

Interactive comment on “Evolution of the human–water relationships in Heihe River basin in the past 2000 years” by Z. Lu et al.

Anonymous Referee #1

Received and published: 23 February 2015

This paper reconstructed water balance in the mid- and downstream area of Heihe River Basin during the past 2000 years. Four stages of the human-water systems are identified. The interaction of cultivated area and streamflow into the terminal lake is then discussed. This study adds a valuable case study for comparative socio-hydrologic studies across different human–water systems. I have some comments for the consideration of revision by the authors.

The estimation of E is not clear to me. Is E estimated by equation (2) or (3) for the basin or for cultivated oases and natural oases separately? Is $w=3.5$ for all the historical periods? Should the value of w be different between cultivated oases and natural oases? Should w even change with time depending on the type and intensity of crops?

C275

Water supply is computed as the summation of local precipitation and irrigation (or groundwater ET). Is irrigation water pumped from groundwater or surface water withdrawal?

Is a portion of local precipitation recharged to the groundwater? If not, the groundwater is fully replenished by the precipitation recharge at the upstream (mountain).

Line 15 page 1061: change to “, e.g., water”

Lines 1-3 page 1062: There are some recently published papers which are for explanatory and predictive purpose, e.g., “A prototype framework for models of socio-hydrology: identification of key feedback loops and parameterisation approach” by Elshafei et al. (2014 HESS)

Lines 24-25 page 1062: some information is repeated at lines 4-9.

Line 15 page 1064: “Budyko and Miller, 1974;” Double check this.

Line 20 page 1064: change to “respectively;” Similar changes are applicable for other locations.

Line 16 page 1066: correct “Fu (1981) fFor details,”

Line 24 page 1066: change “PET” to “E0” or define PET.

Lines 24 page 1066 – line 1 page 1067: E0 is assumed to be the same between the historical period and the instrumental period. This assumption needs to be justified or the uncertainty on estimated E due to this assumption needs to be discussed.

Line 15 page 1067: since “I” has been used for irrigation in Equation (5), you can use “J” to replace “I” in equation (5).

Line 2 page 1074: “m3/year”? Check the unit in Table 2 too.

Lines 10-11 page 1076: The period from 2000-2010 is short. I am not sure whether it has already reached a new equilibrium stage. Natural oasis may continue to increase

C276

from Figure 5.

Line 13 page 1077: Are predictions of its possible future dynamics discussed? How to predict future dynamics?

Lines 15-18 page 1077: I think the claim is over stated. The manuscript can be shortened, but the “transition theory” needs more description and discussion.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 1059, 2015.