

Interactive comment on “The Indus basin in the framework of current and future water resources management” by A. N. Laghari et al.

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Received and published: 19 April 2011

The Indus basin, cradle of the ancient Indus civilisation and modern Green Revolution in South Asia, is under a serious threat of its own making. The surplus food (rice, wheat, sugarcane etc.; and cotton) produced in this basin meets the deficits of about nine other adjacent basins (Amarasinghe et al., 2005) and in the processes nearly depletes all its available water resources. The present paper is a good attempt to highlight the seriousness of the challenge and then present a number of recommendations for sustainable water resources. However, the paper is merely a synthesis of the recently published papers and routine recommendations made at different forums (several of these already rejected due to low feasibility or interest) and lacks innovativeness in the approach. Several of the recommendations are also in contradiction. It shall bet-

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ter serve the purpose, in case the authors make an in house research (may be with secondary data) and come out with few but fresh and more acceptable recommendations. Specific comments are given below: 1. The annual input to the Indus basin is about 824 BCM- the irrigated agriculture covers around 20% area but utilises 33% of the resources (high cropping and irrigation intensity), 92% of the irrigated land receives irrigation from surface water resources and remaining 8% from groundwater. rainfed agriculture covers 14% of the basin and utilises 15% (147 BCM) of the available water. About 45% of the area is under grasslands and 19% under is forests, urban lands and other uses which together uses about 43% of total available water in the basin. As such only about 9% of the water remains unutilised to meet the environmental flow needs and other uses which is by far the lowest as compared to several comparable basins- in Ganges basin 40% of available water is presently uncommitted and leaves as runoff. A quantitative analysis on these lines shall be very helpful. 2. Contribution of snow and glacier melt to the Indus flows is very significant (above 40%) and as such the impact of climate change (rise in global temperatures) shall also be significant. There is better evidence that several of the glaciers in the HKH region are in retreat mode . This implies that in the short to long-term increased supplies of water and frequent floods in the upper reaches of the mountains/ plains are expected. This means more storage dams or increasing the capacity of additional dams (Mangla, Tarbela, Bhakra) may be useful. An additional and useful feature is that water from the snow and glacier melt starts appearing earlier than the main monsoon flows (especially flows in the Kabul river and Indus main stem) which are useful for operating the canals early and timely sowing of the summer and kharif crops. The section 3.2, which presently is very general need to be made very specific. 3. It is true that parts of the Indus basin and its adjoining areas are referred as the global hot-spots for groundwater over-exploitation(Rodell, 2009). The paper needs to analyse the reasons for such a situation which aggravated during the last 2-3 decades. Some of the possible reasons are: (i) poor maintenance and management of the large irrigation systems and their inability to meet the variable and on-demand nature of the farmers water requirements, (ii) Putting large areas under rice

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(including basmati for export) cultivation during the hot summer season with extremely high evaporative demands, and (iii) populist energy policies in the region like free or highly subsidised power supplies to the farmers (Indian Punjab). The decline in water tables can be arrested only through reduced evaporative demands and real water savings. Other cosmetic measures like increasing recharge (again to be pumped back) are less likely to work in the region. The section 3.4 on this topic needs to be more precise and make some assessment of how much area under rice can be hydrologically supported in the basin. 4. The Section 4.1.1 on rain water harvesting, AGWR etc. will have very small +ve impact and is not new- may be deleted. 5. Water Quality Conservation & wastewater: In the basin where demands for irrigation and related activities constitute about 95% of the supplies; the other sectors have a limited scope for conservation. Rather one should argue that share of irrigation needs to be reduced by 10-15% (through productivity improvement) to make available higher allocations for domestic and industrial uses in view of growing urbanisation and industrialisation. The other important factor for water quality is conservation is through improved irrigation technology. The present methods of surface irrigation are wasteful and larger doses through flood irrigation with fresh water only add to the non-retrievable pool of poor quality saline groundwater. as such irrigation infrastructure should enable farmers to apply just the right amount of water- small and frequent (like sprinklers, drips, aerobic rice, SRI techniques, laser land levelling) and conjunctive use of fresh and poor quality waters. Section 4.1.3 needs to be revised on these lines. 6. Section 4.1.4 and 4.1.5 are too brief to convey any meaningful recommendation- either should be developed properly or deleted. My advice is to make few but strong and well articulated recommendations. 7. Water and land productivity in a large part of the irrigated parts of the Indus basin is already very high. The combined productivity of rice-wheat system is around 6.0 to > 10.0 t/ha which is comparable to any other high productive region in the world. Comparing Indus basin with France, Germany etc is erroneous as these countries grow only one long duration crop in a year. Problem in the Indus is that its high productivity is based on rice-wheat system which is hydrologically unsustainable

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in the long run. Other issue is that the region has very high productivity in small regions and low productivity in the adjoining rainfed areas. So the authors need to come out with an innovative solution and may desist for recommending the oft-repeated but never adopted solutions. 8. For economic policy interventions, some of the innovative solutions may be: i. Punjab Preservation of Sub-Soil Water Act (2010) which prevents farmers from transplanting of paddy before 15th June to reduce ET (groundwater pumpage and energy) during the extremely hot summer months. Pakistan Punjab and other states may also emulate such regulations. ii. Review the existing energy policies to ensure the actual value of groundwater. Free/highly subsidised energy to the farmers may be controlled manner or may be supplied in a smarter way. iii. Reducing areas under rice crop in the Indus basin may be a long term policy by encouraging rice cultivation in wetter areas or going other water-efficient but high value crops.

9. Technical Comments: i. Line 2, page 2265 is incomplete. ii. Line 25, page 2265 is not clear. iii. Paras 4.1.4, 4.1.5; 4.2.4, 4.2.5, 4.2.6, 4.2.7, 4.3 may either be better developed or deleted. Just putting as passing reference of the already known facts serves no good purpose. iv. Check the figure in line 1 of page 2277. v. Paper may be better organised under fewer but innovatively designed sections- leave the stale and known facts and recommendations. 4.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 2263, 2011.

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