

## ***Interactive comment on “Assessing water resources adaptive capacity to climate change impacts in the Pacific Northwest Region of North America” by A. F. Hamlet***

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Assessing water resources adaptive capacity to climate change impacts in the Pacific Northwest Region of North America by A. Hamlet

General Comments: This is a very timely publication that illustrates the complexity of arriving at an adaptive management strategy for climate change in large river basins. The author did an excellent job of drawing attention to the assumption of using the stationarity concept, the heavy reliance on historic records, the rigid enforcement of

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operational and water allocation rules, and the jurisdictional fragmentation. All are major obstacles in order to arrive at a comprehensive adaptive water management strategy that can cope effectively with increased climatic variability.

The author rightly suggests that the flood management program in the basin is efficient and has a centralized organization that deals effectively with flood. However, this is completely absent for basin wide drought management and water allocation for environmental services. One of the reasons for this is that in a very large basin drought is rarely prominent in all parts of the basin, water allocations rarely focus on contingencies on how to reallocate water use during drought, and the beginning and end of a drought is much more difficult to project than flood events.

There are three topics that could benefit from a more detailed discussion: The scaling issue, the archaic water laws and regulations, and the conflicts between the water uses for economic development vs. water use for environmental services.

**The scaling issues:** This is partially addressed by suggesting that adaptation at the sub-watershed level might be more effective given the complexity at the basin wide scale. However, the greatest progress is being made at the local level where many communities are starting to develop effective water conservation and climate change adaptation plans. Unless these activities are scaled up to the regional scale, the impacts will not be sufficient. This means that regional authorities (at the county and district level) need to be part of a coordinated effort for water planning in the rural areas. There also needs to be a higher authority (maybe a river basin commission or council) that integrates the efforts and activities at the sub-basin scale.

**Archaic water laws and regulations:** The water laws in the Columbia Basin (on both sides of the border) are rigid and are not flexible to deal effectively with water shortages and reduced summer flow. Reallocating water or having a set of flexible rules on how to reduce the allocations during drought or long term lower summer flow is critical in order to assure that essential environmental services can be maintained in the future.

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Long term privately held fixed water rights are in conflict with the concept of adaptive management.

The conflict between economic developments vs. water for environmental services. This is mentioned but needs more emphasis because as energy demands increase, then the allocation of sufficient water for irrigation, domestic use and power generation, and environmental services will become increasingly conflicting (as happened during the California energy crisis). What priorities should be put in place to use water under dryer summer flow conditions? From the economic perspective hydropower generation will strategically, politically and economically become more important than water for irrigation and the environment.

One of the short term adaptive management strategies that should also be mentioned is the focus on water conservation. The residents in the basin are among the largest water users in the world and there is plenty opportunities to become more efficient in domestic and irrigation water use. Since these uses are highest during the critical low flow summer period the water saving could improve the amount available for ecosystem services.

Much of the academic research has focused on developing climate models based on watershed scale processes. This paper clearly shows that there is an urgent need to scale up to the river basin. This increases the complexity and requires extensive restructuring and integration of institutions. The is an excellent paper. It iis well written and draws attention to the key issues we need to address at the basin scale.

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Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/7/C1631/2010/hessd-7-C1631-2010-supplement.pdf>

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