MANAGING NATURAL RESOURCES (NRM)

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AUDIENCE

- Undergraduate students
- Stakeholders (village council, elders, District representatives and representation from central government).

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OBJECTIVES

By the end of this presentation, participants will be able to:

- Define terms
- List natural resources and how they are utilized by humans
- Identify natural resources used in your area
- Promote coordination and collaboration in sound utilization of natural resources
- Demonstrate the interdisciplinary approaches to the use, management and protection of natural resources
- Provide measures for sustainability in managing their own natural resources

INTRODUCTION

- Definition
- Natural Resource Management refers to the management of natural resources such as land, soil, water, plants and animals, with particular reference to how the management activities affect the quality of life for both the current and future generations.

DESCRIPTION

- The growing population in less developed countries and the rising incomes in more developed countries are placing increasing demands on the resources of the earth.
- Consequently, there are many unresolved conflicts over the use of natural resources and the conservation of the environment. As a natural resource management student you will learn how to apply scientific, economic and social knowledge to help society resolve these conflicts.

DESCRIPTION

- Natural resource management deals with the way in which people wisely use their resources provided by nature.
- It includes: plan for land usage, water management, biodiversity, conservation, and measures for sustainability for agricultural programs, mining, fisheries, forestry, etc.
- It considers that people and their livelihood depend on the existence and the management of natural resources.

TYPES OF NATURAL RESOURCES

- Perpetual resources
- Stock resources
- Renewable resources
- Amenity resources.

Perpetual Resources

- Are not significantly used up by human activities: Example: Sunlight, wind, tides.
- Some would argue rainfall and the air we breathe are perpetual, some stock or renewable resources.
- Man can compromise even perpetual resources.

Stock Resources

- Have a finite amount that cannot be increased.
- Additional locations may be discovered however.
- Includes fossil fuels, minerals.
- Water resources are in-between renewable and stock resources.
- Management focuses on minimizing negative effects of use.

Renewable Resources

- Can be replenished if exploitation is managed or a recovery period is allowed.
- Include: grazing and agricultural lands, forests and fisheries.
- Since they are most valuable if management for long-term benefits, Conservation is most relevant.
- “In-between Resources”: Water, air and some other important natural resources are naturally replenished so they might appear to be renewable, but there may only be a finite amount so they may appear to be stock resources.
- Which type they are depends on the situation.

Potential Resources:

- Resources not yet in use: Examples include: Used tires, garbage dumps could be mined, Deep-sea minerals could be exploited.

TYPES OF NATURAL RESOURCES

Recycling:

- Takes advantage of a potential resource.
- Saves space in landfills.

Intangibles (Amenity Resources):

- Some things in natural world are difficult to put a price tag on:
- A sunset or a waterfall.
- Example: What is value of a wilderness or a pristine trout stream? These are *intangibles*…Sometimes called *amenity resources.*

SOIL MANAGEMENT

- Soil — the layer of natural materials on the earth's surface, containing both organic and inorganic materials, that is capable of supporting plant’s life

THE ESSENCE OF SOIL MANAGEMENT

- Soil is the most precious and vital natural resource of any nation. It is the basis for all the living organisms everywhere at all times. Soil is responsible to meet the requirement of peoples need including food, fodder, fiber fuel and fruits .
- It is therefore imperative that we should manage and conserve the soil.

SOIL AS A LIVING BODY

- Soil is the product resulting from disintegration and decomposition of rocks and also consists of decomposed remains of plants and animals.
- The soil is the weathered surface layers of the earth's crust which has been altered by the influence of water, air, organic matters and living organisms

THE IMPORTANCE OF ORGANIC MATTERS

- As plants develop, they take from the soil significant nutrients, such as nitrogen (N), Phosphorus (P) and potassium (K). Organic matter provides these and other vital nutrients. It also builds up the structure of the soil so that it is easier for plants to grow in it. Organic matter provides food for the soils' micro- and macrofauna, which in turn increases the soil's capacity to hold water (like a sponge). Because organic matter is so beneficial for the soil, it is important to implement activities that protect it and increases it's availability every year. In this way, soils can stay rich and healthy for next year's crop.

