Summary

Session IV

Accurate Ecosystem Services valuation is vital for decision makers and land managers. The case study was done in the National Nature Reserve in South West China having an area of 13,836.18 km². The study focused on Ecosystem services that were more ~~important~~ useful to the villages:

→ Direct use services
→ Clean air
→ cultural value.

The survey was carried out, the average income per km² was determined, Ecosystem services value calculated and then extrapolated for entire land area.

The study area was defined based on land use / land cover, Ecosystem Services value per unit area and map calculation using ESV. ESV of across entire study area was calculated using maps and valuation approaches. ESV across management area such as Non-Protected Area, buffer zone and core area. Across the areas, Non-Protected Area had the highest ESV value, because the area had the highest economic use. In regional perspective, Non-PA has highest value whereas in global perspective, core area has the highest value.

Session V

The case study was based on the Jagdishpur Reservoir Ramsar Site (JRRS) in Nepal. The methodology used was Total Economic Value (TEV).

The methodology:

→ Listing of use and non-use value of wetlands by observation; discussion, literature, survey, rapid assessment. The area divided into:
  - adjoining area (5 km from reservoir)
  - Nearby area (5–10 km from reservoir)
  - distant area (10 km from reservoir).

→ Prioritization of use and non-use value.
  Six major values were selected, namely

✓ Direct value, ~~Ind.~~ Wetland goods, tourism
✓ Indirect value - Irrigation, Carbon sequestration, Biodiversity
✓ Existance value → Future use.

The willingness to pay was also considered. Future use value was estimated using Contingent Valuation Method (CVM). The TEV was estimated to be NRs 94.5 million.

$\frac{TEV}{\text{Total household}}$ = Value of wetland/household = NRs 5439.

$\frac{TEV}{Are}$ = Value by unit area/ha = NRs 4825.

Sustainable financing strategy for reservoir should be developed, considering the economic value of the wetland.

18/8/18

Summary

Session I

Water and Ecosystem services:

the ecosystem offers several benefits such as linking humans and nature, conservation and restoration of natural ecosystems and as a key role in ecosystem functioning: The European Commision (2011) states that, more conservation strategies are emphasised when more services are obtained. the Ecosystem Services of water include provisioning, regulating, cultural and supporting services. this will help in human well being.

Quality, Quantity, timing and location is considered to maintain Water Ecosystems Services. The integrated Assessment framework states that, the pressure from humans on aquatic system is there on one side, there are Ecosystem services on the other.

the Economic evaluation is done by:

→ Cost based approach.
→ Comparing value of the resource in different region.
→ Individual preprence.

A case study in Aghanashini river, (River basin of Uttarakannada) FS done. Rainfall data shows, high rainfall during June–September and annual rainfall in western ghats regions

Session II

Ecosystem services from microalgae – carotenoids

Carotenoids are accessory pigments which help in light harvesting and protect from photo-oxidation. They are found in plants, algae, bacteria and fungi.

Carotenoids (1100 known carotenoids)
↓ xanthophylls
↓ Carotenes

β-carotene (Carrot) ⟶ 2x Retinal ⟶ Retinol (Vit. A)

The Algal source of Carotenoids – Dunaliella sp.
β-carotene – Haematocus pluvialis
Astaxanthin – Green Algae

Astaxanthin is used for treatment of tumors, Alzeimer's, Parkinsons's, CNS diseases.

Production of pigment:

Culture in Agar plate (Green Algae) → Isolate colony → Mass production

↓

Provide stress (UV)

↓

It becomes Red algae

Algal biomass harvested → Red pigment

EPA & DHA from algae have medicinal use.

Session III : Ecosystem services from micro-algae.

Only 15-30 % of algal biomass is used, rest is a waste.

Boil seaweed.

↓ Filter.

Residue → Lipid solution → Lipid

Residue → Agar extraction → Agar

Residue → Fermentation → (A) Bioethanol

Soil conditioner

Filtrate → Pigment

Filtrate → Mineral rich water.

Biochemical and mineral content of Gracilaria corticata:

Agar - 23.01 %.

proteins - 13.85 %.

lipids - PUFA - 1.48 %.

Using one biomass (algae), we are producing many products and also without any waste.

→ Complete utilization of bio-resource.

In Mandapam, Tamil Nadu, the raft culture of kappaphycus alvarezii yield about 2 lakhs rupees per season and also the seed for next season.

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Summary

Session VI

Ecosystem Service change and livelihood impacts in the Maguri–Motapung Wetlands of Assam, India

The case study was to assess the Ecosystem Service value, the change and the impact of change of the Wetland ecosystem. The Wetland lies in the Indo burma global biodiversity hotspot. With an annual rainfall of 2300 mm – 3800 mm.

The methodology used:

⇒ Household survey with Questionaire focusing on Ecosystem Services, their dependancy, the drivers of change and their impact.

⇒ Focus Group Discussion.

⇒ Key Informant Interviews

⇒ Data analysis – using a scale of 1–10 marking highest preference to least preference.

The Ecosystem Services Categories are:

→ Provisioning Services. – 15

→ Regulating Services – 7

→ Cultural services – 5

→ Supporting services – 2

Horticulture, tea plantation were also considered.

Based on the study, eight direct and three indirect drivers of change (Both natural and human induced) were identified.

The major drivers of change were siltation (94%) Over exploitation (87%), weak Management plant. ~~This calls for the necessity of an int~~ This results in the decrease of availability of resources.

This calls for the necessity of an integrated and wholistic management plan, alternate livelihood and the high concern on the conservation of wetlands.

