



# WATER MANAGEMENT AND CLIMATE CHANGE

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An aerial photograph of a tropical resort. In the foreground, a large, winding swimming pool with blue water is surrounded by a pinkish-tan paved deck with lounge chairs and palm trees. To the left, there's a thatched-roof structure. In the background, a sandy beach meets the ocean, with green hills visible on the horizon under a clear blue sky.

# **Water is the elixir of life!**

The oxygen we breathe is necessary for our life process, but without water, life as we know it, would not be possible in our planet.

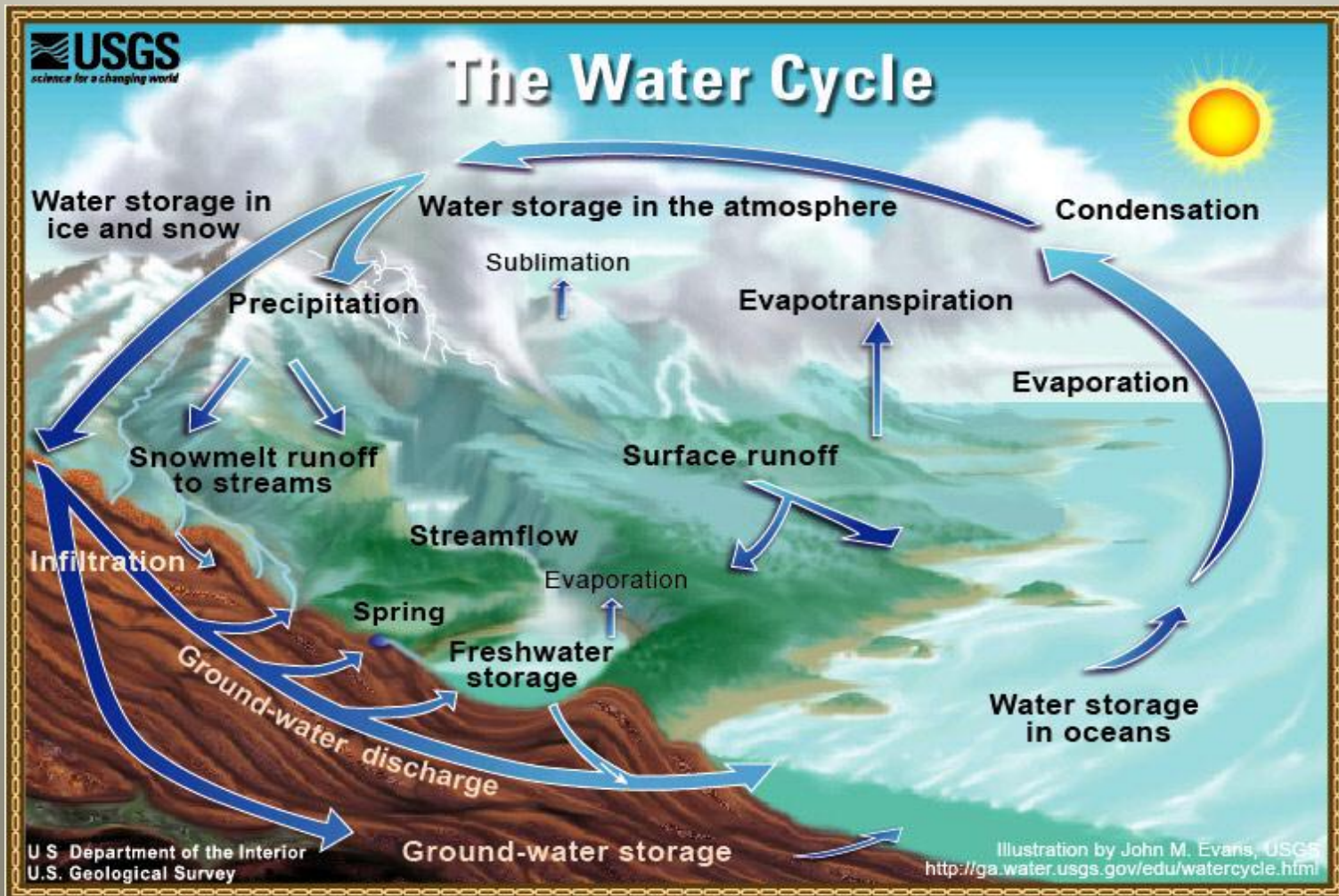
**Water is a primary medium through which climate change will have an impact on people, ecosystems, and economies.**



A high-angle photograph capturing a powerful splash of water against a dark, craggy rock face. The water is frozen in mid-air, creating a dense, white cloud of droplets that fills the center of the frame. The surrounding landscape is lush with green vegetation, including ferns and grasses, which are slightly out of focus. The overall scene conveys a sense of raw natural energy and the impact of water on the environment.

