

Point-by-point response to the reviews including all relevant changes made in the manuscript

Comments from referees	Author's response	Author's changes in manuscript
First Referee		
Overall, the manuscript is well written and pleasant to read. The work is extremely interesting in a region like West Africa, where there is relatively little documentation, as it involves compiling an inventory of existing databases on the locations and characteristics of dams and reservoirs, and attempting to validate this information in the field to verify that the databases are consistent. The results could be very useful for the hydrology community, particularly for feeding into regional hydrological, taking into account water storage and irrigation processes. The database is already available online with a corresponding DOI. One thing I'm not quite clear on is what criteria determine whether or not a database is included in the work. Do you simply use all existing data, or is there a preliminary filtering process? Similarly, I think the criteria for what is considered a large or small dam should be better defined. For example, what is the minimum reservoir size included in this new database? This is important because there is indeed a myriad of very small reservoirs, and I think it's a real challenge to try to inventory them all. On the other hand, it's important for database users to know what types and sizes of dams it contains. One point I think is worth elaborating on a bit more is this validation. It's clear that the database was validated using data from a single watershed. But I think there is a need to provide the reader with a bit more information to assess the reliability of this database, particularly in different hydroclimatic contexts. I fully understand that this type of field validation is a major work that requires significant effort at the local level and, of course, cannot be carried out on a regional scale. However, we need to provide context to help verify whether this validation is representative at the regional level.	Good points and thank you for these constructive comments. We will address them. 1. Criteria that determine whether or not a database is included in the work: We already indicated in the manuscript that based on this review, we selected datasets that are open-access with standardized file formats (CSV or XLS and SHP) for compilation (see Line 124–125). The list of datasets retained for the compilation is provided in the table 2 and Figure 2. 2. The minimum reservoir size included in this new database is already mentioned in the abstract: $57 \times 10^{-3} \text{ km}^2$ (see Lines 20–21)	3. We revised the method section and clearly defined what is called large or small reservoir and dam (see Lines 167–170). 4. We provided additional context for selecting the Upper Bandama watershed as the field-reference site used to validate the compiled dataset (see Lines 112–114). We also discussed the limitations and uncertainties associated with relying on a single watershed for validation across West Africa (see Lines 520–527).
Line 105: It would be helpful to explain why this basin was chosen for validation. Is it the only one with data, or is it representative of the area? In particular, we need to discuss how validation at a single site could be representative of the entire region, given that there are four very distinct climate zones.	The Upper Bandama watershed provides a valuable benchmark because it contains many small reservoirs and represents a data-scarce context where existing datasets often have limited coverage. We fully agree that this is only one watershed and does not capture the full diversity of environmental, hydrological, institutional, and data-availability conditions across West Africa, but it is currently the only validation data available to us for this assessment and thus of high value.	We explained why this basin was chosen for validation in the Study area section (see Lines 108–114). We also discussed the limitations and uncertainties associated with relying on a single watershed for validation across West Africa and provided recommendations for further validation across all West African climatic zones (see Lines 520–527).

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Line 141. I don't quite understand this part. For example, the coordinates of the reservoirs were estimated using a statistical approach. That seems rather inappropriate to me. A reservoir can be observed, for example in satellite images, and its location is precise—not the result of an average estimated from a statistical distribution.	The geographical coordinates of dams and reservoirs were not estimated using a statistical approach. They were verified and harmonized using the spatial information provided in the source datasets, satellite imagery, and QGIS tools. In Line 141, we stated that: “<i>Finally, we assessed the differences between the newly compiled dataset and the original datasets (Sect. 2.2) at the West Africa scale by comparing the probability density distribution of attributes such as dam latitude, reservoir latitude, reservoir surface area, and reservoir volume.</i>” This analysis was not used to estimate the coordinates of reservoirs. Rather, it was used to compare the spatial and attribute distributions of the compiled dataset with those of the originate datasets, in order to assess differences and potential gaps between them.	