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Session VII

The ecosystem services provided by Mangroves include:
→ Honey,
→ Mangrove salts, flowers, ~~salt~~ fruits
→ Mangrove soil for bricks, Mangrove mud for mud therapy
→ Mangrove animals like worms as food.
→ Nursery ground for fishes, crabs etc.
→ Molluscs, bivalves
→ Tourism.

Fishes dependent on mangroves for their development. The fish value in market is affected by belief, taboo, different developmental stages, season etc.
→ Salt from mangroves.
→ Crabs: 850 species of salts.
crabs ~~provide~~ contribute to food, by products, sport fishing.

Ecosystem services verses Ecosystem functions.

Based on the 141 papers studied, three methodologies,
(1) In the context of coastal environmental protection
(2) Review of Studies in Ecosystem service assessment in mangrove wetland.
(3) Discussion — Site specific economic valuation and standard definition of ES.

(Shalini) Sommary (13th Day) 17/8/18

Mangroves :-

Marine ecosystem are one of the largest of earth's aquatic ecosystem. Firstly, in 1960's ES valuation concept come into light. Coastal habitats are highly productive and accounts to 1/3 approx of all marine productivity. Out of many biomes of marine ecosys. Mangroves are the one, which are basically the salt-tolerant plants growing in swampy mud of coastal areas. Grows in intertidal zone of river mouth, lagoons, creeks, etc. Special adaptations like pneumatophores, stilt roots, buttress roots, salt filtering roots, salt glands, lenticels, etc are there in them that help them survive in saline areas. Marine ecosystem provides services like - fishing, firewood, recreation, biodiversity, protection, etc, and other provisioning, regulating, supporting and cultural values. Mangrove are of 3 types - High salinity, Medium salinity and low salinity mangrove. Various spp. are Sonneratia alba Rhizophora apiculata, Avicennia marina, Bruguiera cylindrica, Excoecaria agallocha, Acanthus ilicifolius [High Salinity]

Medium - Kandelia Kandel, Avicennia officinalis,

Bruguiera gymnorhiza, Porteresia coarctata.
Low - Sonneratia caseolaris, Acrostichon aureum.

Importance -
Ecotourism, erosion - protection,
[18/8/18 Continuation from 17/8/18]
Characters like leaf morphology, root morphology, are used for identification.
Different products provided are honey, flowers, fruits, mangrove salt, mangrove soil herbs, mud therapy, timber
Aesthetic value - birds, tourism.
Supporting - fish nursery.

Mangroves Crab, fish, salt

(1) Crab - 850 spp (Crustaceans) - Highly valuable
Review of valuation methods for mangrove ecosys.
Services - Ecological Indicators
We try to give economic value to services
for - Integrated envi. decision making
Sustainable business practices
land use planning at multi-geographic scales
Socio-political level.

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Summary

Coastal areas are the interface or transition areas between land and sea, and having a salinity of 5PPT. There are Mechanized, non-mechanized, traditional and subsistance fishery. We also have marine, estuary and ~~and~~ estuarine fishery. The bivalves are important in that it ~~helps~~ is the raw material for lime, cement and as feed. Based on depth, marine ecosystem are of four zones:

→ Intertidal zone → Oceanic zone
→ Neritic zone → Benthic zone.

The Coastal landscapes include Bay, Barrier island, salt marsh, mangroves, Coral reefs, Rocky shores, ~~and~~ and human settlement area.

Sand dunes are the first line of defense against soil erosion. The Exclusive Economic Zone (EEZ) in India is 2.172 million km^2. The CMFRI ~~2001~~ 2010 census shows that there are 9 maritime states and 2 union territories. ~~Also~~ Keystone animals like the turtle are part of Coastal ecosystem. Coastal areas include mangroves and ~~the~~ salt marshes. Shell mining and sand mining are the activities going on in coastal areas.

The scope of Study of Coastal ecosystem include hydrological and sedimental properties, increased storm flooding, Ballast Water regulation and oil spill.

The existing observation systems in India include tsunami buoys, other buoys and gauges that help in information forecast on wave height, ~~Water~~ Water level, tsunami warnings etc.

The Coastal Regulation Zone (CRZ) includes a series of prohibited areas for activities and they are preserved. They include CRZ-I A – Mangroves, coral reefs, National parks
CRZ-I B – Intidal areas.
CRZ-II – Developed land areas.
CRZ-III A – Population density is 2161 km^2 in 2001
CRZ-III B – Population density less than 2161 km^2.
CRZ-IV, CRZ-IV A, CRZ-IV B.

Pollution and ghost nets are a major problem for animals and plants in Coastal areas.

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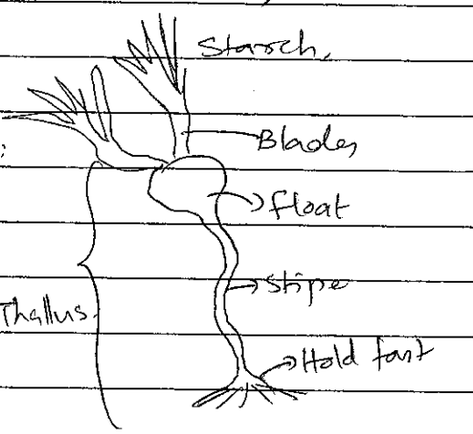
Marine Macroalgae/Seaweeds.

Based on the pigments present in them, they are classified into:

~~Rhodophyta~~	① Rhodophyta (Red algae)	② Phaeophyta (Brown algae)	③ Chlorophyta (Green algae)
→ ~~Habitat~~			
→ Habitat	Salt water	Salt water	Freshwater (Euryhaline)
→ Cell wall	Cellulose	Cellulose & algin	Cellulose
*chlorophyll	a, d	a, c1, c2, c3	a, b
Reserved food	Floridean Starch	Laminarin, Mannitol	Starch,

The basic structure of a macroalgae:



Some macroalgae show alternation of generation in which they sexually reproduce by the formation of anisogamic gametes and the offspring asexually reproduce by producing zoospores of similar size and shape.

