scale and inter-city). Similarly, rainwater and stormwater are the same thing to me, and yet they are listed as two water sources (lines 183-184). In the results section, the authors discuss the usage of the four water sources (surface water, groundwater, stormwater, and rainwater), so the model must have simulated the water sources. However, I could not find their definitions nor how the water supply portfolio is simulated except for surface water. I will recommend a more rigorous quality control and assurance to improve the flow and readability.

Response:

Thank you for your thorough review and valuable feedback on our manuscript. We understand your concerns regarding the clarity and readability of the text, particularly related to the use of technical terms and acronyms. We apologize for any confusion caused by the excessive use of acronyms and the lack of clear definitions for some key concepts.

To address the issues you raised, we propose the following revisions:

1. **Reduction of Acronyms**: We will reduce the number of acronyms by eliminating those that are infrequently used. Additionally, we will include a comprehensive list of acronyms at the beginning of the manuscript to assist readers in understanding the terms used throughout the text.
2. **Clarification of Key Concepts**: We will add clear definitions for key concepts that were omitted in the current version of the manuscript. For instance, we will provide explicit definitions for rainwater and stormwater. As referenced in studies by Khan et al. (2023) and Fielding et al. (2015), stormwater is the water that drains off land areas from rainfall, including water from rooftops, ground surfaces, and other areas. In contrast, rainwater refers specifically to the rain that falls on roofs and can be collected into storage tanks before contacting the ground, resulting in higher quality due to fewer contaminants. The distinction between these two sources is crucial as it impacts their respective urban water cycle and costs of water use (MSSC, 2008), which is why both are considered in our model framework.
3. **Detailed Explanation of Simulation Processes**: We will enhance the methodology and results sections with additional details on the simulation processes, particularly how the water supply portfolio is simulated within our proposed model framework. Although these details are included in the appendix, we will ensure that key points are clearly presented in the main sections of the manuscript to improve readability and comprehension.

References

Khan, A., Park, Y., Park, J., Sim, I. and Kim, R., 2023. Analysis of Stormwater and Rainwater Harvesting Potential Based on a Daily Water Balance Model: A Case Study of Korea. Water, 16(1), p.96.

Fielding, K.S., Gardner, J., Leviston, Z. and Price, J., 2015. Comparing public perceptions of alternative water sources for potable use: The case of rainwater, stormwater, desalinated water, and recycled water. Water Resources Management, 29, pp.4501-4518.

Minnesota Stormwater Steering Committee (MSSC)., 2008. State of Minnesota Stormwater Manual: Version 2. Minnesota Pollution Control Agency, St. Paul, MN. https://stormwater.pca.state.mn.us/index.php/Overview_for_stormwater_and_rainwater_harvest_and_use/reuse

My second major comment is about the framing of the model. After reading the method section a few times, the modeling components become clear to me. The modeling framework includes three models coupling together. However, it is essentially one agent-based model with two agent types (city agents, UWM, and a watershed agent, WM) and a hydrologic model (including UWB-SM and M-C) representing the spatial connections among the city agents and the watershed environment. I can understand the authors' intention in examining the interactions among agents across multiple sales; however, framing the models separately at different scales has had the opposite effect for me, leaving me confused and obscuring my understanding of the study. The

suggestion here may be somehow subjective, but I am hoping that the manuscript could benefit from my perspective.

Response:

Thank you for your insightful comments on the framing of our model. We appreciate your efforts in thoroughly reviewing the methodology section and providing valuable feedback.

The primary reason for framing our models separately at different scales is to explore the role of Green Infrastructures (GIs) in water resources management from the city scale to the watershed scale. Our intention was to simulate the socio-hydrologic interactions driven by the introduction of GIs within multiple agent systems. We believe that the impacts of introducing GIs for rainwater use in urban water resources systems are not only local (city-scale) but also overall (watershed-scale) due to the social and hydrologic connections between urban areas. Therefore, as described in the methodology section, we constructed our model from the city scale to the inter-city scale to the watershed scale.

