Water, Environment and Development

Part 1: Introduction—What You Need to Know About Water

Segment 1B: The Hydrologic Cycle

The part of our course comprises the science of water quantity and water quality. It examines the hydrologic cycle of evaporation, transpiration, precipitation; surface water and groundwater; the nature and function of watersheds; the roles of surface permeability, wetlands, and floodplains; as well as general hydrologic problems—withdrawal of water in excess of the recharge capacity of streams, rivers, and aquifers; flooding; erosion; deforestation; and desertification.

The aim of this segment is twofold:

• First, to introduce you to the basic principles of water science and the global water resource and use regime, thus placing water in the context of the natural and human worlds, and
• And, second, to make clear the linkages between human use of land and the potential for that use to engender degradation of natural resources and systems.

Let’s begin with the principle of water science. It can be said that nature “makes” fresh water, in both the obvious sense that water is a naturally occurring chemical, but, more importantly, in the sense that the reserves and resources of fresh water upon which humans and many living things rely is generated by an ongoing natural operation, the hydrologic cycle. Intact ecosystems never run out of fresh water. But how can this be when we know very well that things dry out and fresh water flows downward eventually to the sea where it is rendered saline? In fact, fresh water is “recreated” over and over again as both fresh and salt water evaporate into the atmosphere by the action of heat and moving air, eventually to form the clouds that generate the precipitation that recharges streams, rivers, lakes, and groundwater. At the same time, moisture is taken up by plants and released into the atmosphere in the process known as transpiration. The most dramatic, and productive instances of transpiration are the Earth’s tropical rain forests in which vast quantities of water are released into the air, to famously create these forests’ own rainfall. The two process by which water enters the atmosphere are often referred to jointly by the term evapo-transpiration.

Inasmuch as water problems are in reality ones of water supply—some form of inadequacy of either quantity or quality—this brief introduction of the hydrologic cycle is intended to familiarize you with “where water comes from” so that you can tackle issues of supply with some confidence in your understanding of this basic science.