Line 286. I don't think this collection exceeds the number in previous studies; as its written it actually ranges from 1,415 to 1,429. So not a large difference. It would be interesting to state here which dataset reports 1415 dams, and the % in common with the current database. And it is not the same number reported line 488 (1141 records). Please revise.	In Line 286, we stated that: “<i>The dataset that we compiled based on the selected twelve datasets contains a total of 1,429 georeferenced dam points and 1,258 reservoir polygons ($\geq 0.57 \times 10^{-3} \text{ km}^2$ and $\geq 0.1 \text{ MCM}$). This number of entries clearly exceeds the count of dams and reservoirs in West Africa reported by any individual dataset, from 288 to 1,415 entries (Fig. 5).</i>” We would like to clarify that the range from 288 to 1,415 does not refer to the number of entries contained in the originate datasets. Rather, it refers to the additional number of entries in the compiled dataset compared with each individual source dataset. In other words, depending on the originate dataset considered, the compiled dataset contains between 288 and 1,415 more dam entries. This increase is explained by the fact that the original datasets do not contain exactly the same dams and reservoirs. Some infrastructures appear in more than one dataset, while others are unique to a specific dataset. By integrating the twelve selected datasets, removing duplicates, and adding reservoir polygons identified through satellite imagery, the compiled dataset includes more entries than any individual source dataset.	We have revised the sentence as follows (see Lines 318-323): <i>“The dataset compiled from the twelve selected datasets contains 1,429 georeferenced dam points and 1,258 reservoir polygons ($\geq 0.57 \times 10^{-3} \text{ km}^2$ and $\geq 0.1 \text{ MCM}$). Compared with the individual source datasets, the compiled dataset adds 1,088 to 1,415 dam entries and 117 to 1,119 reservoir entries, depending on the dataset considered (Fig. 5). Among the originate datasets, GLRSED contributed the largest share of reservoir records, accounting for 91% of the reservoir entries in the compiled dataset, whereas GDAT contributed the largest share of dam records, accounting for 24% of the dam entries.”</i> We also corrected the inconsistency in Line 488 (see Lines 553-554).
Figure 6: I see that the size of the catchment area is missing in many cases. However, it seems to me that this information is very easy to estimate: once you have the precise locations of the dams, you can delineate the catchment area using a digital elevation model (DEM).	We agree that watershed area can be estimated using dam locations and a digital elevation model (DEM). However, watershed-area delineation requires additional methodological choices, including DEM selection, flow-direction processing, treatment of flat areas, correction of dam-point locations relative to the drainage network, and validation of the derived catchments. These steps may introduce additional uncertainty and were therefore not included in the current version of the compiled dataset which	In the revised manuscript, we clarify this point and mention watershed-area delineation with other missing attributes as a valuable next step for improving the compiled dataset, in the discussion section (see Lines 538-544).

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	focuses on harmonizing and documenting the attributes already provided by the selected source datasets rather than deriving new hydrological attributes for all dams and reservoirs.	
Line 310. It should also be noted that these are climatologically very different regions, with a gradient of aridity from south to north.		We revised the text accordingly. In the revised version of the manuscript, this point is addressed in Lines 348-349 .
Figure 12 can be misleading. At first glance, I thought it was a comparison of the same dams—specifically, what was in the databases versus what was observed—but upon reading the text, one realizes that these are two different databases: on the one hand, what is observed in the field, and on the other hand, what is in the databases. Because otherwise, it would be very surprising that information such as the year of construction or the height of the dam—which are actually fairly easy to obtain—would differ so much. So I think the figure’s caption should be rewritten slightly to explain that these are in fact two different sets of data.		We revised the caption of the Figure 12 as follows: <i>“Comparison of the density distribution of attributes from the compiled dataset and the field campaign dataset (ground truth data) at watershed scale (14,000 km²). This does not represent a one-to-one comparison of the same dams, but rather compares the overall attribute distributions in both datasets. The attributes shown are: (a) latitude, (b) year of completion, (c) reservoir volume, (d) reservoir surface area, (e) average reservoir depth, (f) dam height, and (g) average discharge.”</i>
Line 415: I think this paragraph should be expanded slightly to explain the link between the spatial distribution of dams and the climate. One might imagine that dams are unnecessary in humid regions but necessary in semi-arid regions. However, this is not explicitly discussed in the manuscript. However, given the number of dams analyzed, I believe this type of analysis would be very interesting.	In the line 415 of the preprint, we stated: <i>“The spatial pattern derived from the compiled dataset revealed a pronounced concentration of dams and reservoirs between 8° N and 14° N, corresponding to the Sudanian zone. This is consistent with previous studies (Cecchi et al., 2009b; Lèye et al., 2021; Fowé et al., 2023) and reflects long-term efforts to mitigate rainfall variability and sustain agricultural productivity in the savannah biome (Cecchi et al., 2009a; Lèye et al., 2021; Fowé et al., 2023; Peña-Angulo et al., 2025).”</i> The main purpose of this paragraph is to support the quality and consistency of the compiled dataset by showing that the spatial distribution of dams and reservoirs agrees with patterns already reported in previous studies. Additionally, the paragraph already addresses the climate link briefly. We agree that a detailed discussion of the necessity or role of dams across each climate zone would be interesting. However, it is beyond the main scope of this manuscript and does not directly address our research objectives.	
