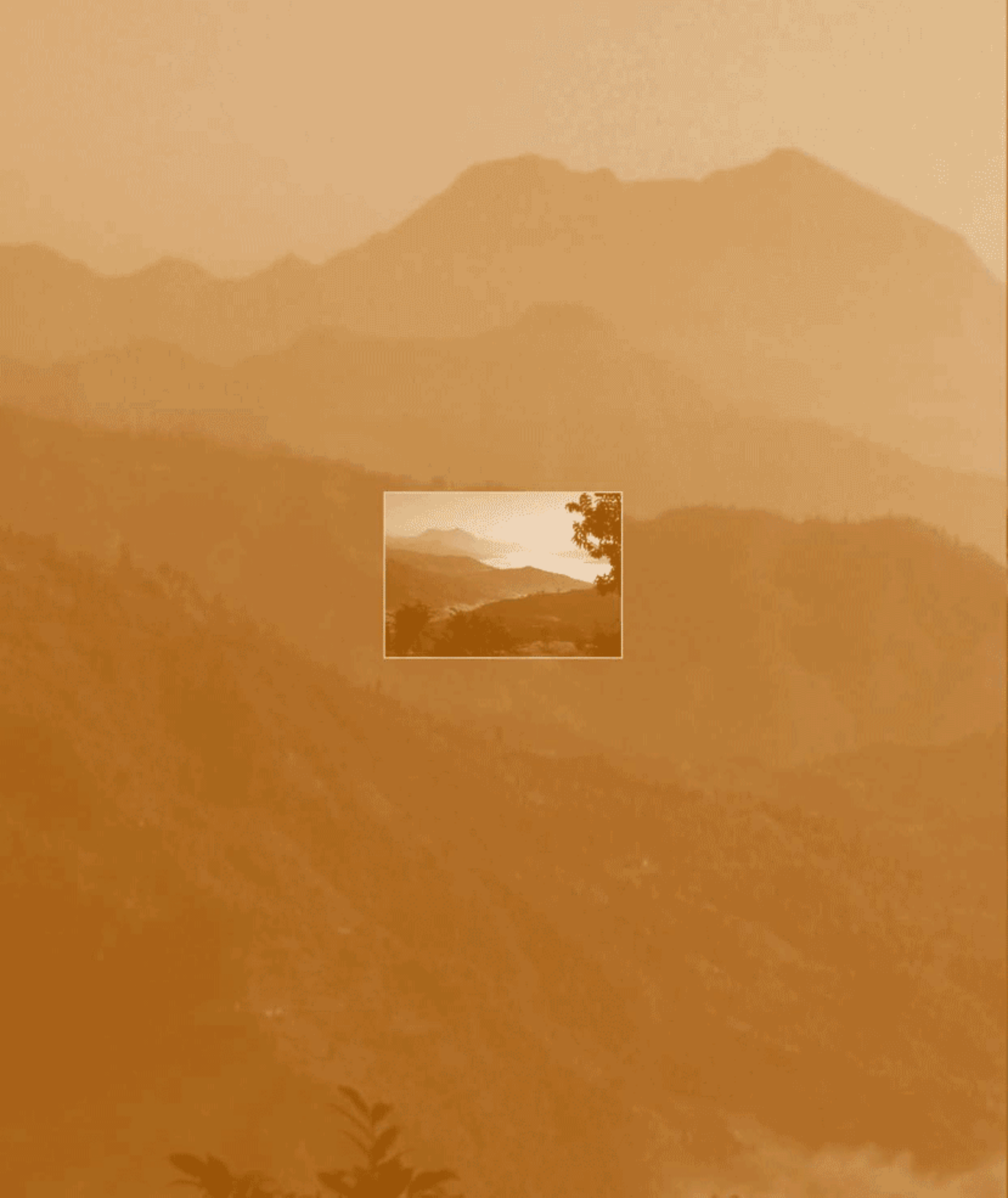


WHY INVEST IN WATERSHED MANAGEMENT?