However, based on your feedback, we understand that the current presentation of our model framework may be confusing to some readers. To address this, we propose the following revisions:

1. **Introduction of the Model Framework**: We will add a paragraph at the beginning of the methodology section to briefly introduce the entire framework of our models, the corresponding components, and their relationships. This will provide readers with a clear overview of the model structure and its components, facilitating a better understanding of the overall framework.
2. **Improvement of Model Details**: We will enhance the subsequent parts of the methodology section to ensure coherence, cohesiveness, and consistency. Specifically: a. We will highlight and explain the relationships between models at different scales, making it easier for readers to understand the underlying logic of framing the models separately at different scales. b. We will delete redundant and overlapping content between the parts detailing models at different scales, making the manuscript more readable and straightforward.

Generally, I found it difficult to follow the results and discussion, partly attributed to not fully understanding the modeling components. Since I did not go through all the details in the Appendices, I was not sure whether I could agree or disagree with the findings and discussion. I will suggest presenting the key components of the models in the main text. For example, in lines 297 – 298, the authors mentioned an assessment index (Gini coefficient) set by the WM agent but did not go any further to explain how it was incorporated into WM's decision-making nor describe what the Gini coefficient means and how it is calculated. I feel the results and discussion can be condensed to focus on key findings as a long discussion would lose its audience. Another suggestion is to

provide more details of the urban water balance model (UWB-SM) in the main text as the model of the physical environment since it is where the water partition is determined. Contrarily, the texts related to the routing model (M-C method) and solution approach (S-APSO) can be moved to the Appendix. Is the S-APSO approach the original creation of this work? If so, I think the solution approach as well as the UWM model could be a separate paper.

Response:

Thank you for your constructive comments and suggestions on our manuscript. We apologize for any confusion caused by the presentation of our results and discussion sections. We appreciate your detailed feedback and propose the following revisions to address your concerns:

Key Model Components in the Main Text: We acknowledge that the detailed explanations and associated calculation equations for the assessment index (Gini coefficient) and the urban water balance model (UWB-SM) are currently located in the appendix (see lines 1018-1024 and lines 695-815, respectively). To improve clarity, we will reorganize and rewrite the methodology and corresponding appendix sections. Specifically:

1. We will present the some technical details for key components of the models, including the urban water balance model, in the main text to provide a clearer understanding of the modeling framework.
2. We will move the minor components of the model, such as the routing model (M-C method) and the solution approach (S-APSO), to the appendix. Although the S-APSO approach is an original creation of this work, designed specifically to solve the proposed model framework, we will consider your suggestion to further develop this approach and potentially publish it as a separate paper in the future.

Clarification of the Gini Coefficient: We will provide a detailed explanation of the Gini coefficient, including its meaning, how it is calculated, and how it is incorporated into the WM agent's decision-making process, within the main text. This will help readers understand the relevance of this index to our study.

Results and Discussion: In response to your comments, we will rewrite and rearrange the Results and Discussion section. We will condense the discussion to focus on key findings and remove any redundant or unimportant parts to make the discussion more focused and easier to understand. We believe these changes will enhance the discussion and provide clearer and more actionable insights for the readers.

Overall, this manuscript has the potential to be a high-quality paper (by the modeling framework itself) if the authors can improve the clarity in the methodology, experiment designs, and discussion and highlight its contributions.

Specific Comments

- Lines 27-34: The introduction highlights the need for multi-scale green infrastructure frameworks in urban water management. The introduction needs to provide a detailed positioning within recent literature and how the current research contributes to the body of knowledge. Integrating findings from recent studies on similar frameworks could help contextualize their suggested approach within the broader field and clarify its unique contributions. Suggestion: Expand the literature review to include recent ABM applications in socio-hydrology and water resources.