Line 496: I think we should clarify here what is meant by a “small reservoir.” Are we trying to detect pools a few meters in size? What is the average size? And, in fact, I feel that this definition is somewhat lacking in the manuscript; perhaps it should be clarified= what is the minimum dam size considered in the database	The dataset does not aim to systematically inventory very small pools or ponds of only a few meters in size.	In the revised manuscript, we defined reservoir classes according to the classification proposed by FAO (See Table 3 of the revised manuscript). We also defined “small-scale infrastructure” as referring to minor and small reservoirs, as specified in the Methods section (see Lines 170–171). We have ensured that the minimum reservoir size included in the compiled dataset is clearly stated where relevant in the revised manuscript, including in the Abstract (Line 21).

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Second Referee														
The manuscript is generally well written and reads smoothly. It provides a clear overview of existing dam and reservoir datasets, identifies relevant scientific gaps, and presents a coherent methodology, results, and discussion. By integrating 12 existing datasets, the authors developed a harmonized database of dams and reservoirs in West Africa and evaluated it using field-survey data from the Upper Bandama watershed. The study has substantial regional relevance and potential practical value. In addition, the dataset has been made publicly available through a repository with a DOI, which is appropriate for an ESSD data description article. However, additional technical details are needed for several key procedures, including data harmonization, duplicate removal, dam–reservoir matching, and manual digitization. The authors should also consider that the source datasets differ in feature type, size threshold, and temporal coverage. Moreover, several datasets inherit records from the same sources and therefore cannot be regarded as completely independent products. These dependencies should be explicitly considered during data integration and quality assessment. Overall, I consider this a meaningful study with considerable potential value. However, the manuscript would benefit from careful revision before publication. Improving the transparency and reproducibility of the methodology would substantially enhance the scientific value and practical usability of both the manuscript and the dataset. My specific comments are provided below.	We sincerely thank the reviewer for the careful reading of our manuscript and for the constructive and helpful comments. We are pleased that the reviewer found the manuscript generally well written and recognized the regional relevance and practical value of the harmonized dam and reservoir dataset. We also appreciate the specific suggestions regarding the need to provide more technical details on data harmonization, duplicate removal, dam–reservoir matching, manual digitization, temporal mismatches, and the non-independence of some source datasets. We agree that improving the transparency and reproducibility of these methodological steps will strengthen both the manuscript and the dataset. In the revised version, we will provide additional details in the Methods and Discussion sections and add a dedicated limitations subsection. Please find below our preliminary responses to each comment.													
1. Abstract: Please define “small-scale infrastructure” and provide the corresponding area, storage-capacity, or dam-height threshold.	In our manuscript, “small-scale infrastructure” refers to minor and small reservoirs of the definitions proposed by FAO (Bernacsek, 1984), which ranges from 0.010 to 9.99 km ² surface area. We revised the manuscript to strictly follow the FAO classification, as shown below: <table><tr><td>Reservoir category</td><td>Surface area range at USL (km²)</td></tr><tr><td>Major</td><td>≥ 1,000</td></tr><tr><td>Large</td><td>100–999</td></tr><tr><td>Medium</td><td>10.0–99.9</td></tr><tr><td>Small</td><td>1.00–9.99</td></tr><tr><td>Minor</td><td>0.010–0.999</td></tr></table>	Reservoir category	Surface area range at USL (km ²)	Major	≥ 1,000	Large	100–999	Medium	10.0–99.9	Small	1.00–9.99	Minor	0.010–0.999	We clarified in the abstract that large-scale reservoirs, classified as medium, large, or major, have surface areas greater than or equal to 10 km ² , whereas small-scale reservoirs, classified as minor or small, have surface areas below 10 km ² (see Line 25). We defined “small-scale infrastructure” and “large-scale infrastructure” in the revised manuscript (Lines 167–170) and updated Figure 7c to strictly follow the classification proposed by FAO (Bernacsek, 1984).