Macro algal habitats include tidal pools, mangroves, laterite rocks.

Green algae - Seasonal and seen almost everywhere

Brown algae - Grow during winter and seen in estuarine mouth.

Red algae - Grow in all season but only in the sea and estuary

Macroalgal sampling is done using quadrate sampling of 0.5 m x 0.5m or 0.25 m x 0.25 m. Sampling is done perpendicular to the sea.

Sea weed utilization:

Red algae → Agar, carrageen and algin.

Useful in: Cosmetics, pharmaceuticals, food, fertilizers, animal feed, feed stock, bioplastics and biofuels.

Presently in Gulf of Mannar, a red algae Capophycus alvarezii is cultivated.

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Summary

Microalgae

Microalgae comes under the dimensions of 2-200 μm where nanoplanktons and planktons are included. Microalgae is classified into:

→ chlorophyta - Tree like, green organisms.
→ Euglenophyta - Obligatory heterotrophs with flagella.
→ Cryptophyta - Thrive in extreme conditions - flagellate
→ Pyrophyta - Dinoflagellates, flagellated.
→ Rhodophyta

Diatoms have a cell wall made of silica which is transparent. they form diatamaceous earth. Diatom classification:

Diatoms
- Pennate (Needle like)
  - → Raphid (Benthic)
  - → Araphid
  - } planktonic.
- Centric (soap box)
  - → Bipolar
  - → Radial. - (Benthic)

The life cycle of diatoms involve ~~asex~~ fission in which the epivalve (big) ~~sepa~~ and hypovalve (small) seperate and this fission continues leading to the critical point. In there, lineage of epivalve forms egg and that of hypovalve forms sperm. After fusion, zygote forms and a diatom is formed.

Diatoms exhibit uric acid cycle. Deatoms are important because they: → Produce 25-40 % of oxygen
→ Indicate aquatic ecosystem health
→ Primary producer.
→ 40 % of marine primary productivity
→ Silica frustules for paleo-environmental.

the biofuel production from diatoms is a carbon neutral process.

Diatom sampling:

For Benthic diatoms: → identification of sampling location
→ sample collection by scrapping rocks.
→ processing and microscopic analysis.

For planktonic → collection using plankton nets.

Identification and taxonomy is based on silica frustule structure.

Ecosystem monitoring is important because:

→ Human well being → Ecosystem service.

→ Environmental policy → Human activities

→ Stressors.

Ecological monitoring involves calculating relative abundance (RA)

$$RA = \frac{x_i}{X}$$

x_i = No. of individuals in one species

X = Total no. of all individuals.

It tells about species diversity and species composition.

The physico-chemical parameters and biological parameters are complementary. Coastal Monitoring is done using remote sensing using ~~satellite~~ sensors like SeaWiFS.

Diatom cultivation is done by:

→ Culturing in Agar plates

→ Isolation of colonies

→ Based on nutrient composition, growing in bottle or flexible plastic bottles.

Application of algal biomass:

→ Biodiesal production process.

Algae → harvest → Factors

Lipid ← trans-esterification → Biodiesel

pigment → Value added product.

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15/8/18 Summary

Water quality is dependent on the physical, chemical and biological characteristics of water. the objective of water quality assessment is to analyse the trends and status of water body, its causes and taking appropriate measures. Water body helps in purification, ground recharge, nutrient cycling, shore line protection and provide habitat for plants and animals. The sources of water pollution is from point and non-point sources.

The problems faced by Lakes include discharge of ~~sewage~~ sewage and nutrient effluents, heavy metal accumulation, dumping place for solid wastes etc. the consequence of nutrient enrichment in lakes include foams, algal bloom, macrophyte growth and fish kill. this also affects the food web and cause air pollution. the impacts of water pollution include social, economical and environmental costs.

The sampling sites for water quality includes inlet, outlet and centre. the parameters include physical, chemical and biological. Physical parameters include visual comparison of water colour with distilled water, temperature which changes due to flow, altitude or air circulation. the change in pH level affects both photosynthetic and respiration activity. the high value of TDS indicate decreased water quality, photosynthesis and increased water temperature. the amount of dissolved oxygen due to diffusion and photosynthesis. the Electrical conductivity, transparency, ~~and~~ turbidity, free and bound Carbon, Alkalinity, chloride, Total hardness Calcium and Magnesium are determined by titration and applying their formula. there are desirable ranges for these.

Fishes are cold blooded vertebrates that have gills for breathing and fins for locomotion. They are good indicators of water quality and ecosystem health. Fishes are ideal nutritious food with Omega Oil. There are 21,730 species worldwide and 544 species endemic to India.

Ichthyology deals with the study of fishes. the types of carps in India are:

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Indian Major carp:
- Catla – surface feeder
- Rohu – Column feeder
- Mrigal – Bottom feeder

Exotic carp
- Grass carp : Surface feeder
- Silver carp : Surface feeder
- Common carp : Bottom feeder.

Fish growth is affected by both biotic and abiotic factors.

Fish identification includes:
→ Collection of fishes.
→ Identifying and positioning in taxonomical hierarchy

It includes:

Dorsal fin (unpaired)	Pectoral fin (Paired)
Anal fin "	Pelvic fin (Paired)
Caudal fin. "	

The common fishes in Bangalore includes Labeo, Catla, Gambusia, Oreochromis etc.

