Lecture 3.

The Engineering Profession:
Hydraulic Engineers

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What is Water /Hydraulic Engineering?

A Engineering branch among other branches.

Water resources engineers are concerned with the problems associated with the use and control of water

Examples of Application of Water Resources Engineering

Flash Flood in mountainous areas– needs protection

Landslide from heavy rainfall – needs protective measures
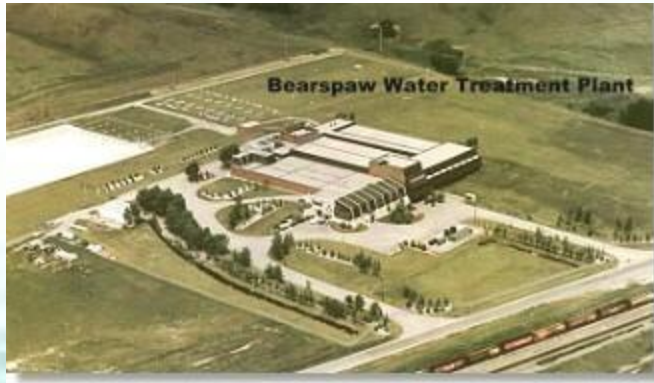

A dam for flood protection, storage, power, fishing and navigation

A water intake point (for consumption) from a stream

More Examples

Water Treatment Plant draws water directly from a River. You cannot use directly

Wastewater Treatment plant – used water can not just be thrown back – it will kill the fishes and the environment. Must treat it first

Civil Engineers design and lay water distribution system for cities

A More specific Example
(Job Type for a Water Resources Engineer)

Design the water distribution and storage system.

Design life will be 25-50 years

How will a Hydraulic Engineer do it?

✓Factor Population Growth

✓Factor how much water is needed (after 25 years)

✓Is the water available enough to meet demand?

✓Factor how much water is available (from groundwater, rivers, lakes)

✓No – then plan storage system (reservoir) – But how big should it be?

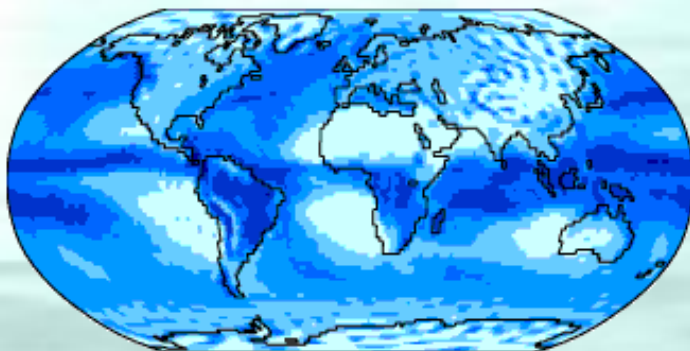# How do Hydraulic Engineers Find out How much Water is Available?

In Water resources engineering, we study the 'water cycle'

This is the cycle that describes how water is moving around us (rainfall, groundwater, river water, evaporation etc.)

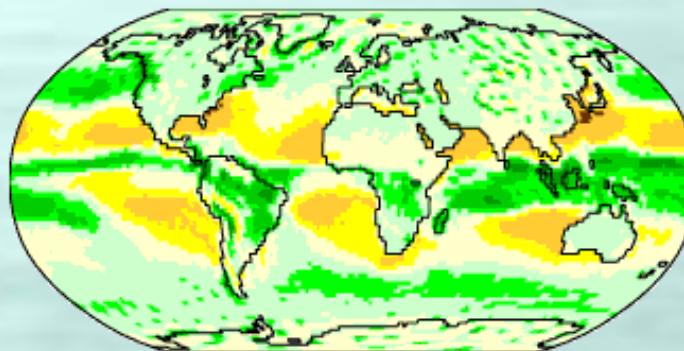The name of the course is '**HYDROLOGY**'
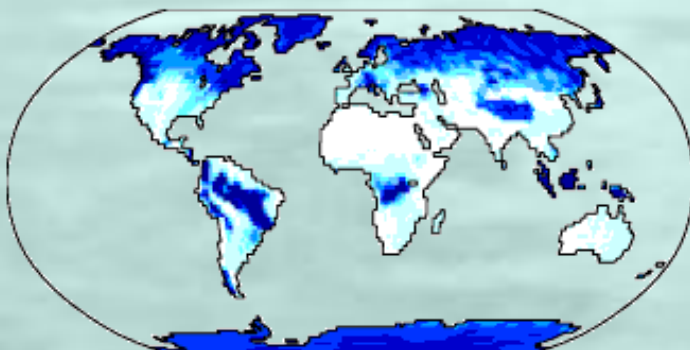
The Global Water Cycle