Response:

Thank you for your valuable suggestion regarding the introduction section of our manuscript. We agree with your opinion that the introduction should provide a detailed positioning within recent literature and clearly demonstrate how the current research contributes to the body of knowledge. In the current version of the introduction, we have referenced some previous studies on multi-scale green infrastructure frameworks in urban water management, particularly IGWM at the city scale (lines 82-103), inter-city scale (lines 104-124), and watershed scale (lines 125-138). We also analyzed their contributions and identified gaps. However, we acknowledge that the literature review may be insufficient and its current positioning may not effectively highlight the research problem, motivation, and gaps addressed by our study. To address your comments, we will undertake the following revisions:

1. **Expand the Literature Review**: We will expand the literature review to include recent applications of agent-based models (ABM) in socio-hydrology and water resources management. This will help contextualize our suggested approach within the broader field and clarify its unique contributions.
2. **Rearrange the Literature Review**: We will re-arrange the location of the literature review within the introduction to ensure a logical flow. This will help readers better understand the research problem, motivation, and gaps that our study aims to address.

- Line 15–20: Add brief mention of the specific experimental scenarios (e.g., “streamflow penalty” and GI adoption) to give readers a clearer picture of the paper’s approach and key findings at the outset. This will make the abstract more informative for readers skimming the content.

Response:

Thank you for your insightful suggestion regarding the introduction section of our manuscript. To address your comment, we will revise the beginning of the introduction section to include brief descriptions of these specific experimental scenarios. This will help

set the stage for our research and make the introduction more informative and engaging for readers.

- Line 35–40: The statement on the importance of GIs could be made more impactful by adding specific challenges (e.g., “urban flooding, groundwater depletion, and inter-city water conflicts”) that this framework aims to address. This would help sharpen the focus on the practical problems the model intends to resolve.

Response:

Thank you for your valuable suggestion regarding the statement on the importance of green infrastructures (GIs) in our manuscript. To address your comment, we will revise the relevant section to include specific challenges such as inter-city water conflicts and groundwater depletion. This will demonstrate the importance of GIs more effectively and highlight the practical significance of our framework.

- Ensure that acronyms such as “GI” (for Green Infrastructure) and “UWM” (for Urban Water Manager) are consistently defined and used throughout the text. For instance, Line 42 introduces GI without explicitly defining it, which may confuse readers unfamiliar with the abbreviation.

Response:

Thank you for your helpful suggestion regarding the use of acronyms in our manuscript. To address your comment, we will undertake the following actions:

1. **Review and Modify Acronyms**: We will carefully review the manuscript to ensure that all acronyms, such as "GI" for Green Infrastructure and "UWM" for Urban Water Manager, are explicitly defined when first introduced and consistently used throughout the text.
2. **Reduce the Number of Acronyms**: We will reduce the number of acronyms by eliminating those that are used infrequently, thereby simplifying the text and reducing potential confusion.
3. **Add a Comprehensive List of Acronyms**: We will include a comprehensive list of acronyms in the manuscript to help readers easily understand the terms used.

- Specific terms, such as "hydrologic regime" and "multiagent system," are used inconsistently. A brief definition of these terms early in the manuscript (in the Introduction or Methods) would improve consistency.

Response:

Thank you for your valuable suggestion regarding the use of specific terms in our manuscript. To address your comment, we will take the following actions:

1. **Review and Ensure Consistency**: We will review the manuscript to ensure that all specific terms are used consistently throughout the text.
2. **Provide Definitions**: We will include brief definitions of these terms in the Introduction and Methods sections to enhance understanding and consistency for the readers.

- The methodology section presents a layered framework with urban and watershed scales involving socio-economic and hydrologic variables. However, the description of how these scales is integrated within a complex system would benefit from additional detail and clarity.