- Adding commercial fertilizer is another way to increase soil fertility. But it has some disadvantages. It is expensive and does not contain all the nutrients plants need. Commercial fertilizer does not improve the soil structure or its capacity to hold water. Applying too much artificial N-P-K fertilizer too often will kill important soil animals and contaminate downstream water sources. However, if the soil is severely depleted of nutrients, fertilizer may be a necessary measure. Commercial fertilizer can trigger new plant growth, and thus give the organic matter that can be introduced back into the soil. Over time, poor soils can be transformed into healthy soils by adding both commercial fertilizer and organic matter.

PROXIMATE CONSTITUENTS OF THE SOIL

- The soil is the heterogeneous complex system made up of solid, liquid and gaseous materials. It contains four major ingredients:
- Mineral matters 50% - 60%.
- Organic matter 5%
- Water (soil solution /soil moisture 25% - 35%
- Air 15%- 25% .

BASIC SOIL SCIENCE TERMINOLOGIES

- Organic matter — dead plant and animal material in various stages of decay
- Parent material —those materials underlying the soil from which the soil was formed
- Soil conservation — use of soil so damage or loss is minimal or nonexistent
- Soil erosion — the process by which soil is removed
- Soil horizon — layers in a mature soil
- Soil profile — a vertical section of a soil at a specific site
- Soil structure — the arrangement of soil particles into shapes and sizes
- Soil texture — the proportion of sand, silt, and clay in so

- Aquifer — an underground stream or pool in sand or gravel layers
- Groundwater — the water beneath the surface of the earth; found in spaces between rocks and soil particles
- Hydrologic cycle — the water cycle
- Potable water — water that is appropriate for human consumption without further purification or boiling
- Runoff water — water that runs on the earth's surface
- Surface water — water on the earth's surface, such as lakes, ponds, and streams
- Water — a colorless, transparent, naturally occurring compound made of hydrogen and oxygen
- Watershed — an area of land from which all the water that does not infiltrate the soil runs to a downhill location

- Environment — all the factors that affect a living thing
- Natural resource — a naturally occurring material or organism that supports life, provides fuel, or is used in other ways by humans
- Natural resource interaction — the action of natural resources on one another
- Natural resource interdependence — all resources depend on each other
- Nonrenewable natural resource — a natural resource that cannot be replaced
- Renewable natural resource — a natural resource that can be replaced
- Supervised Agriculture Experience (SAE) — a program (production, experience, cooperative, or directed lab) operated by an FFA member

THE FOREST SOIL DIFFERS FROM THE AGRICULTURAL SOIL IN THE FOLLOWING ASPECTS

FOREST SOIL

- Depth varies from few cm to various metres
- Voluminous root system. roots have
- high penetrating power
- Root system carries beneficial fungi.
- Soil contains high amount of humus.
- The root secretions like amino acids, enzymes are great.
- Highly porous, rich in organic matter content, nitrogen and other nutrients.
- PH 2.0-4.0 due to presence of Fulvic acid and humic acid. (Weak organic acids).
- Forest soil is characterized by soils of tundra, marshes, heaths, grassland and deserts.
- Influences composition of tree stands, rate of growth, wood quality, vigour, stability against wind, degree of resistance against diseases.