Precipitation

P-E   Dec

10 50 100 200 400 mm

-200 -100 -50 0 50 100 200 mm

Run Off/Water Surplus

Soil Moisture

.01 10 20 40 60 80 100 mm
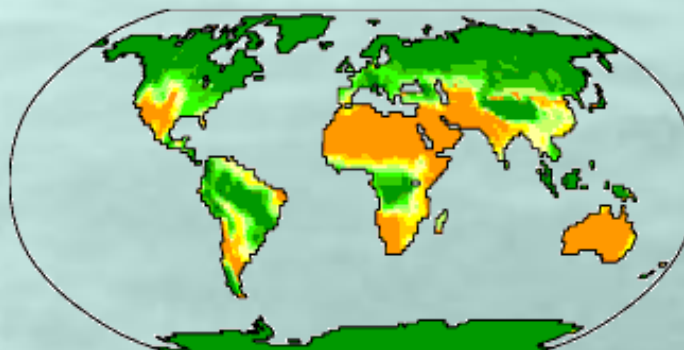
.15 .18 .21 .24 .27 .30 .33 .36 .40 cm

Data: NCEP/NCAR Reanalysis Project, 1959-1997 Climatologies
Animation: Department of Geography. University of Oregon, March 2000

Satellites Can Also Help Study Rainfall variability - Hydrologic Cycle
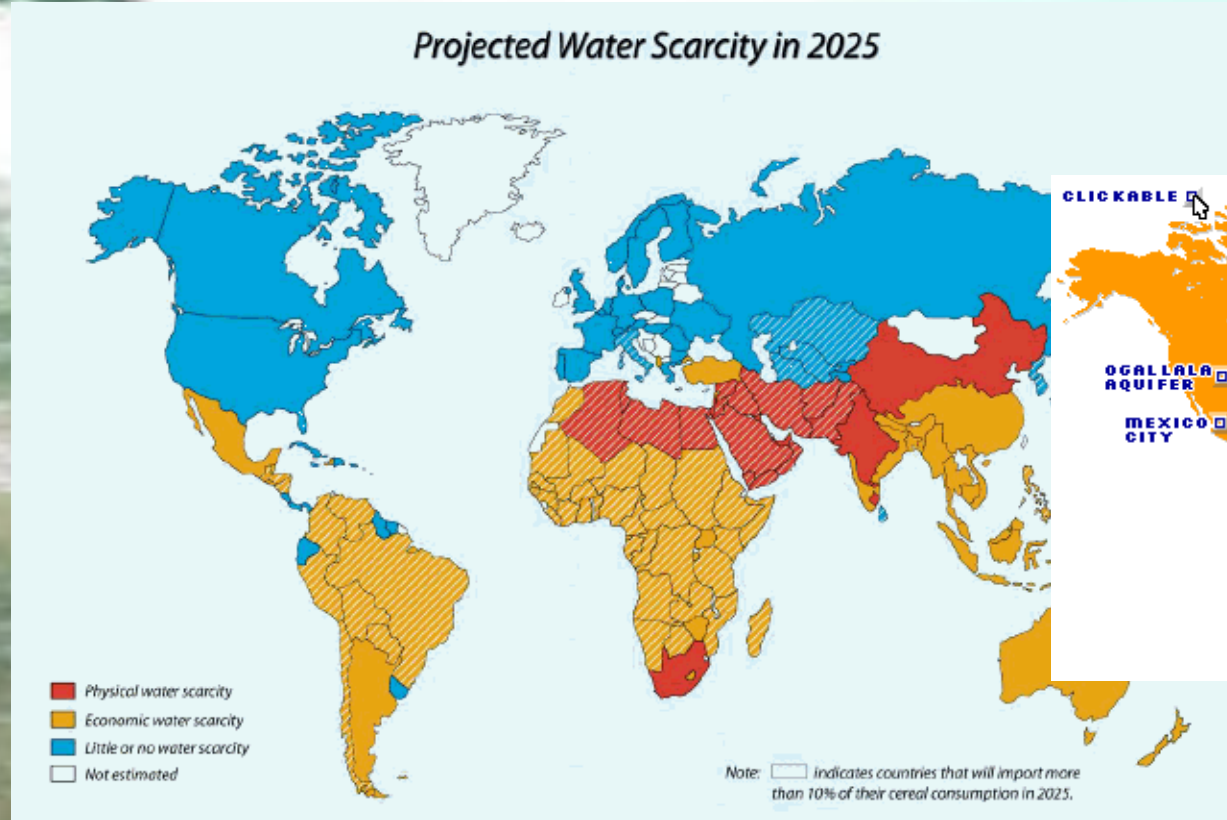
Water is More Important than Ever Before