Response:

Thank you for your insightful suggestion regarding the methodology section of our manuscript. To address your comment, we will take the following actions:

1. **Add an Overview Paragraph**: We will add a paragraph at the beginning of the methodology section to briefly introduce the entire framework of our models, including the corresponding components and their relationships. This paragraph will focus on the interactions and relationships between models at different scales and how these local-scale models are integrated within a complex system.
2. **Enhance Detail and Clarity**: We will improve the subsequent parts of the methodology section to make the descriptions of models at different scales more coherent, cohesive, and consistent. Specifically, we will highlight and explain the relationships between models at different scales, making it easier for readers to understand the underlying logic of framing the models separately at different scales.

- Lines 170-182: The agent-based modeling (ABM) setup could be explained more systematically. Clarifying the assumptions behind each agent's decision-making process, especially for UWMs and watershed managers, would make the model's structure more understandable. Additionally, line 175 references the "Markov property," but a brief explanation or contextualization within the model would benefit readers unfamiliar with this concept.

Response:

Thank you for your valuable suggestion regarding the agent-based modeling (ABM) setup in our manuscript. To address your comment, we will take the following actions:

1. **Systematic Explanation of ABM Setup:** We will add a paragraph to briefly introduce the entire framework of our models and the corresponding components at the beginning of the methodology section. This will include a more systematic explanation of the assumptions behind the decision-making processes of different agents, including UWMs and watershed managers. Although these assumptions are detailed in the Appendix (see lines 817-827; lines 961-973; lines 999-1009), we will extract key assumptions and place them in appropriate positions within the methodology section to make the model's structure more understandable.
2. **Clarification of the Markov Property:** While a brief explanation of the Markov property is provided in the introduction section (see lines 63-65), we will further improve this explanation. We will also re-arrange this explanation within the methodology section to ensure that readers unfamiliar with this concept can easily understand its relevance and application within our model.

- Line 250 briefly mentions historical hydrologic data without indicating the data sources, calibration metrics, or validation techniques. Include a clear explanation of the calibration and validation processes. A summary table with parameter ranges, calibration techniques, and validation outcomes would strengthen the model's reliability and replicability.

Response:

Thank you for your insightful suggestion regarding the hydrologic data used for calibration and validation of the hydrologic model components in our framework. To address your comment, we will take the following actions:

1. **Clarify Data Sources**: We have mentioned the data sources in Section 3.3 - Data Collection and Processing (lines 409-410). We will ensure that this information is clearly stated and easily accessible to the reader.
2. **Detail Calibration and Validation Techniques**: We have discussed the calibration metrics and validation techniques in Section 3.4 - Model and Algorithm Setup (lines 437-447). We will further elaborate on these processes to provide a clearer understanding.
3. **Include a Summary Table**: We agree that a summary table with parameter ranges, calibration and validation techniques and processes would greatly enhance the clarity and comprehensibility of our model. Although some details are provided in the Section 3.4 and Appendix, we will add a comprehensive summary table in the methodology section. This table will include the parameter ranges, data sources, and calibration and validation techniques for the hydrologic models, making it easier for readers to understand the model details.

- Line 280–285: The hydrologic and socio-economic data sources description is somewhat broad. Including a brief list of specific datasets used, such as U.S. Geological Survey data or climate records, and their date ranges would clarify the model's foundation. The manuscript presents three spatial scales (city, inter-city, and watershed) for experimental analysis, focusing on GI policies. However, these scenarios are presented with minimal contextual detail.

Response:

Thank you for your valuable suggestion regarding the description of hydrologic and socio-economic data sources, as well as the contextual detail of our experimental design. To address your comment, we will take the following actions:

1. **Enhance Data Sources Description**: We will rewrite Section 3.3 - Data Collection and Processing to include more detailed information about the data sources. This will involve listing specific datasets used, such as U.S. Geological Survey data and climate records. Additionally, we will provide basic information about the selected gauge and weather stations, as well as details on data ranges and data processing methods.
2. **Improve Experimental Design Description**: We will enhance Section 3.2 - Experimental Design by adding more details about the experiments. This will include the purpose of the experiments, the methods used, the settings of key experiment parameters, and the evaluation metrics for the experimental results. We will ensure that the scenarios involving the three spatial scales (city, inter-city, and watershed) and their focus on GI policies are presented with sufficient contextual detail.