The threats to fishes include:
→ Dams.
→ Water pollution.
→ Sedimentation
→ Introduction of exotic species
→ Overfishing.

The conservation measures for fishes include:
→ Avoiding harvest during breeding season.
→ Avoiding harvest of juveniles.
→ Don't allow invasive species.
→ Awareness ~~about~~

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Summary

Aves - Introduction, identification and Ecological significance:

Birds are animals having wings, feathers and are warm blooded vertebrates. Archaeopteryx lithographica is the intermediate between reptiles and birds. There are about 9702 species of birds. Birds are found in almost all the habitats of earth. The adaptations of birds are highly improved: the highly locomotive behaviour is because of the feathered wings. Feathers are of many types namely semi-plume, filoplume and bristles. The feeding, nesting and courtship behaviours are of particular significance. Some birds have very colourful plumage whereas in some other birds, only during breeding season, they possess plumage.

The migration of birds are of long-distance, short-distance, diurnal or nocturnal.

The ecological significance of birds:

→ they occupy various levels of food web.
→ Help in biological control
→ they are biological indicators
→ Active pollinators.
→ keystone species
→ ~~Their~~ they have application in technology like

Streamlined body - bullet trains.

14/8/18

Summary

ASHIQ

Butterflies: Identification and Ecological significance

Insects come under the taxa hexapoda having six legs and two pairs of wings. About 336 species of butterflies are reported from Western Ghats. Heterocera include moths and Rophalocera include butterflies. The ecological significance of butterflies include:

→ they serve as pollinators ~~(About~~

→ Biological indicators.

→ A part of food chain and food web.

→ They show co-evolution and ~~host plo~~ insect-hosplant interaction.

The wing structure and the structural colours of butterflies have helped in technological advancement.

The documentation format for butterflies include date, time, location, weather conditions, Scientific name, common name, family, Activity etc.

By Transect method (line

By

transect or belt transect) and hour count butterflies can be documented.

The behaviours of butterflies include basking, feeding, mud puddling, local movements etc.

The symbiotic association of caterpillars with ants so that both the parties benefit are also interesting.

planting specific host plants will help to attract butterflies.

Killing of caterpillars and ~~not~~ complaining the absence of butterfly is a stupid idea. The encouragement of planting host-plants will help to conserve butterflies.

12/8/18:- KUNARU Documentation of Biodiversity in the village

Biodiversity - all variety of life on earth

United Nations convention on Biodiversity - 1992

Biodiversity Act - 2002 in India

2.5% land area. = 7.8% world's species

Act:

① To allow the biological resource for sharing equal share & benefit of local people

② To conserve & sustainable use of biodiversity

③ protect knowledge of local people

④ sharing of benefits

National Biodiversity Authority

State Biodiversity board

Biodiversity management committee.

Setup in every level for monitoring Natural resource

i. People Biodiversity Register:-
ii. Intellectual property issues
iii. Access & Benefit sharing issues
iv. levy of taxes
v. Preparation of Action plans, project Report
Annual report

Case study:

① digitize the village boundary
② Attribute data, field data, Secondary data

Methodology:-

vegetation - loamy loam
layer - rainfall
vegetation
Road, sampling plot

Angiosperms plant taxonomy & identification

Father of Botany - Theophrastus

De materia medica - Dioscorides -
all medicine prepared by different plants
Morphological characteristic

Carl Linnaeus - Father of Taxonomy

Plant Taxonomy - Identify, describe, classify & name plants

Classical Plant Taxonomy = Herbarium, description, Binomial System

Taxonomy Component =

1. Classification
2. Identification
3. Nomenclature
4. description

Importance =

I. Identify
II. ancestors - evolution - development
III. monos & dicots = Bryophytes - lower plants, ferns, Gymnosperms, Angiosperms

Taxonomy system =

Kingdom > Division > class > order > family > genera > species > variety

Identification methods

Trees with Honey fragrance - cinnamon

Trees with milky latex :

Trees with Stem oozing watery or Coloured water come out

Trees with Nerves pattern of leaves

Trees with clustered or whorled

Summary of 7th Day Session

The 7th day of the GSDP programme can be summerised into 5 sessions;

Session 1 : Developing / Designing & presenting the Thematic Map.

It contained 2 parts :

A. Designing & development
B. Refining the map to presentable form

A. Designing = Step 1: Development/ Already designed Georeferenced map to QGIS (Layer-1)

Step 2: Add Layer 2 (predefined) Agro-Climate to QGIS

Step 3: Joining the layer 1 & 2 called Intersection map ie District_Intersection map.

Step 4: Identification of number of Agro-climatic zones in the interest District.
: Colouring the different zones
: Removing / making transparent colours to non Agro climate zone.

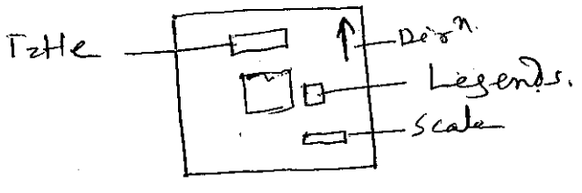
B: Preparing Presentable Map:

Step :1 A presentable map needs
- Title
- Direction (N)
- Legends
- Scale

Step :2 Drawing the map.

- We have scope for writing editing the title

Step 3. Positioning the Title, Direction, Legends & scale at right location



Session: 2 covered Western ghats a need for identification and conservation of plants by Dr. R. Rao.