Water is both key part of the  
problem and important part  
of the solution.

**WE HAVE TO UNDER STAND THE ROLE OF THE WATER CYCLE**  
Any slight variation at any stage of the cycle dynamics triggers “chaos” caused by increase of temperature in the atmosphere.



Credit: Image - John M. Evans USGS Colorado District

# CLIMATE CHANGE

- ❖ These changes are happening faster than ever before.
- ❖ They have began & will continue for the unforeseeable future.
- ❖ They are non-linear and no one knows when they will end.
- ❖ There are no assurances that natural or human systems can adapt to the rate or extent of this change.

# ANTICIPATED LOCAL IMPACTS OF CLIMATE CHANGE

- Changing rainfall intensity increase
- Changing rainfall patterns diversify
- River flow becomes irregular

## UNDESIRABLE EFFECTS

- Intensification of droughts, floods, typhoons, monsoons
- Vector-borne diseases like malaria, dengue increase
- Proliferation of water borne diseases like dysentery and cholera, etc. – water pollution



# TWO ALTERNATIVES TO MEET CLIMATE CHANGE

- **MITIGATION** – MEANS AND REQUIRES FUNDAMENTAL CHANGES IN THE WAY SOCIETY PRODUCE AND USE ENERGY
- **ADAPTATION** – MADE THROUGH A SERIES OF FUNDMMENTAL CHANGES IN THE WAY SOCIETIES MANAGE AND USE WATER



## **DIFFICULTY OF MOVING -**

FROM PROBLEM IDENTIFICATION TO ACTION

## **RECOMMENDED APPROACH -**

**IWRM - INTEGRATED WATER RESOURCES MANAGEMENT**

## **REASON -**

A HOLISTIC APPROACH BECOMES NECESSARY DUE TO WIDE SPREAD SCARCITY, GRADUAL DISTRUCTION AND AGGRAVATED POLLUTION OF FRESHWATER RESOURCES IN MANY REGIONS, ALONG WITH PROGRESSIVE ENCROACHMENT OF INCOMPATIBLE ACTIVITIES OF WATER USERS.

# INTEGRATED WATER RESOURCES MANAGEMENT COVERS

- ALL TYPES OF INTER-RELATED FRESHWATER BODIES - SURFACE AND GROUNDWATER
- CONSIDERS ALL ASPECTS OF WATER QUANTITY AND QUALITY
- MULTI-SECTORAL PARTICIPATION IN WATER RESOURCES DEVELOPMENT IN RELATION TO MULTI-INTEREST UTILIZATION OF WATER RESOURCES – health and sanitation, agriculture, industry, urban development, hydropower, inland fisheries, transportation, recreation.
- ECOSYSTEMS NEEDS FOR BIOVERSITY AND HEALTHY WATERWAYS
- WATER CONSERVATION AND WASTAGE MINIMIZATION MEASURES

# ATTRIBUTES OF IWRM

- IT INTEGRATES THE ACTIVITIES OF A RANGE OF SECTORS THAT USE, IMPACT OR IMPACTED BY WATER THUS ENSURING THE ACTIVITIES IN ONE SECTOR DO NOT UNDERMINE THOSE OF ANOTHER.



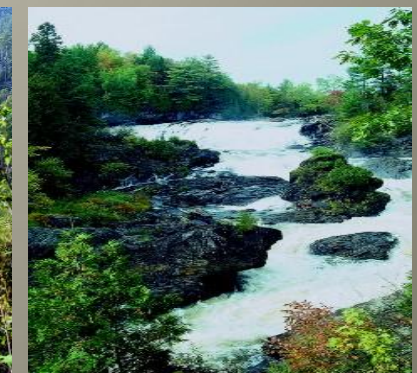
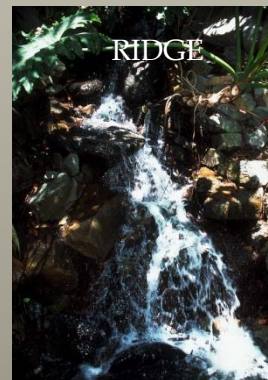
- IT RECOGNIZES THAT EFFECTIVE GOVERNANCE INSTITUTIONS WILL BE NEEDED TO MANAGE THE TRADE-OFFS BETWEEN DIFFERENT ACTIVITIES AND INTERESTS.