- Lines 315-327: Discussing the experimental conditions would help explain why specific scenarios were chosen, such as the "streamflow penalty" policy in line 319. A description of how this penalty reflects real-world practices would better convey the practical relevance of this scenario.

Response:

Thank you for your insightful suggestion regarding the discussion of experimental conditions in our manuscript. To address your comment, we will take the following actions:

1. **Add Detailed Discussion of Experimental Conditions**: We will expand Section 3.2 - Experimental Design to include a more thorough discussion of the experimental conditions. This will involve explaining the rationale behind selecting specific scenarios. For example, we will describe how this penalty reflects real-world practices and provide key experimental parameter settings, such as the base penalty rate.
2. **Motivation and Mechanism Analysis**: We will also include an analysis and description of the motivation and underlying mechanisms for choosing these specific scenarios. This will help convey the practical relevance and importance of the

scenarios in the context of integrated green infrastructures and water resource management.

- Lines 390-420: This section would be more accessible if the results for each spatial scale (city, inter-city, watershed) were divided into distinct subsections rather than being presented together. This would help readers understand the unique impacts observed at each scale.

Response:

Thank you for your valuable suggestion regarding the presentation of results for each spatial scale in our manuscript. To address your comment, we will take the following actions:

1. **Division into Distinct Subsections**: We will ensure that Section 4 - Results and Discussion is clearly divided into three distinct subsections: Subsection 4.1 for the city-scale model, Subsection 4.2 for the inter-city scale model, and Subsection 4.3 for the watershed-scale model. Each subsection will focus on presenting and discussing the results specific to that spatial scale.
2. **Prioritize Unique Impacts**: In each subsection, we will prioritize showing and analyzing the results of the model at the corresponding scale. This will help readers clearly understand the unique impacts observed at each spatial scale.
3. **Discuss Relationships Between Scales**: After presenting the results for each scale, we will discuss the relationships between models at smaller and larger scales. This discussion will include results from different scales to illustrate how they interrelate, but we will ensure this is done in a way that does not obscure the unique impacts at each scale.

- Lines 460-475: While the discussion briefly mentions the potential impacts of GI policies, it could provide more concrete suggestions for policymakers, especially regarding implementing penalty-based policies. For instance, specifying how such policies could be enforced across jurisdictions or considering potential limitations would strengthen the section.

Response:

Thank you for your insightful suggestion regarding the discussion of potential impacts of GIs policies. To address your comment, we will take the following actions:

1. **Enhance Policy Suggestions**: We will add one or two paragraphs in Subsection 4.3 - Impacts of Water Policy on Watershed-Scale IGWM. These paragraphs will provide concrete suggestions for policymakers based on the results and analysis of our watershed-scale model.

2. **Discuss Enforcement and Limitations**: We will include a discussion on how penalty-based policies could be enforced across different jurisdictions. Additionally, we will address potential limitations of such policies, considering practical aspects and challenges in implementation.

- Lines 490-500: This discussion could explore the model's adaptability to other similar regions or hydroclimatic conditions and cross-case comparisons. The authors could broaden the study's relevance by highlighting how it might apply to other areas. Expand the discussion on the policy implications of GIs, considering practical challenges and enforcement strategies. Including recommendations for policymakers, such as adaptive management guidelines or climate-resilient infrastructure planning, would enhance the study's applicability.