The Session has focussed on following key points

1. Birth of human civilization started from plants and Forest based ecosystem.
2. conservation of plants means – production of food
   – Production of O_2
   – Production of H_2O
   – Reduction of CO_2
3. System's thinking approach to ~~water~~ and Forest and rain
4. How India is in eye of world community as 8th largest biodiversity Landmass, on earth
5. Nine phytogeographical regions in India and the forest biodiversity basis on topography, elevation, monsoon, temperature etc.
6. Four different categories of forests e.g Dry, Wet, Sub-temperate and coastal., their forms species diversities
7. The loss of water yielding plants and current approach of plantation which more suited and considered as beneficial for Carbon sequestration and O_2 release.
8. How continental drift in India transform India over 150 million years to get monsoon or Himalayan climate as deciduous forest. the effect of shifting cultivation on evergreen forest.
9. Human - animal conflict due to shifting cultivation, Forest land conversion to agriculture land and blocking breathing spaces of wild animals.

Session - 3 This Session has focused on Herbarium for preservation of pressed & dried collection of flower, fruits, leaves. Herbarium of International

natural and local importance. Approach to: Collect the herbarium species, methodology for preparation of herbarium species, by focusing on field note, press, vasculum, knife, rope, magnifying lens. The process of pressing and drying the species through different stages was given how systematic, challenging to make herbarium lively. In addition to this we came to know the naming process of herbarium species by keeping focus on.

- Collection no
- date of collection
- name of plant family
- person who identified, who collect
- local name etc.

Session 4: The participant in Session Mr Anirudha Kishore has presented valuation of forest ecosystem in terms of natural resources, other services like storm water protection, carbon sequestration, water quality management etc. He has sited two key methods to valuate ecosystem goods e.g. market price method and benefit transfer method. Two cases was presented by him to cite how the calculation was done.

Session 5: Dr Pabitra Nayak from EMPRI has presented the importance of honey bee, the types, key indian species, their life cycle, production capacities per year. She has focused on Apis cerana indica, Apis florea; the production capacity and medicinal value. Honey bee types in hives (Queen, Drone, worker) was also discussed and the processing part is to be done tomorrow.

Tirtha Sarathi Mohapatra

Wetland Monitoring Macrophytes & Redemication potential :-

① Land transition btw land & aquatic system (shallow water)

Ramsar wetland - artificial, Natural, water flowing or stagnate, freshwater & brackish water. ~~or~~ area built marsh or fen or peatland -

Functions of wetland :-

① Freshwater, fish, sediment retention, groundwater recharge, Biodiversity, water quality, Micro climate.

Causes of loss :-

① Agri, deforestation
② denundation of dams, upper catchment
③ Sewage, industrial waste
④ ground water table
⑤ exotic sp.
⑥ dumping of Slid waste management

need for monitoring :-

① protect from converse degrade
② Ramsar convention are signed to conserve the wetland.

Aims to Wetland Monitoring :-

① identify existing problems or emerging one
② destruction of forest, fish, fens.

Approach :

① physical - chemical approach - Character of water that respond to the sense of sight, rouge, taste, smell.
② Chemical parameter - solvent capabilities of water
③ Bio - monitoring through bio indicators - flora & fauna.
* to access periodic change in environmental Quality
* An indicator signals Nutrient potentially from Numerous sources

Aquatic food chain - phyto plankton ← zoo plankton ← fishes

phyto plankton as indicator. Microscopic organism floating

Zoo plankton - animal microscopic indicator.

* Comprises of microscopic protozoa, rotifers, copepods.

Macro Vertebrates: Snails, mussels, crustacean ---

Fishes: Health of ecosystem

Keystone sp. in aquatic sp.

Cumulative pollution effects on fish habitat.

Macrophytes: plants.

* plants sp found growing in wetlands, in water or soils are flooded or saturated long enough anerobic condition.

enough to see in naked eye. Water must be

Shallow & Summerged in water.

Physical stability against flood water. light to reach the bottom of.

Functions of microphytes:

* Base of food chains, link btw inorganic environment with biotic one, provide habitat, Hydrology & Sediment - influence

* Health of ecosystem, medicine, Cultural & economic aspect

Types:

I. Emerger

II. free floating

III. floating leaved

IV. Summerged.

Emergent:

It grows in shore line, roots penetrate in sediment, transition zone.

Leaves float in surface. It grows

Eg: Alligator weed - primary stem,

weed, fodder

Typha - cattail - perennial marsh, temperate region also, wind pollination, Phyto remediation

water Primrose

colacasia

common marsh Buck wheat

water spinack

Eg: ipoma aquatica.

cyperus sp : Nut grass.

Floating macrophytes: leaves & stem flood on the water surface, entire plant

Eg:

water Hyacinth

pristia

lenna

Azolla

salvinia.

Floating leaved macrophytes :- root in soil, leave are floating stand water

Eg: lilly, lotus, pond weed, Nymphoea.

Summerged plants :- entire plant under water, leaves are dessicated, not developed

Eg:

coontail, common hornwort, Hydrilla, Najas.

general characteristict

I. grown in Nuetrient rich water like sewage, udlesnail waste

II. weed, it affect water quality & foul smell.

Sampling: depends on type of habit of vegetation.

= 1m×1m

= 0.5×0.5 m.

vegetation mapping :

Heavy metals present in pond, lake, observation of Heavy Metals by plants.

Sankar rao :-

Earth - Changed by Trees, = Ecological service.

earth & environment co-evolved.

It maintain stable the earth

Failure of ecosystem - climate change, can predict weather. drought, flood, dry river, landslides.

Solution of the problm:-

① ecosystem never ideal exist before earlier only endemic

② ecosystem restoration scientific Model. plants afforestation

③ entraction bro plants / animals microbes,

④ digital development - update the data - visual identification of sp, lat, long destribution

⑤ Herbarium → identity

⑥ To create new, inventory - create data base not depend old inventory

⑦ Eastern ghats - endemic

⑧ Komplete data base done in Southern peninsula.

