We greatly appreciate the useful comments provided, especially by Referee #1, and we have addressed these in detail. As a result, we are confident that the paper stands very much improved. We hope that the latest revision of the paper meets the standards of HESS and is acceptable for inclusion in the special issue.

REFEREE #1

The framing of the paper in terms of the theme of the special issue has significantly improved, and is now acceptable. But still I have problems to precisely pin down what this paper actually contributes, and what the "socio-hydrological transition" in this particular basin is, how it unfolds, and whether or not,

The main contribution of the paper is to advance understanding and methodology to analyze socio-hydrological transition in a semiarid basin and to assess the ability of water infrastructure to meet the demand under new variations in a coupled human-water system.

and if so how, it has been included in the modelling. As far as I can tell, it has not been included in the model, but some remarks on it are being made in the discussion and conclusion sections.

The socio-hydrological transition in the Capibaribe River Basin is characterized by factors that influence the water cycle, water availability and water demand. For example, the economic and population growth generate a stress on the water supply. This will be intensified by 2040 when it is projected that the population will peak and stop growing. The climate is other driving force that influences the socio-hydrological transition. These factors are now included in the modeling, which now takes into account the changes in the water demand and in the climate.

I also have my doubts whether the following concluding statement is sustained by the results of this paper: :".. we can conclude that the combined use of mathematical models is able to indicate the effectiveness of measures for socio-hydrological transition management"(p.16 lines7-9).

We agree that the statement "... *we can conclude that the combined use of mathematical models is able to indicate the effectiveness of measures for socio-hydrological transition management*" may be overstated. However, the models certainly aid the evaluation of management and response measures. We have changed the statement to "… *we can conclude that the combined use of mathematical models <u>can aid the evaluation of the</u> effectiveness of measures for socio-hydrological transition management*".

The authors have also made changes to the manuscript that were not required by the reviewers. However, these changes have not been declared and justified in the authors' response, which I think the authors should have done. For example, modelling results have significantly changed compared to the original version. Especially noteworthy is that whereas in the original version network water supply was 6.59 m3/s in the baseline period as well as in the period 2010-2040, it decreased to 5.84 m3/s in 2040-2070 and to 4.83 m3/s in 2070-2100, in the new version the present flow is given as 7.59 m3/s, which decreases to 6.63 m3/s in 2010-2040, then increases to 7.67 m3/s (2040-2070) and finally decreases to 6.99 m3/s in 2070-2100, which is still 45% higher than in the original version. It remains unclear why there are these significant differences.

The major changes in the second version were new calibration of the rainfall-runoff model, use of four members of the HadCM3 model for uncertainty reduction and assessment of adaptation strategies.

There are two reasons for the changes in the water supply. Firstly, there was a new calibration of the rainfall-runoff model that can result in a different synthetic runoff time series. Other explanation, and most important, it is the simulation of the network flow model considering the discharge from the interbasin transfer project of the São Francisco River. The discharge (4 m^3/s) from the São Francisco River project is linked to human demands in the analysis units 1, 2 and 3.

(1) The high volume errors for Toritama and Vitoria gauges in the validation of the model (-31 and +45%) are not adequately explained. The authors therefore do not give a satisfactory rebuttal to thecomment of Reviewer #1 ("The model performance during the calibration period is not critically discussed in section 4. In fact Table 3 should lead to some serious discussion – why does the model perform so badly in the lower part of the basin? The authors cannot skirt that question!"). And yet, in the concluding section the authors write: "The MODHAC hydrological model accurately represented the streamflow" (line s 15-16, p.14). What is the basis for this qualification?

The process of calibration has been improved. The main improvements are:

- In the first version, there was no validation. Now, there is a period for calibration and other one for validation;
- In the first version, three stream gauges were used. Now, four stream gauges are used;
- The calibration of the lower part has improved according to the results of calibration and validation at Eng. Canavieira and calibration at Vitória;
- Calibration assessment by parameters transfer. The model has been applied in a drainage area of a stream gauge (Salgadinho-4,923.0 km^2) nested in the Limoeiro stream gauge and showed good results.

Moriasi et al. (2007) present model evaluation guidelines for quantification of model performance. Based on literature, the authors show the performance ratings for statistics Nash-Suttcliffe and volume error (Table 1).

Table 1.

PerformanceRating	Nash-Sutcliffe (NS)	Volume error - ΔV (%)
Very good	0.75 < NS< 1.00	ΔV< ±10
Good	0.65 < NS< 0.75	±10 <ΔV< ±15
Satisfactory	0.50 < NS< 0.65	±15 <ΔV< ±25
Unsatisfactory	NS < 0.50	ΔV> ±25

There were eight simulations with MODHAC (four calibrations and four validations). According to the performance ratings presented in Moriasi et al. (2007), the NS was "Very good" in four simulations, "Good" in three simulations and "Satisfactory" for one simulation. The volume error was "Very good" in four simulations, "Good" in two simulations and "Unsatisfactory" for two simulations.

