1. Climatic changes have been on-going for some time;
2. Climate changes usually predict warmer temperatures and variable precipitation (e.g., Lettenmaier and co-workers Nijssen, Christensen, Payne, etc.);
3. Large river basins integrate the spatial and temporal variability of rainfall. (e.g., long-term trends could affect hydropower, ecosystems and aquatic species...).
Climatic changes imply increased variability

Climatic changes imply uncertainty

Climate Change Issues in the US

1. Rainfall vs Snowmelt;
Rainfall vs Snowmelt

Upper Elevation: Flooding from snowmelt

Lower Elevation: Flooding from thunderstorms

Climate Change Issues in the US

1. Rainfall vs Snowmelt;
2. Extended Droughts;

U.S. Drought Monitor
August 21, 2007

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for detailed statements.
Reduced Water Supply from Reservoirs

Climate Change Issues in the US

1. Rainfall vs Snowmelt;
2. Extended Droughts;
3. Forest Fires and Sedimentation;
Sediment Plugs on the Rio Grande

Climate Change Issues in the US
1. Rainfall vs Snowmelt;
2. Extended Droughts;
3. Forest Fires and Sedimentation;
4. Water Quality and Floods;

Upland Erosion (water quality, nutrients, fertilizers, pesticides, etc.)

Sheet erosion in the Upper Mississippi River basin
Climate Change Issues in the US

1. Rainfall vs Snowmelt;
2. Forest Fires and Sedimentation;
3. Extended Droughts;
4. Water Quality and Floods;
5. Hurricanes
In face of sweeping changes, it is better to build on strength and live right...

Katrina, a category 5 Hurricane
Impact of Katrina on wetlands

[Image of before and after comparison of wetlands affected by Katrina]

Figure 3-10. Elaboration of global mean sea level (deviation from the 1980-1999 mean) as observed since 1870 and projected for the future. The future projections have been calculated independently from the observations (after IPCC 2007a, FAQ 3, Figure 1).

From USACE Circular CECW-CE 1165-2-211, July 2009
Potential Issues in South Korea

1. Upland Erosion;
2. Water Quality;
3. Sedimentation and Dredging;
4. Typhoons and Floods;
5. …

Rainfall of Typhoon Maemi Sept. 2003

Mangun mountain, South Korea
River changes below Hapcheon dam

1983

2007
Nakdong River Estuary Barrage

- From U. Ji, PhD dissertation, CSU

Gupo Bridge during Typhoon Maemi in 2003

- From U. Ji, PhD dissertation, CSU
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