# STRATEGIC APPLICATION OF IWRM THROUGH RIVER BASIN CONCEPT

A CONCEPT NOT DIFFERENT FROM “WATERSHED” APPROACH OR “CATCHMENT” SYSTEM.

THE **RIVER BASIN** IS MORE THAN THE BODY OF FLOWING WATER THAT PEOPLE SEE. IT IS A SYSTEM THAT INCLUDES ALL THE TRIBUTARIES – UPLAND AND INLAND CREEKS, BROOKS STREAMS – THAT FEED INTO THE RIVER.

THE **FLOW**, BESIDES COMING FROM SPRINGS, ALSO DEPENDS ON RAIN-WATER THAT TRICKLES FROM THE SLOPES OF THE MOUNTAINS AND COLLECTS IN THE GULLIES BELOW AND INTO THE TRIBUTARIES.



# BASIC INTERVENTIONS IN RIVER BASIN APPROACH WITH RELEVANCE TO CLIMATE CHANGE

## RESTORATION OF RIPARIAN LANDS

RIPARIAN LAND IS “ANY LAND WHICH ADJOINS, DIRECTLY INFLUENCES OR IS INFLUENCED BY THE BODY OF WATER.”

## REFORESTATION / ADOPTION OF AGRO-FORESTRY IN THE UPLANDS

## WATER IMPOUNDING AREAS FOR FLOOD CONTROL



# OBJECTIVE: A RESTORED LIVING RIVER



- WITH UNPOLLUTED CLEAN WATER
- SATISFYING STANDARD WATER QUALITY
- SUPPORTING LIVING ORGANISM AND WATER AND WATER CREATURES
- CONTROLLED FLOW
- SUSTAINS OVERALL ECOSYSTEMS



# CUSW'S LOCAL INITIATIVES

## ❑ ACTIVATING THE CEBU CITY RIVERS MANAGEMENT COUNCIL

To revitalize Cebu City's main five "dead" rivers

Within its city limits

- ❖ Guadalupe River
- ❖ Lahug River
- ❖ Mahiga River
- ❖ Buhisan River
- ❖ Bulacao River



## ❑BUHISAN WATERSHED AND DAM REHABILITATION

Problems with charcoal makers and siltation in the reservoir area

Buhisan Protected Watershed



Buhisan Dam

Built in 1911 as surface water source for Cebu City's small population.



## □ SUSTAINABILITY FORUM'S PROJECT

A coalition of NGOs, Church groups, private sector and LGU

### “RIDGE TO REEF” MANAGEMENT OF THE MANAGA RIVER BASIN

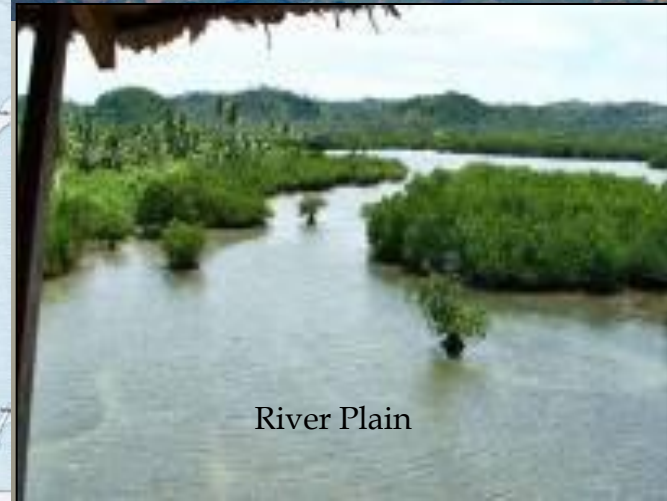
- Encouragement of river basin partnership for planning, management and operation between government, NGOs, private sector and civil society.
- Local application of institutional and legal frameworks to allow participation of civil society in decision-making.
- Protection of key ecosystems – upper watershed forests, wetlands and coastal zones that are critical to maintain water quantity and quality.
- Implementation of environmental flow of river to ensure ecosystems functions – flood prevention, maintenance of life forms, natural water purification, etc.
- Implementation of action plans in river system to prevent and treat pollution from agriculture, industry & cities.

# CENTRAL CEBU PROTECTED LANDSCAPE

## ITS THREE MAIN RIVER BASINS



Upper Mananga



River Plain

**NOW, THAT I HAVE TOLD YOU  
AND HAVE SHOWN YOU,**

**TAKE NOTE OF THIS SAYING -**

“Tell me and I will forget,

Show me and I might remember,

But, if I do, I will not forget.”

Ingeborg Krukert - Photographer



# ACKNOWLEDGEMENTS

## REFERENCES

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THANK YOU