It is important to highlight that the two unsatisfactory simulations correspond to validation periods. Moriasi et al. (2007) state that "*stricter performance ratings should*

generally be required during model calibration than during validation. This difference is recommended because parameter values are optimized during model calibration, but parameters are not adjusted in validation".

We also remark that the average simulated streamflow in the validation period at Toritama and Vitoria are similar to average streamflow in the calibration period (Table 2). We do not have elements to state that the observed streamflow changed, but this must be investigated. For example, the water use for irrigation may have affected the flow in the river reach upstream Vitoria.

Table 2. Average streamflow

	Toritama	Vitoria
Calibration/Observed	3.41	2.21
Calibration/Simulated	3.50	1.94
Validation/Observed	**4.25**	**1.45**
Validation/Simulated	2.92	2.10

In the statement *"The MODHAC hydrological model accurately represented the streamflow"*, the word "accurately" is not appropriate. The sentence has changed to *"The MODHAC hydrological model adequately represented the streamflow"*.

(2) Some statements made are in my view implicitly normative or are assumptions rather than facts. These should in my view either be reformulated or qualified:

- p.2 line 1-2 "... which together reduce future water demand by 23.0%."

Modified to "... which together have potential to reduce future water demand by 23.0%."

- p.10 lines 20-21: "Both increase by 2040 and remain constant until 2100..."

Modified to "We assume that both increase by 2040 and remain constant until 2100..."

- p.14 line 29: "Brazil has a history of inappropriate policies..."

The paragraph has been modified to show that the new policy regime focuses on demand management.

(3) There are still some editorial flaws, or sentences that are difficult to understand. I noted the following:

All the corrections have been done. We show below some comments that need complementary explanation.

- p.11 line 11: "It was used.."

"Two periods of time were used …"

- p.12 lines 3-6: data are literally repeated on p.13 lines 7-8.

The text was deleted.

- p.13 lines 4-6: edit sentence

"…have as consequence higher pressure ..."

- p.13 lines 28-29: edit sentence; unclear what this sentence wishes to say.

"These simulated results are attributable to water that is projected to come from the interbasin transfer project of the São Francisco River".

- p.14 lines 23-28: "Supply-side strategies ... (Cheng and Hu, 2012)." These sentences expounding on demand and supply management do not belong in the conclusions

This sentence is important because opens discussion for the text that follows about the policy regime for water demand management, and we consider to be important.

- p.15 line 14: "...sustainable economic growth.." The word sustainable is not appropriate here. Do you mean "sustained"? Otherwise consider omitting the word.

"…sustained economic growth ...".

REFERENCE

Moriasi, D.N., Arnold, J.G., Van Liew, M.W., Bingner, R.L., Harmel, R.D., Veith, T.L.: Model Evaluation Guidelines for Systematic Quantification of Accuracy in Watershed Simulations. American Society of Agricultural and Bio-logical Engineers, 50, 885-900, 2007.

REFEREE #2

More edits noticed:

p. 14, line 20 to p. 15 line 4: these sentences add context to what follows in the paragraph, but it reads more like background/introduction material. I still wonder if the conclusions section is too long.

The Conclusions section has been tightened up although it is still somewhat long. The policy regime for water demand management we consider to be important.

p. 4, line 15: impact or impacts?

"These are the "forward" impacts…"

p. 5, line 20: not clear what/which "impact" is hoped to be diminished;

"diminish the climate change impact…"

p. 7, lines 9-10: as written, sounds like people here have no access to any water (couldn't survive);

"live in the interior with limited access…"

p. 10, line 24: hypotheses plural

"Three hypotheses have been considered…"

p. 11, line 13: delete "The"

"Evaluation of the model calibration considers..."

p. 11: maybe it's my lack of modeling background, but line 8 says 16 simulations; not clear if periods on line 12 are averages of more than 1 (4 simulations?);

Clarified in revised submission.

p. 13, line 29: delete "the" in "the responsible" and phrase generally unclear;

"These simulated results are attributable to water that is projected to come from the interbasin transfer project of the São Francisco River."

p. 14, line 16: "and" instead of "which"?

"and has been used…"

p. 15, line 2: "a water resources master plan" or "water resources master plans"?

"water resources master plans for the basins"

p. 15, lines 26-27: should "model" be plural?

“regional climate models, hydrological models and allocation models…”