Response:

Thank you for your constructive suggestion regarding the exploration of our model's adaptability to other regions and hydroclimatic conditions, as well as the expansion of policy implications. To address your comment, we will take the following actions:

1. **Expand Discussion on Model Adaptability**: We will add a relevant discussion about the adaptability of the model at different scales to other regions in Subsections 4.1, 4.2, and 4.3 of Section 4 - Results and Discussion. This discussion will include: a) The possibility and operability of applying the proposed model framework to other regions with similar hydroclimatic conditions. c) Further analysis of the potential effects of GIs on watersheds similar to our study area. b) The potential for extending our model framework to simulate GI-driven socio-hydrology dynamics in other watersheds under different water policies, such as water trading schemes (Eheart and Lyon, 1983).
2. **Broaden Policy Implications**: We will expand the discussion on the policy implications of GIs, considering practical challenges and enforcement strategies. Specifically, we will include: a) Recommendations for policymakers, such as adaptive management guidelines and climate-resilient infrastructure planning. b) An analysis of practical challenges and strategies for enforcing GI policies across different jurisdictions.

References

Eheart, J.W. and Lyon, R.M., 1983. Alternative structures for water rights markets. Water Resources Research, 19(4), pp.887-894.

- Lines 520-530: The conclusion summarizes the key findings well but could further emphasize the study's contributions and the potential for broader application. Highlight how the study advances the field of socio-hydrologic

modeling, specifically regarding multi-agent frameworks for GI integration. A concluding sentence on how this framework could guide future studies in water management would leave a stronger impression.

Response:

Thank you for your valuable suggestion regarding the conclusion section of our manuscript. To address your comment, we will take the following actions:

1. **Enhance the Conclusion**: We will improve the conclusion section to further emphasize our study's contributions, specifically highlighting how the proposed multi-agent socio-hydrologic framework advances the field of socio-hydrologic modeling and the integration of GIs.
2. **Broader Application**: We will discuss the potential for broader application of our model framework to other watersheds, focusing on urban and watershed water management scenarios.

Technical corrections

- Minor grammatical issues and ambiguous phrases appear throughout the text. For example, line 175, "up-and downstream imbalances," could be clarified as "upstream-downstream imbalances." A thorough proofreading would enhance readability.

Response:

Thank you for your careful review and for pointing out the minor grammatical issues and ambiguous phrases. We appreciate your attention to detail. We will make the following revisions to address your comments:

Line 175: Change "up-and downstream imbalances" to "upstream-downstream imbalances."

In addition to this correction, we will thoroughly proofread the entire manuscript to identify and correct any similar minor errors and ambiguous phrases.

- Figure 1 provides a schematic of the model, but its components and interconnections need to be labeled clearly. A legend or detailed figure description indicating each component's function within the model would enhance interpretability. Improvement Suggestion: Include a step-by-step description or flowchart illustrating the interactions between socio-economic factors, hydrologic processes, and policy influences. This would help in clarifying the multi-agent interactions and coupling between scales.

Response:

Thank you for your valuable suggestion regarding Figure 1. To address your comment, we will take the following actions: We will add detailed descriptions for each component in Figure 1, clearly labeling all elements and their interconnections. This will make the figure easier to understand.

Besides, we will include a step-by-step flowchart illustrating the interactions between socio-economic factors, hydrologic processes, and policy influences.

- Figures 2 and 5: These figures would benefit from concise captions that specify what variables or trends they are intended to show. For instance, state whether they display policy impacts, flow distributions, or demand-supply imbalances explicitly.

Response:

Thank you for your insightful suggestion regarding the captions of Figures 2 and 5. To address your comment, we will take the following actions: We will expand the captions of Figures 2 and 5, as well as other figures associated with the results demonstration of our models, to explicitly specify what variables or trends they are intended to show. This will include clearly stating whether the figures display policy impacts, flow distributions, demand-supply imbalances, or other relevant information.

- Figure 3: While Figure 3 illustrates IGWM patterns for UWMs, more context on the visualized policy implications and the decision-making dynamics among UWMs would make the figures more impactful. Additionally, increasing the color contrast between scenarios in this figure would improve readability.
  Improvement Suggestion: Provide a rationale for each experimental scenario, focusing on its real-world applications. Consider adding a flowchart or table summarizing the experimental setups and their objectives to help readers follow the study's design.