Eco service :-

Genetic reservior - food crop & domesticated animals

water conservation, recharge

livlihood : Forest dependent Community

Flora of pennensular India & South india in the web.

He update 10,000 sp of the sp. is Present in the web

all the data about

Images, are also present

9/8/18

Summary:

Angiosperms are flowering plants with fruits covering the seeds. In 1969, R.H. Whittaker proposed the five kingdom classification for living organisms:

Five kingdoms:

living things → Monera (Bacteria) – Prokaryotes
→ Protista (Unicellular Eukaryotes)
→ Fungi (Multicellular eukaryotes)
→ Plantae (photosynthetic)
→ Animalia (Heterotrophic)

Angiosperms or phanerogams are the largest group of Plantae with their reproductive organs as flowers consisting of:

calyx
corolla
Androecium and
Gynoecium.

Angiosperms are classified based on the number of cotyledons (embryo leaf) into monocotyledons (one cotyledon) and dicotyledons (two cotyledons). They can also be classified based on the presence of androecium and Gynoecium.

Unisexual (With only androecium or Gynoecium)
Bisexual (With both androecium and Gynoecium).

Plant taxonomy is the process of identification, nomenclature and classification of plants.

Nomenclature (Binomial Nomenclature) is ~~supervised~~ regulated by International code for Algae and Higher plants (ICN) and International code for Botanical Nomenclature (ICBN).

Binomial Nomenclature is two part naming of organisms.

Eg: Mangifera indica
genus specific epithet

Genus: Starts with capital letter. Species: Starts with small letter. When printed, it is in italics and when handwritten, seperately underlined.

classification system are many sonch as Sexual system proposed by Carollas Linnaeus, Natural system proposed by Benthams & Hookers and new APG 4 system.

Plant kingdom

Cryptogamia — Phanerogamia

Phanerogamia → Dicotyledonae, Gymnospermae, Monocotyledonae

Dicotyledonae → polypetalae, Gamopetalae

Monocotyledonae → Monochlamydae

Leaf phyllotaxy includes the arrangement of leaves on nodes and internodes. We have
- Simple and compound leaves
- Opposite and alternate leaves.
- Pinnately compound and palmately compound leaves.
- Bipinnate, tripinnate leaves.

~~Leaf shapes are various~~ (margins):
~~entire, serrate, dentate, linear, oblong, spatulate etc.~~

Leaf margins are various:
entire, serrate, dentate, rounded, lobed etc.
Leaf shapes: Entire, ovate, lanceolate, linear etc.

Inflorescence type: Racemose and cymose.

Inorder to describe a plant, the requirements are:
habit, habitat, root, stem type, leaf type, flower, fruits, seeds, floral diagram and formula.

The sampling methods for measuring plant groups are:
(1) Transect method:
- ~~line~~, bisect, trisect, ~~Ring count and quadrat method~~

(2) Bisect method.
(3) Trisect method.
(4) Ring count method
(5) Quadrat method.

The statistical analysis such as frequency, relative frequency, density, relative density, abundance, relative dominance, SIV, ~~and~~ Shannon-diversity index and Simpson diversity index are imp.

In GIS, inorder to collect the data of flora and fauna of the district, it can be collected from:

→ field data → data porta - india biodiversity portals.
→ published paper → recent reports.
→ state biodiversity ~~boards~~ boards.

Inorder to create topography maps of respected districts;

→ import district grid through vector layer.
→ import state data through raster layer

save the file in UTM formate.

→ Using zonal statistics, the mean value is calculated.
→ ~~The~~ For the created data, the classes (4) are specified with colours from blued-green-yellow and red.

06/Aug/18 | To GRID the selected district |

Open QGIS software.

Choose Layer,

Add Layer

Add Vector Layer.

Choose the file — Browse

Then by Right Clicking on the Layer chosen.

Look for the Attribute table option & the find the select using an Expression seen as Ex

Then search for Fields & value.

+

└ District

Then

all unique. ✓

Then Assign

Type in DIST =

District of interest.

Select features ✓.

The Go back to the home page.

select the layer & Right click it

Properties

Label

Apply Labels

Type in the district of interest

Apply ✓.

Then go back to Layer Right click Save As

- select ESRI

- Browse to save it in the desired place

OK

* CRS look for "WGS 84 / UTM Zone 43 N."

as per the Grid number. that was discussed by dividing the eastern western hemispheres into 30° each & the adjusting the co-ordinates

Under Encoding.

☑ save only selecte feature

OK ✓

How to add grids on the field of interest

Vector

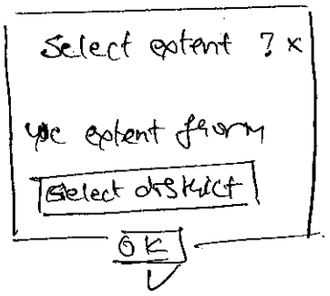
Research Tools

Vector grid

OK ✓

From the Grid extent choose "use layer / Canvas extent"

* important to change the co-ordinate system to UTM co-ordinates [32644]



After clicking on OK assign x-spacing & y-spacing as 9000 mts each

Choose grid type ↓ output grid as polygon

to save file location Browse.

RUN ✓

Now to crop out the grids away from the outline of the district Go to Vector → Geoprocessing Tools → Intersection.

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Summary

Today was an exciting class because I was more interested in GIS mapping and the new techniques for collecting spatial data.