Several researchers found that population growth and economic development, in tandem with global climate change, will impact the availability of fresh water over the first quarter of this century.

Water-related Hazard – 1
Global Water Scarcity (Too Little Water)

Projected Water Scarcity in 2025

Physical water scarcity
Economic water scarcity
Little or no water scarcity
Not estimated

Note: □ indicates countries that will import more than 10% of their cereal consumption in 2025.

Hot Spots for Wars

CLICKABLE

OGALLALA AQUIFER
MEXICO CITY
SPAIN
ISRAEL
CHAD RIVER NILE
TURKEY
IRAQ
ARAL SEA
CHINA
RIVER GANGES
SOUTHERN AUSTRALIA

Water-related Hazard – 2
Global Floods (Too Much Water)

2003 - Global Flood Archive - Dartmouth

At least 10 million displaced and 2000+ death annually due to Floods caused by widespread rainfall

Cutting-edge Technology that Water Resources Engineering Will Use in Future

Engineers studying Hydrology will have to learn to deal with satellites soon.

Satellites can measure:

Rainfall, River discharge, soil moisture, evaporation from soils, soil temperature,

Track Hurricanes

GPM

http://gpm.gsfc.nasa.gov

Courses on Water Resources Engineering

1. Fluid Mechanics is a prerequisite for any CEE water-resources courses

2. Fundamentals courses (theory)

3. Engineering' aspect (application) Engineering Hydrology (on water cycle and hydrologic modeling)

4. Water Resources Engineering (on management of water resources systems)

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https://ft.univ-tlemcen.dz/fr/pages/854/fili-re-hydraulique

https://ft.univ-tlemcen.dz/fr/pages/152/d-partement-d-hydraulique

Job Opportunities

Studying Water Resources Engineering widens job opportunities within the Civil Engineering domain.

Some fun places where you can work are:

ANBT – building dams, navigation, power generation

AGIRE – flood protection, Integrated Water Resources Management

ONIDE: Irrigation and Drainage

ANRH– protecting the water bodies from contamination , environmental aspects and Water quality

DRE/ ADE: Any Town or City needs Water Resources Engineers for planning and management of distribution systems

ONA – Sanitation and Wastewater treatment

Insurance Companies (Lots of money) – Guess why?

Any questions??

Thank you for your attention