Response:

Thank you for your valuable suggestion regarding Figure 3. To address your comment, we will take the following actions:

1. **Context and Dynamics**: We will add more context on the visualized policy implications and the decision-making dynamics among UWMs to Figure 3. This will help readers better understand the IGWM patterns and their significance.
2. **Color Contrast**: We will increase the color contrast between scenarios in the figure to improve readability and distinguishability.

Additionally, we will include a table summarizing the experimental setups and their objectives in this section. This table will help readers follow the study's design and understand the rationale behind the experimental scenario.

- Figure 4: The information presented in Figure 4 lacks sufficient labeling to identify different variables. Clear labels or a more detailed caption would clarify how the results vary by scale and policy. Improvement Suggestion: Reorganize the results section by scale and add clear interpretations of findings about policy scenarios. Additional labels and color coding in figures, especially Figures 3 and 4, would improve clarity. Why are the lines zigzagging?

Response:

Thank you for your insightful comments regarding Figure 4. We appreciate your suggestions to enhance the clarity and interpretability of our figures and results section. To address your comments, we will take the following actions:

1. **Labels and Captions**: We will add clear labels to identify different variables in Figure 4 and other figures associated with the results demonstration of our models. Additionally, we will provide more detailed captions to clarify how the results vary by scale and policy.
2. **Reorganization**: We will reorganize the results section by scale, providing clear interpretations of findings related to different policy scenarios. This reorganization will help readers follow the study's design and understand the implications of our findings.
3. **Trend Analysis**: We will further analyze and explain the trends and features observed in the figures, such as the zigzagging line in Figure 4b. This analysis will provide additional context and clarity for the presented results.
4. **Color Coding**: We will incorporate additional labels and color coding in Figures 3 and 4 to improve clarity and distinguishability of different scenarios and variables.

- Figures 3 and 4: Improve color contrast and include labels for specific variables to make visualizations easier to interpret. Including a note explaining the data or variables displayed in each figure would enhance accessibility.

Response:

Thank you for your valuable suggestions regarding Figures 3 and 4. To address your comment, we will take the following actions:

1. **Add Labels**: We will add clear labels to Figures 3 and 4 to identify different variables.

2. **Increase Color Contrast**: We will increase the color contrast between scenarios in Figures 3 and 4.
3. **Detailed Captions**: We will include detailed captions for Figures 3 and 4, providing explanations of the data or variables displayed.

Besides, We will also apply these improvements to other figures associated with the results demonstration of our models to ensure consistency and clarity throughout the paper.

- Line 367: Typo 'experiment'

Response:

Thank you for your careful review and for pointing out the typo on line 367. We appreciate your attention to detail. We will correct the typo by changing "experience" to "experiment".

Additionally, we will thoroughly review the entire manuscript to identify and correct any similar minor errors.

- Line 381: What are r_{imax}, r_{rmax}, and r_{smax}?

Response:

Thank you for your question regarding the parameters r_{imax}, r_{rmax}, and r_{smax} mentioned on line 381. To clarify:

- r_{imax} represents the maximum ratio of the area constructed with infiltration-based GIs to the relevant surface area.
- r_{rmax} represents the maximum ratio of the area constructed with rainwater harvesting systems to the relevant surface area.
- r_{smax} represents the maximum ratio of the area constructed with stormwater harvesting systems to the relevant surface area.

All of these parameters are part of the urban water balance simulation model (UWB-SM). By setting these parameters to zero, we can simulate scenarios without GI development using the UWM agent model.

While a detail explanation of these parameters is provided in the Appendix, we will rewrite this section in the manuscript to make it clearer and easier for readers to understand.

- Line 430: References?

Response:

Thank you for pointing out the omission of references on line 430. We apologize for this oversight. We will add the relevant references to this part of the section to ensure proper citation and to support the statements made.