# WHY INVEST IN WATERSHED MANAGEMENT?

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

ROME, 2007

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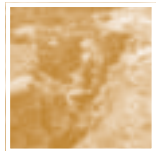
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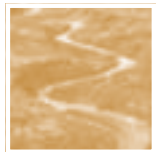
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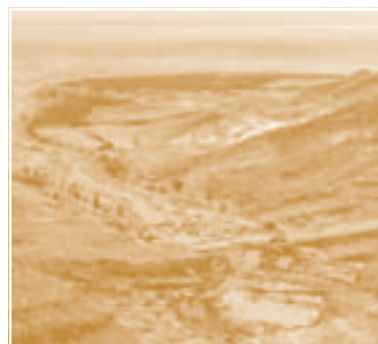


## WHAT ARE WATERSHEDS?

**W**atersheds are the familiar landscapes created by mountain ranges as they slope down to valleys, with creeks and torrents flowing downstream. Also known as drainage areas or river basins, watersheds are the zones from which rain or melting snow drains downhill into a river, lake, dam, estuary, wetland, sea or ocean. A watershed can be as large as several thousand square kilometres (as in the case of major river basins), or as small as a few hectares (as in the case of farm micro-watersheds). Smaller watersheds are nearly always part of a larger watershed or river basin.

Watersheds are powered by the force of gravity, which makes water flow downstream according to the gradient of the slope. This physical process generates extra energy, which makes the watershed environment highly dynamic. Highland rainfall is collected and delivered to downstream areas. Surface and underground water resources are created and recharged. Vegetation is irrigated and animals watered. Soil is enriched by the mineral and organic sediments carried by runoff. Seeds are transported.

Depending on the climate, watersheds can host rich floras and faunas, or be deserts except for during the rainy season. Owing to their variety of altitudinal gradients, temperatures and rainfalls, most watersheds include a range of distinct vegetation belts, such as mountain rangeland, forest belt and lowland prairie. As these vegetation belts are often interlinked by water discharge, runoff flows and other biophysical processes, watersheds are complex and diverse “vertical” ecosystems that integrate a variety of ecotypes and ecological niches.



**Top:** Glacier watershed in the Swiss Alps

**Centre:** Seasonal torrent in a pre-Atlas watershed, Tunisia

**Bottom:** Downstream wetlands in the Danau Sentarum river basin, Indonesia

**Opposite page:** Himalayan watershed landscape

## READING A WATERSHED LANDSCAPE

Observation and interpretation of landscape features can help to understand the functioning of watershed ecosystems. In this picture of the upper Indus river watershed (Pakistan), four main landscape units can be identified:

- 1 The horizon is made up by the peaks of the Himalayan ranges. Precipitation is temporarily stored in the glaciers or the snow caps. Glacial and snow melt contribute to the perennial discharge of the Indus river and its tributaries, which is of particular relevance during the dry season when there is little downstream rain.
- 2 These south-facing and steep slopes are part of the middle mountains of the Himalayas. Their geological layers are parallel to the slope, which makes these hills highly exposed to erosion. Over the millennia, tectonic movements and rain showers have shaped this landscape, weathered the slopes, dug torrents and triggered landslides. These processes have been reinforced by the southern all-day-long exposure to the sun rays, and by human-made deforestation and overgrazing.
- 3 On the eastern side, the geological layers are at right angles to the slope and there is less direct exposure to the sun. Accordingly, these slopes are more stable and are covered by vegetation. Differentiated erosion has created natural terraces, which local farmers have extended over the centuries to practise agriculture and agroforestry.



- 4 Confined by a large meander bend of the Indus river, this almost flat alluvial terrace is formed by an ancient rockslide and by fertile sediments deposited over millennia by the Indus river and its tributaries. Availability of surface

and underground water allows for a dense vegetation cover. As evidenced by the presence of settlements, agricultural fields and infrastructure, this area offers considerable potential for human livelihoods.



Humans are often part of watershed ecology, and traces of human activities are clearly visible in watershed landscapes. For 5 000 years, humans have been manipulating streams and slopes in order to irrigate fields, control floods and drought and supply drinking-water to villages and towns. Watershed management works, such as terraces, irrigation works and aqueducts, have significantly contributed to the development of human civilizations.

Since the end of the nineteenth century, modern technology has made it possible to implement huge hydraulic works at inaccessible mountain sites. Dams have been built upstream for generating hydroelectric power and supplying water to local and downstream users. Watersheds have thus become an essential source of water, energy and other natural resources for modern agricultural, industrial and urban development.

## KEY TERMS

A **watershed** is the geographical area drained by a water course. The concept applies to units ranging from a farm crossed by a creek (a micro-watershed) to large river or lake basins.

A **river basin** corresponds to the complex system of watersheds and sub-watersheds crossed by a major river and its tributaries while flowing from the source to the mouth.

**Watershed management** is any human action aimed at ensuring a sustainable use of watershed resources.

Below: An artificial lake and its dam in Turkey

