Watershed Management

1. Integrated Watershed Management

1.1 Watershed as a management unit

1.2 Watershed characteristics: Soil, Geology, Climate, Landuse, Land capability, Socio-economic and Geomorphology

1.3 Objective, Approach and Scope of Integrated watershed management (WM)

1.4 Concept of integrated watershed management from a mountain ecosystems perspective

1.5 Present status of soil conservation and watershed management in Nepal

1.6 Role of GOs and NGOs in on-going programs and research in WM

2. Application of Hydrology in Watershed Management

2.1 Water and energy budgets and cycles

2.2 Ecosystems perspective of the hydrologic cycle

2.3 Slope hydrology, runoff generation and drainage networks

2.4 Quantitative hydrologic methods (return period; frequency analysis; probability; time series analyses)

3. Land Problems in Nepal

3.1 Soil properties and moisture (physical, biological, chemical)

3.2 Erosion mechanisms in mountain ecosystems

3.3 Water and wind erosion (process perspective for modeling)

3.4 Mass movement (soil slumping, mud flows, landslides, soil creep)

3.5 Soil fertility and productivity decline

3.6 Flood and water logging

3.7 Desertification

4. Land Use Impacts on Watershed Degradation

4.1 Land use types and features

4.2 Agricultural impacts (farming practices, systems and cropping patterns)

4.3 Grazing impacts (vegetation, erosion, hydrological)

4.4 Forest degradation

4.5 Soil degradation

4.6 Land use changes (cause/effect relationships)

4.7 Road/trail construction and slope instability

5. Watershed Rehabilitation Techniques

5.1   Rehabilitation and reclamation principles and approaches

5.2   Reclamation of degraded soils (fertility, salinity/sodicity, acidity/alkalinity, organic matter)

5.3   Major land rehabilitation techniques (mechanical, vegetative, and bio-engineering including its functions and Interaction between vegetative & engineering system)

5.4   Ecosystems approach to rehabilitation (Churia example; W.A.T.E.R., DSCWM strategy)

5.5   Upstream-downstream linkages

5.6   Indigenous Technology Knowledge (Soil conservation, Nutrient management/soil fertility, Soil classification system)

6. Watershed Management Program and Activities in Nepal

6.1   Management approach taken by DSCWM,User group / Conservation committee,Community development group / Committee model farmer

6.2   Development strategies to enhance local management capacity Ownership building, In-situ institution

6.3   Soil conservation program and activities adopted by DSCWM

          6.3.1 Landuse planning

          6.3.2 Productivity conservation

          6.3.3 Natural hazard prevention

          6.3.4 Infra-structure protection

          6.3.5 Conservation extension

          6.3.6 Income generation activities

6.4   Legal consideration

          6.4.1 Land tenure

          6.4.2 Water laws in Nepal

          6.4.3 Soil and Watershed Conservation Act, 1982

          6.4.4 Soil and Watershed Conservation Regulation, 1985

          6.4.5 Other legislation related with the Protected Areas

7. Water Quality and Management

7.1   Water quality standards and criteria (for different uses)

7.2   Total maximum daily loads standards (TMDLS)

7.3   Water quality monitoring and assessment (principles and processes)

7.4   Water quality problems (point and non-point source pollution)

7.5   Water quality management (source and headwater protection)

7.6   Water harvesting, ground water recharge and Springshed managemen

8. GIS/RS Applications in Watershed Management
    8.1   Concepts and principles
    8.2   Geographical information system and RS software
    8.3   Applications in Geological interpretation (emphasis on rock types, drainage pattern), Soil interpretation and classification, Road location, Water resource application
    8.4   Land use and land cover mapping
    8.5   Temporal change detection
    8.6   Interpretation of remote sensing imageries for natural resource management
    8.7   Environmental Impacts Assessment application

9. Soil Erosion and Watershed Modeling
    9.1   Spatial and temporal considerations in modeling
    9.2   Model types (empirical/process-based; continuous/event-based; lumped/distributed)
    9.3   Scale issues in modeling processes
    9.4   Examples of major model types (RUSLE, WEPP, EPIC, SWAT)
    9.5   Advantages/disadvantages of model types
    9.6   Comparative modeling and field experimentation

10. Watershed Monitoring and Research
    10.1   Erosion Process and monitoring (Erodibility of soil and Erosivity of rainfall)
    10.2   Spatial and temporal scale of watershed monitoring and research (plot, sub watershed, catchment; event: daily, monthly, annual, etc.)
    10.3   Hydrological instrumentation and measurements (precipitation, surface runoff, subsurface flow, infiltration, evapo-transpiration)
    10.4   Soil and landscape processes
    10.5   Soil fertility and nutrient status and management
    10.6   Research approach, assessment of needs and priorities
    10.7   Field experimental design and implementation (plot, paired catchments, etc.)

11. Watershed Analysis and Project Planning
   11.1   Watershed analysis methods
   11.2   Watershed resources interactions (biological, physical, human)
              and conditions assessment
   11.3   The project cycle
   11.4   Socio-economic aspects of watershed projects (analysis tools
              and methods; case studies)
   11.5   Institutional consideration in design
   11.6   Project design
   11.7   Appraisal of alternatives
   11.8   Design of implementation plan
   11.9   Monitoring and evaluation procedures
   11.10   Plan preparation