AGRICULTURE SOIL

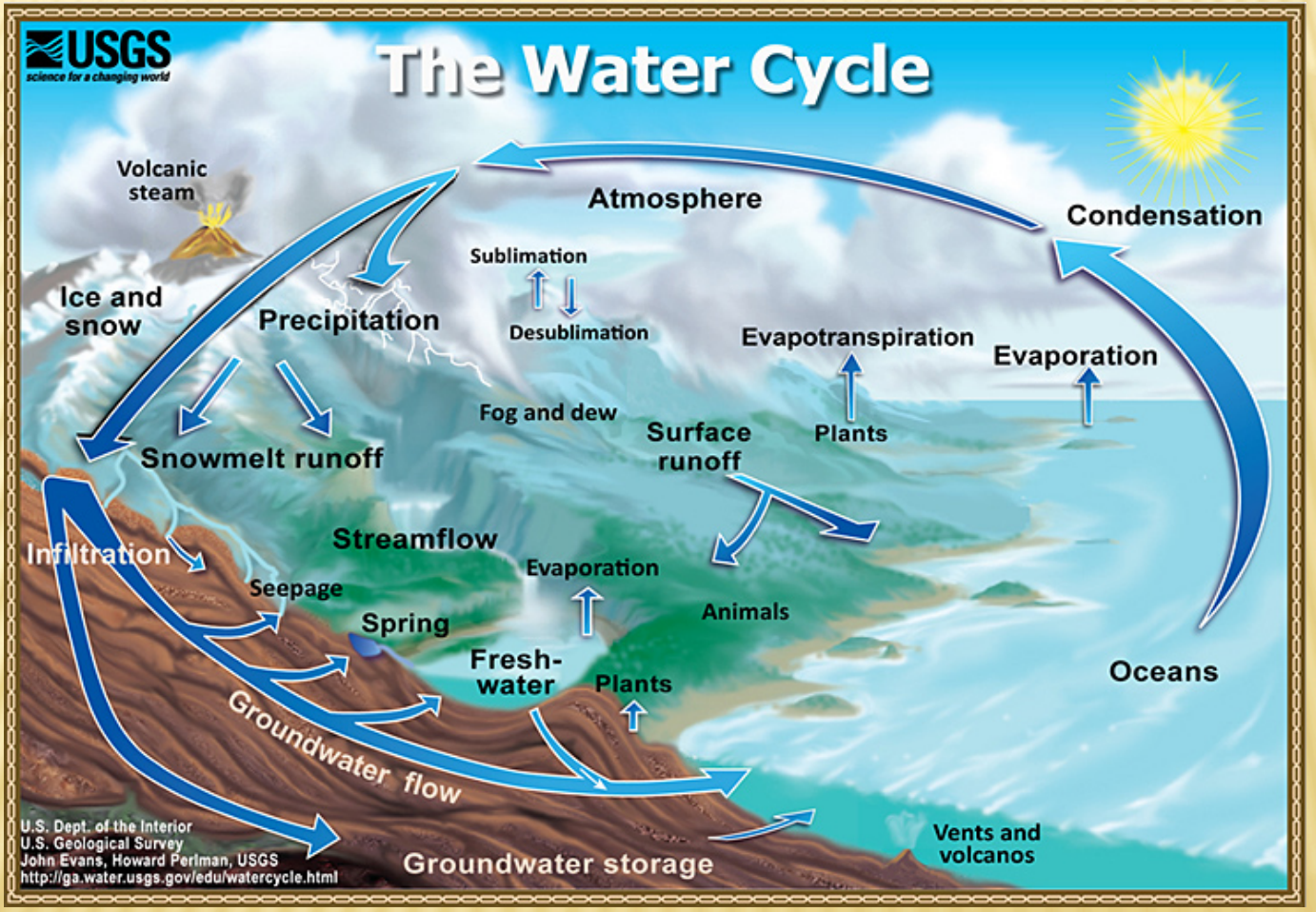
- Depth is confined. Maximum is 1m.
- Sporadic spreading of roots.
- Little or no penetration power.
- Root system and rhizosphere soil contains microorganisms like fungi, bacteria, actenomycetes etc.
- Poor content of humus, root secretions is little.
- Pervious or impervious, poor in organic matter content and nitrogen. PH 6.0-8.0 due to the presence of salts.
- Cultivated soil is bounded by boulders, stones, gravels etc.
- Influences the growth of cultivated crops.

PLANT HEALTH

- Plants need large amounts of the following nutrients: carbon, hydrogen, oxygen, sulfur, calcium and magnesium, and small amounts of other nutrients: boron, chlorine, copper, iodine, iron and zinc. However, the three major nutrients are nitrogen, phosphorus and potassium. Deficiency in any of the three major elements can result in low crops yield.
- Nutrients move in cycle from the soil to plants and animals that consume these plants. Fertilizers are prepared by farmers and applied for better growth. In addition, the pH of the soil also determines the health of the plant. The average pH of a plant growing soil should be about 6.5. A very high pH prevents nutrients in the soil from reaching the plants.

- Also, moderate water supply is needed for a better plant growth. Too little water deprives young plants that lack the network of roots that are needed for water supply.
- Therefore, water in moderate content of water is essential for healthy plant growth. Similarly, plant need light energy to be transformed into chemical energy for food production.
- Plants can also be attacked by pests and diseases. Pests may include arthropods and other creatures such as rat and rabbit.