GIS has a multidisciplinary approach having applications in the field of Archaeology, forestry, urban planning and Economy. GIS works by spatial or geographic reference with x and y coordinates, latitudes and longitudes, administrative unit etc.

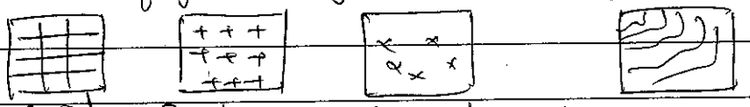
GIS helps to check for proximal entity which is exploited in taxi services like Uber, exploring Relations between activities based on location and proximity such as investigating link between pollution sources and disease patterns. GIS also helps in integration of both Vector and Raster data. The product of rows, columns and grey scale gives the bits.

Information is which is the processed data which is of two types namely continuous data and descrete data.

Continuous information – can be measured anywhere. Eg: Elevation

Descrete information – It is a point or location Eg: Stream.

Object view includes point, line and polygon whereas field view consists of grids, Regular and irregular units.



The process of GIS involves defining the problem, defining Criteria, collecting data, analysing it, output and impartial decisions. It is done with the help of information system.

Spatial encoding of vector is done using point (without area) having xy coordinate, line (connection of node) and polygon (node connected to form a closed label). Spatial encoding of Raster is done using grids depending on the energy reflected from the entity. Here GIS helps in providing spatial, temporal and attribute data.

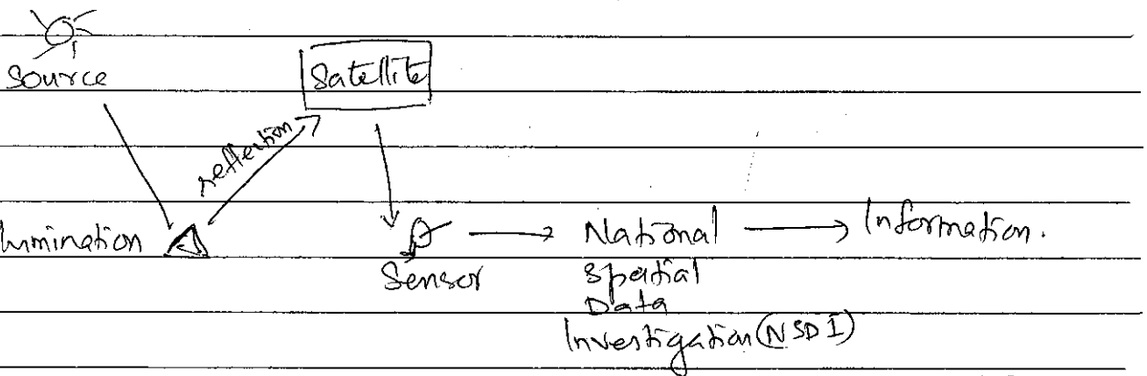
GIS consists of Verification, compilation, Storage, updation using Remote sensing, management and exchange, and analysis of data. This helps into the translation of data into maps and symbols. It also helps in the visualisation of data.

Geographical data consists of two types namely Geometric and Attribute data

Geographic data
- Geometric data
- Attribute data
  - Ordinal (good, best and better)
  - Interval scale (within a range)
  - Ratio

GIS helps in the descriptive database analysis of earth whereas GPS helps in location.

Satellite information helps in generating timely, reliable and cost effective information of natural resources like land, water body etc. It makes use of the reflectance of electromagnetic spectrum (EM) consisting of visible rays and IR rays.



Using components of EM with shorter wavelengths or higher frequency results in higher energy. This is evident from solar energy $Q = \frac{hc}{\lambda}$ $\nu = \frac{c}{\lambda}$

h - plank's constant.

This is exploited in information collection using reflected rays.

In resolution, there are four types namely spatial resolution (depending on the scanned area), spectral resolution (depending on acquired band), Radiometric resolution (based on grids and bits) and temporal resolution (based on how often the data is obtained.)

The spectral reflectance of vegetation using near IR has two types namely:

(1)

① True composite : Assigning red to red, green to green and Blue to blue.

② False composite: In near IR, vegetation has a higher reflectance and is assigned as red.

Sample selection should be based on
- it should include all the heterogeneity.
- include 10 % of whole area.

The classification of entity is of two types:

- Unsupervised
  - Mean distance to mean
    the ~~enti~~ unclustured entity which has the smallest mean to a particular cluster, ~~to process~~ ~~Con~~ contain the entity
- Supervised
  - Using parellopied
    Using mean and standard deviation
  - Ganssian maximum likelihood
    ~~Depending~~
    Depending on the probability the pixels get classified.

In unsupervised, the histogram is made, and it shows a normal distribution (Bell curve) and the peaks shows the categories.

The data collected and entered in excel spread sheet ~~is conv~~ with latitude and longitude is represented as visualisation in QGIS. Then the maps were geo-referenced using the coordinates provided in the map. After georeferencing, the google street map and the georeferenced map was overlayed. In QGIS, the coordinates entered provide the attribute data, and it can be overlayed and the area can be calculated.

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Inorder to identify a conservation site, using GIS mapping, landuse patterns, drainage networks, buildings are all considered and this data is feed to a computer for analysis. Data can be primary and secondary depending on whether it is directly observed or obtained from other sources.

In spatial analysis, each layer of data is seperately made and then overlayed. Each pixel or grid in the spatial image should have x-y coordinates, place name, description and projection. A spatial data represents the geometry, topology and socio-economic information.

In designing water harvesting structures using GIS and remote sensing, the calculation of Catchment yield is necessary where the availability of the water is represented as

$$R = C \times A \times P$$

C = Catchment coefficient
A = Area.
P = Precipitation.

