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Natural Hazards and Earth System Sciences
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Discussions

Interactive comment on "Assess arsenic distribution in groundwater applying GIS in capital of Punjab, Pakistan" *by* M. M. Akhtar et al.

Anonymous Referee #2

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General comments on NHESS-2014-352 This manuscript presents a case study on arsenic in groundwater in Pakistan. The authors aim at describing the critical situation for groundwaters used for human consumption in the district of Lahore, Pakistan. They also aim at demonstrating that the impact of human activities is the main reason for high arsenic concentration in groundwaters. This topic is very timely today, and very attractive as well worldwide. For this reason this manuscript could be relevant for NHESS, although the manuscript as it is is very weak both for the data they use and in general the information they bring to support they hypothesis. The authors affirm that the principal source of arsenic is anthropogenic (agricultural activities, industrial effluents, . . . , see pag 2133 lines 17-18). However they do not bring any clear evidence to justify this affirmation. In addition this seems to be in contraddiction with the sentence

at pag. 2134 lines 9-10 where they mention that "local geological composition and anthropogenic activities are regarded as major sources of arsenic high concentration". At pag.2135 lines 15-17 they again mention both geological structure and anthropogenic activities as main sources for arsenic in groundwater. Worldwide, arsenic is mostly of geogenic origin, although enhanced dissolution of arsenic bearing minerals may be triggered by anthropogenic pressure. Anthropogenic sources exist of course (e.g. mining activities, the use of pesticides containing arsenates, . . .) but mostly they are not the main reason for the arsenic in groundwaters. The authors seem to aim at demonstrating the importance of anthropogenic sources in the case study, however the data they present only confirm that arsenic is present in local groundwaters but there are no elements to justify which part is geogenic and which is possibly due to anthropogenic sources. For this purpose, they should e.g. show the relation between anthropogenic impacted areas and the highest concentration in groundwaters, or any other element that could support their hypothesis.

In addition the manuscript is rather confused and sometimes it is not easy to distinguish the authors' affirmations from the literature review.

Other specific comments:

They analyse groundwater quality data referring to 2010 and 2012. The authors mention that 268 samples are available but it is not clear how many wells are used in the analysis as the do not specify the numbers of the sampling sites. In addition they do not specify if the sampling sites are the same in 2010 and 2012. The number of sampling sites is most important in the GIS analysis. Sampling sites should be visible in Fig.2.

There are no information on the quality of chemical measurement results: which methods were used in sampling? Which is the precision of the chemical analysis?

Pag.2131 line 1-2: please show the semivariogram could. Please show the 3D trend analysis.

A large part of the Results and discussion chapter should be moved in the Introduction or in the case study description. See e.g. pag.2128 lines 14-16, pag.2129 lines 1-14 and lines 19-20, pag.2132 lines 6-9, pag.2133 lines 24-29 and pag.2134 lines 1-5, pag.2134 lines 6-28, pag.2135 lines 1-18. However, there are many repetitions and the Introduction itself should be shortened.

The geology and hydrogeology of the case study should be better described, both in the text and in the maps.

English is rather poor, sometimes difficult to understand the meaning.

Units should always be in Int.System (i.e. do not use feet)

The maps are very poor, please add the sampling sites location, the location of Lahore city and any other relevant information.

The WHO limit for arsenic is 10 ug/L, not 50 (see pag.2123 line 1) What is PSQCA? Please explain acronyms when they are first used in the text.

Pag 2131 line 13 :20.61 should be 2.61!

Reference to the figures is sometimes wrong, please check.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 2119, 2015.