Reservoir category	Surface area range at USL (km ²)													
Major	≥ 1,000													
Large	100–999													
Medium	10.0–99.9													
Small	1.00–9.99													
Minor	0.010–0.999													
2. Introduction: The terms “large” and “small” dams and reservoirs should be precisely defined throughout the manuscript. If the classification is based on reservoir area, please provide the corresponding area ranges.		We clearly defined these categories, in the revised manuscript, based on the definitions proposed by FAO (Bernacsek, 1984).												
3. Line 76: The research gap is described as the “underestimation” of West African dams and reservoirs in existing datasets. Does this refer to the number of dams, reservoir area, storage capacity, positional accuracy, attribute completeness, or a combination of these factors? Please define the specific dimensions of underestimation more clearly.	In the current version, the term “underestimation” refers to the number of dams and reservoirs reported in existing datasets.	We revised the manuscript as followed (see Lines 79–81): “One key gap is the inconsistency in the number of West African dam and reservoir entries across existing datasets (Zhang and Gu, 2023). This suggests that some datasets underestimate the number of dams and reservoirs, thereby limiting their completeness, accuracy, and reliability.”												
4. Please explain how duplicate records were identified and removed, including the matching	The harmonization was performed manually in QGIS after merging the selected source datasets. Separate	We revised the method section accordingly (see Line 155–161).												

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criteria, thresholds, and whether the process was automated or manual.	harmonized attribute tables were created for dam points and reservoir polygons. Duplicate records were identified using a combination of spatial and attribute-based checks. First, records with identical or nearly identical geographic coordinates were flagged as potential duplicates. Second, overlapping or very closely located features were visually inspected in QGIS. Third, available attributes such as dam or reservoir name, country, river or basin name, reservoir area, storage capacity, construction year, and source dataset were compared to confirm whether the records referred to the same infrastructure. When duplicate records were confirmed, only one representative record was retained in the compiled dataset. Attribute information from the duplicate sources was not simply discarded; rather, consistent information was retained and used to improve the completeness of the final record. In cases where attributes differed across sources, priority was given to the most complete and plausible record. Ambiguous cases were checked manually before final inclusion.	
5. Please clarify whether dam points and reservoir polygons have a one-to-one relationship in the compiled dataset. How were dam points linked to reservoir polygons?	Dam points and reservoir polygons do not always have a strict one-to-one relationship in the compiled dataset. This is because the selected source datasets differ in their feature types and purposes. Some datasets provide dam locations as points only, while others provide reservoir polygons without associated dam points. In addition, some large or complex reservoir systems may include more than one dam-related point, while some small dams may not have a clearly mapped reservoir polygon in the available products. Where possible, dam points were linked to reservoir polygons using spatial overlay and proximity analysis in QGIS. A dam point was associated with a reservoir polygon when it was located within, on the boundary of, or immediately downstream of the polygon. This spatial matching was supported by attribute information where available, including dam or reservoir name, country, river or basin, reservoir area, and source dataset. Ambiguous cases were manually inspected using the spatial layers and, where necessary, satellite imagery or base maps.	We clarified that in the method section of the revised manuscript (see Line 143-151).
6. Please clarify whether each record retains its original data source and indicates any modifications made during harmonization.	We agree that data provenance is essential for the transparency and reuse of the harmonized dataset. In the current version of the compiled dataset, each dam or reservoir record does not retain the full list of all original datasets in which the same infrastructure may have appeared. During harmonization, when duplicate or overlapping records were identified, we retained one representative record. The source indicated for each final entry corresponds to the dataset that provided	We clarified that when attribute values differed across sources, we retained the most complete and consistent record and identified the primary contributing dataset in the source field of the compiled dataset (See Line 160-163).

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	the entry itself and/or the majority of the retained attribute information. Therefore, the source field should be interpreted as the main contributing source for the harmonized record, rather than as a complete record-level provenance history across all overlapping datasets. However, all original datasets used to build the harmonized database are cited throughout the manuscript and are also listed in the README file associated with the published dataset. In the revised manuscript, we will clarify this point to avoid any misunderstanding.	