THE WATER CYCLE



- The water cycle illustrates the existence and movement of water on, in, and above the Earth. Earth's water is always in movement and is always changing states, from liquid to vapor to ice and back again. The water cycle has been working for billions of years and all life on Earth depends on it continuing to work; the Earth would be a very difficult place to live.

- This cycle has no starting point, however, it's better to begin with the ocean, since that is where most of Earth's water exists. The sun, which drives the water cycle, heats water in the oceans. Some of it evaporate as vapor into the air; a relatively smaller amount of moisture is added as ice and direct sublimation from snow to solid state into vapor. Rising air currents take the vapor up into the atmosphere, along with water evapotranspiration from which is water transpired from plants and evaporated from the soil. The vapor rises into the air where cooler temperatures cause it to condense into clouds.

BIODIVERSITY

- Biodiversity is the variety of all living organisms, including all species. It can be defined as ‘the variety of life forms, the different plants, animals and micro-organisms, the genes they contain, and the ecosystems they form’. The concept emphasises the dynamic interrelationships occurring in the biological world in which humans now play an integral management role and is usually considered at three levels.

- **Ecosystem diversity** is the variety of habitats, biotic communities and ecological processes. An ecosystem consists of plant, animal, fungal and micro-organism communities and the associated non-living environment interacting as an ecological unit. Ecosystem diversity has two interrelated components: the diversity of communities of species and the diversity of interactions between community members (called processes).

Why is biodiversity important?

Biodiversity values are important because:

- At the most fundamental level, biodiversity provides the basis for all life on earth, ensuring clean air and water, fertile soils and healthy, functioning ecosystems necessary to maintain essential ecosystem services such as soil formation and nutrient storage and cycling.
- Biodiversity provides all of our food and the raw materials for a wide range of products, for example clothing and medicinal goods.
- Biodiversity provides opportunities for recreation, tourism, scientific research and education.

- Biodiversity is a source of cultural identity for many Australians, particularly for Aboriginal and Torres Strait Islander people.
- There is a growing community recognition of the intrinsic values of biodiversity, such as the right of all species to exist regardless of their value to humans.
- Financial benefits of the value of biodiversity are difficult to estimate, but can be described both as the economic benefits of biodiversity, and the costs of not protecting biodiversity.

- **Genetic diversity** is the variety of genetic information contained in all individual plants, animals and micro-organisms. Species diversity is the variety of species on earth.
- **Species diversity** is usually a measure of the number of species (richness) and their relative abundances for a given area at a given point in time

THE ROLES OF STAKEHOLDERS IN (NRM)

- The roles of stakeholders help to systematically determine who needs to be a partner in the management arrangement or agreement, and whose interests are too remote to make this necessary. Special care must be taken to ensure that voiceless and disadvantaged groups that may include women, youth, the elderly and poor people, are not excluded from the analysis.

STAKEHOLDER ANALYSIS IDENTIFIES STAKEHOLDERS BY ASKING QUESTIONS INCLUDING:

- Who is directly affected by the problem situation being addressed?
- What are the interests of various groups in relation to the problem?
- How do groups perceive the management problem to affect them?
- What resources do groups bring to bear (for good or bad) on the problem?
- What organizational or institutional responsibilities do the groups have?
- Who should benefit, or be protected from, management interventions?
- What conflicts may groups have with each other and management strategies?
- What management activities may satisfy the interests of the various groups?

DECISION-MAKING, POWER AND EQUITY

- The power advantages of the strong and the disadvantages of the weak make them both reluctant to co-manage because of nothing to gain and too much to lose, respectively. It is essential to be aware of power differences and dynamics. An issue in decision-making is that resource users often have not sought to use their organisations as vehicles for representation, or have not been effective in doing so. For example, fishers in many places consider themselves to be relatively powerless in relation to other stakeholders in the fishing industry and coastal zone, especially in relation to tourism-related groups.

BUILDING CAPACITY

- Building stakeholder capacity for natural resource management is essential in every developing nation, and a critical first step in many cases.
- In many cases capacity could be built fairly simply if the stakeholders engaged in.
- collaborative activities in which complementary skills transfer was undertaken.
- Organisations should set priorities and schedules for building capacity, with testing, monitoring and evaluation incorporated to measure success. Leadership is a key element of building capacity.
- Without good leadership it is unlikely that appropriate capacity will be built in any organization. It is a common mistake to take leaders out of their element and expect them to do equally well in another environment.

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