

### Chapter 3 Highlights

1. Climate change and land-use change are modifying global and local water availability, posing a threat to infrastructure and institutions built around past conditions.
2. The clearest impacts of climate change on the hydrologic cycle are those that stem directly from higher temperatures: an increase in both ET and P, more intense droughts and floods, earlier snowmelt, a decrease in snow and ice storage in water tower regions, and a decrease in runoff ratio in many locations. Climate change is also likely to affect the spatio-temporal distribution of precipitation in complex ways, leading to effects on local runoff that are harder to predict.
3. Climate change is making some extreme events, including droughts, more likely; **extreme event attribution** can now estimate the extent to which a given event was made more likely by climate change.
4. Other hydrologic effects of climate change and CO<sub>2</sub> include: sea-level rise and **saltwater intrusion** into coastal aquifers; **global greening** (resulting in higher transpiration rates); and a decrease in stomatal conductance (resulting in higher **plant water-use efficiency**).
5. With some exceptions (such as cloud forests), the effects of deforestation on water availability are driven by three factors: (a) Deforestation reduces ET, thus increasing blue water availability. (b) Deforestation reduces soil water storage capacity, producing a **flashier** hydrology. (c) Deforestation can reduce precipitation in downwind regions, especially those that are heavily dependent on **terrestrial moisture recycling**.
6. Forests are an important source of water supply, and should be managed, at least in part, to protect water quality by minimizing erosion, pest outbreaks, and catastrophic wildfire. In some cases, forest thinning and **prescribed** or **cultural burns** can increase water yields while also increasing forest diversity and resilience.
7. Great Green Walls are being implemented in Africa and China to fight **desertification**. While dense planting of forests in arid regions is unlikely to be successful in increasing water availability, appropriate **agroforestry** practices can improve soil health and productivity in these areas.
8. In urban areas, the presence of **impervious surfaces** creates flashy **stormwater** that poses a significant problem in terms of flooding, water quality, and the health of urban streams.
9. “Stationarity is dead,” but models are not yet good enough to provide actionable predictions, so we need our water systems to be resilient to uncertain future conditions.