Free and open source Software(FOSS) is necessary for Ecosystem planning because they help in datamining, spatial data collection based on temporal scale, geospatial technologies and regulatory mechanisms. The GIS and GPS represents the Geospatial technologies.

In NDVI, the Near IR has high reflection in vegetation cover and Red has lower reflectance. In the vegetation, a dip in the peak represents the water content of leaf and in bare soil, dip in the peak represents a water body.

The various sources for data collection are Survey of India toposheet, IKONOS, Landsat, MODIS, pre-calliberated GPS and Google earth image. MODIS give a temporal data of 1-2 days whereas in Landsat, small area is represented with fine resolution.

The real world modelling is done by representing data as grid (Rastor data), understand the data and

apply GIS techniques, GPS, Satellite information and the required attributes as well as description are added.

GIS is a computer based system with hardware, and software that requires labour and data. It is useful in many fields like Urban planning, research, forestry etc. Its elements are space, time, location and attributes. It is used to update traditional maps, environment models, and analysis of multilayer information.

The components of GIS include Map digitization, Cartographic display, spatial and attribute database and Geographic analysis.

And then, how to used Google earth for Map digitization including representing buildings as polygons, roads as lines and trees as points were learnt.

Quantum GIS (QGIS) which supports both Raster and Vector data also include Map data like location, Attribute data like description and image data. It helps in compiling administrative data.

For example IND-adm1 - provides state level data of a country.

Cartography is the process of developing a map. A Map includes latitude and longitude of each are. Latitude represent the angle with respect to equator and the point whereas longitude is the angle between GMT and the point. There are large scale, small scale and medium scale maps. There are Topographic, geographic, political maps available. A map is developed by surveying and Projection into a 2D plane.

Projections can be carried out in planar, conic or cylindrical. The Universal Transverse Mercator (UTM) divides the earth into grids and every grid on earth is 6 degree from East to West and 8 degrees from North to South. The Reference Datum are the Mean Sea Level, GMT, Everest spheroid.

The Global Positioning System (GPS) helps in navigation, location and timing. The Assisted GPS is present in mobile

5.8.18

Summary of Day 1 Session

 TVR40ir

The economic value of our ecosystem goods and services that not been seen in the lens of marketable transactions, it is because we never, ever pay a price for it. On the other hand value of the ecosystem goods and services when quantified by any organization or appellate body are either undervalued for the reason best known to them. The tragedy become a regular fashion to divert the attention of the youths of India for either the vested interest of grabbing land, money or votes.

Today's session in IISc that highlighted the following key facts which prompted one to derive this conclusion or summary as mentioned above.

*. Points

1. We are rich in biodiversity but poor in documentation.
2. We never see ecosystem as economic asset as we feel it is free of cost and nature allows us to inherit and destroy as per ours will without knowing the repercussion.
3. I understood the basic food chain and energy transfer process among the components of ecosystem "producers, consumers and decomposers" and the importance of energy in the system.

2

4. I understood the relationships between resources and management of resources. Linkage

resources ↑ ' mismanagement of the ↑
resources are more
by people
and Vice versa

5. I understand the water footprint and agriculture linkage.
ie quantification of water requirements for products.
Ex: 2000 lt water for 1 kg pulses.

6. Human - animal conflicts when we intentionally or unintentionally affect the nature's way an equilibrium is lost

7 Role of Hydrological, Biogeochemical and nutrient cycle in building equilibrium in nature

8. Understood the value of wetlands for maintaining hydrological cycle.

9. Understood the role of Spatial Image in ~~Eva~~ Evaluation of ecosystem goods & services as → it clearly gives quantitative response over period of time to forecast future aspect of a particular landmass / territory

(3)

10. Understood the effect of valuation of Land and 3 crop produces and one crop produce due to hydrological degradation, forest degradation and monoculture

11. I understood the value or role of Geography, Demography and Topography in valuing the ecosystem goods & services

* Understood population growth is not a problem but mis-management of our resources is key problem

12. Understood how to take grid as monitoring tool, use of Survey of India Toposheet for 9x9 km. grid as basic unit of GIS/ Spatial mapping.

- Understood Stratified Sampling, on the basis of Agro-climatic zone & the area
- Ranking
- Biomass quantification
- Value of Endemic Species
- Calculation of T E V. by Considering direct use, indirect use, optional ~~use~~ value and existence value.

13 Understood land cover dynamics analysis from Rastar data & vector data. and measure the change in land use pattern

14 Understood the level of fragmentation and role in decision making & in future project proposition in an area

15 Understood water quality assessment by analyzing biological organism. by diversity
- pollutes
- non pollutes

Sample analysis.

16 Understood the requirements of Resource mapping of an area
- Renewable energy potential
- Land availability
- Irrigation potential
- &

And

Demand Analysis.

17 Understood the total values of provisioning services, regulating services, Supporting services, Cultural services Information services in valuating Forest ecosystem

18. See the anomaliy in District Gross Domestic product Calculatin and Under-valuation of the Natural Resources

(19) Understood Estuary and its role in productivity.

(20) Understood how to take a bird's eyeview for cluster Dent Approach for ecological Sensitivity analysis of an area by taking Land, ecology, hydrology, Energy, Social, Estuary Diversity as parameters. and making Zones(4) based on weightage given to Forest cover, Endemic Species (Flora & Fauna), Slope, rainfall, Energy, population density..

(21) Finally internalize the role of IISc in facilitating local, national ecological problem addressing & management by and simultaneously Creating Value through recreation, Learning Science by children, youths. and communicating Science for better Understanding by all.

Tirtha Sarathi Mohapatra