7. Please report the sample size and selection criteria for the surveyed dams and villages in the Methods and clarify whether the survey covered all known dams in the watershed.	We conducted the field campaign in the Upper Bandama watershed, which covers approximately 14,000 km ² . It is important to note that the survey focused on dams and reservoirs identified through consultations with institutions, local authorities, and community members, and that were accessible by vehicle or on foot and therefore verifiable during field visits. Some informal, inaccessible, or locally unreported dams may still be absent from the field data. Data from the field and institutional sources were combined to form a ground truth dataset for the Upper Bandama watershed. Therefore, the ground truth dataset contains all dams included in the lists of dams provided by the consulted institutions within the watershed but may still lacks inaccessible or unreported dams.	These points are clarified in Lines 170–180 . We also discussed the limitations of this approach in the Discussion section (see Lines 525–526).
8. The field survey was conducted in 2024, whereas some source datasets are much older. Please consider temporal mismatches when interpreting missing dams and assessing dataset accuracy.	We conducted the field survey in 2024, while the most recently constructed dams recorded in the field dataset date from 2000. Among the original datasets used in the compilation, GLRSED is the most recent, having been developed and updated in 2024. In addition, FAO AQUASTAT, although the oldest source dataset used in this study, was first published in 1994 and has been updated regularly (FAO, 2021). Therefore, we do not consider temporal mismatch to be a major factor explaining the dams missing from the compiled dataset. Several source datasets were updated well after 2000, which corresponds to the construction year of the most recent dams identified in the reference field dataset (ground truth dataset).	
9. Figure 4: Please define the meaning of “lake control.”	The term “lake control” comes from the HydroLAKES database. It refers to a natural lake that is influenced or regulated by a control structure, such as a dam or outlet regulation structure.	We defined this term in the caption of Figure 4 .
10. Many of the selected datasets overlap or inherit information from other datasets. For example, some newer products incorporate records from GRanD, GLWD, HydroLAKES. Did the harmonization procedure account for this lack of independence?	We agree that the selected datasets cannot all be considered fully independent. Several dam and reservoir products share common source information or inherit records from earlier datasets such as GRanD, GLWD, and HydroLAKES. Our harmonization procedure accounted for this issue mainly through duplicate identification and data-source tracking.	We indicated that we accounted for this issue mainly through duplicate identification and data-source tracking in the revised manuscript (see Lines 154–157) We also discussed the limitation and uncertainties related to the non-independence of source datasets in discussion section (see Lines 529–535)

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	When the same dam or reservoir appeared in multiple datasets, it was treated as a duplicate record rather than as independent evidence of multiple infrastructures (dams and reservoirs). The final compiled dataset therefore aimed to retain one harmonized record per identified infrastructure while preserving source information for traceability.	
11. Table 4: The current comparison of attribute availability is rather coarse. Please consider listing the individual attributes provided by each dataset; this should not require excessive additional space and would substantially improve the usefulness of the comparison.	The existing datasets contain many individual attributes. For example, GRanD alone includes more than 45 attributes. Listing all attributes from each dataset in Table 4 would therefore make the table too large and difficult to read in the main manuscript. For this reason, we grouped the available attributes into four main categories and presented these categories in Table 4 to provide a concise overview of attribute availability across datasets.	
12. Lines 307–311: 148,671 MCM represents approximately 52.5%, rather than 55.61%, of 283,032 MCM.		We corrected the percentage in the revised manuscript and check all numbers (Line 344-346).
13. Lines 399–400: If the compiled dataset contains 32% of the dams observed during the field campaign, the gap should be approximately 68%, not 88%.		We corrected the statement in the revised manuscript in Line 440.
14. The field-based assessment was conducted in only one watershed. Please discuss more carefully whether its results can be generalized to the whole of West Africa.	The Upper Bandama watershed provides a valuable benchmark because it contains many small reservoirs and represents a data-scarce context where existing datasets often have limited coverage. We fully agree that this is only one watershed and does not capture the full diversity of environmental, hydrological, institutional, and data-availability conditions across West Africa, but it is currently the only validation data available to us for this assessment and thus of high value.	We discussed this limitation in the discussion section (see Lines 521-525)
15. I recommend adding a limitations subsection in discussion. This section should address the use of only one watershed for field evaluation, the non-independence of source datasets, and potential uncertainty in the field-reference data itself.	We agree and will add a dedicated limitations subsection to the discussion.	We added a limitations subsection to the discussion (see Lines 519-543).

