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## UNIT 14 RESOURCE CONSERVATION

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### 14.0 INTRODUCTION

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All materials obtained from the environment to satisfy our needs are known as resources. The proliferation of globalization, population, urbanization and industrialization leads to overexploitation and mismanagement of natural resources, which triggered the generation/ increase the intensity of a number of environmental problems like scarcity of resources, air pollution, water pollution, climate change, global warming, etc., Therefore, resource conservation is one of the most important elements for achieving the sustainability in the modern era. Resource Conservation is the process of using resources very carefully and giving them protection and also giving them time to rejuvenate or restore. It is very important because the use of the resources should not only be benefitted to the current generation but it should also benefit the future generation.

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### 14.1 OBJECTIVES

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After studying this unit, you should be able to:

- define resources and their types ;

- describe the importance of resources ;
- explain the planning for conservation of resources;
- understand the concept of natural resource accounting; and
- identify traditional knowledge and customary laws.

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## 14.2 CONCEPT OF RESOURCE CONSERVATION AND ITS IMPORTANCE

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A natural resource means anything that we use from our environment. The Earth's natural resources include water, air, soil, minerals, plants, and animals. Conservation is the practice of caring for these resources so that all living beings can benefit from them in present and in the future. Conservation of resources is our ethical duty in order to protect, preserve, restore and use them carefully. These resources are of two types one *natural* (e.g. wood, water, soil) that provided by nature and second *artificial* (e.g. electricity) that are developed by human being. Further natural resources can be categorized into two non-renewable (exhaustible) and renewable (Inexhaustible). A renewable resource can be replaced when used and they can be used again and again. Whereas, non-renewable resources are in fixed amount and cannot be replaced on use however, on careful management some can be reused. Fossil fuels and minerals are example of non-renewable while solar energy, water, and forests are examples of renewable resources. Renewing may take a long time. Many resources are being used up so fast that they cannot renew themselves e.g. forests. Wetlands, grasslands and forests are shrinking because of converting them into urban settlements, industries and agricultural farms. Increasing demand by growing human population, use of advance technologies for resource use and increase in per capita resource consumption has led to resource degradation. Average use of resources in some of the developing countries is 2 tonnes/person/year compared with 30–40 tonnes/person/year in case of developed countries. In general, an average citizen in a developed country utilizes nearly 24 times of material and 12 times of energy resources each year as one in a developing country (UNEP, 2011). Overuse and exploitation of resources leads to their early consumption and also disturb the ecological balance. Conservation is the proper management of a natural resource so as to prevent its degradation and exploitation. Conservation includes all activities, which can derive benefits from natural resources but at the same time prevent excessive use leading to degradation or destruction. In general conservation means using resources wisely, while preservation is maintained them without finishing it up. Sustainable resource use means using resources in such a manner that they can last for longer time. Conservation is the responsibility of everyone and not restricted to concerned authorities and governments.

### 14.2.1 Importance of Resource Conservation

Some natural resources are vital for our survival like oxygen and water. Without them human being cannot survive. However, other natural resources may not be vital for life but are important for our wellbeing and in our daily life e.g. furniture, utensils, automobiles etc. Natural resources provide essential life support, in the form of both consumptive and public-good services. As we all

depends on natural resources for our survival and sustenance and overuse of resources can make them no longer available for further use. The resources must be conserved in order to:

- i) maintain natural balance.
- ii) safeguard different kinds of plants and animal species.
- iii) make resources availability for present and future generations.
- iv) ensure our survival by meeting demand of resources and maintaining living standard.
- v) aesthetic benefits.
- vi) all species have an inherent right to survive.

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### **14.3 PLANNING FOR THE CONSERVATION OF RESOURCES**

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Planning is an essential component of conserving natural resources. It involves more than considering individual resources and focuses on the natural systems and ecological processes which sustain these resources. The conservation planner attempts to balance natural resource issues with economic, energy and social needs of humans. According to Natural Resources Conservation Service (NRCS), United States Department of Agriculture (USDA) (NPPH, 2003), the conservation planning process helps to achieve the following goals:

- i) To help protect, conserve, and enhance natural resources.
- ii) To design alternatives that meet local resource quality criteria for identified resource issues.
- iii) To incorporate human concern in achieving sustainability.
- iv) To consider the effects of planned actions on interrelated geographical areas (i.e. within a watershed etc.).
- v) To consider and explain the interaction between biological communities and society.
- vi) To focus on ecological principles.
- vii) To support development plans, regardless of scale, which will help to achieve the client's and society's objectives.
- viii) To identify where knowledge, science, and technology require to be advanced.

#### **14.3.1 Steps in Resource Conservation Planning**

As per NRCS, planning process is a three-phase, nine-step process. There is cycling back to previous steps in the planning process and some planning activities may overlap and some activities may not necessarily occur in a particular planning step each time. The three phases are Collection and Analysis, Decision Support and Application and Evaluation, respectively (Table 14.1).

**Table 14.1 Different Phases and Steps in Natural Resource Planning**

Phase-I	Steps
Collection and Analysis	<ol style="list-style-type: none"> <li>1. Identify Problems and Opportunities</li> <li>2. Determine Objectives</li> <li>3. Inventory Resources</li> <li>4. Analyze Resource Data</li> </ol>
Phase-II Decision Support	<ol style="list-style-type: none"> <li>1. Formulate Alternatives</li> <li>2. Evaluate Alternatives</li> <li>3. Make Decisions</li> </ol>
Phase-III Application and Evaluation	<ol style="list-style-type: none"> <li>1. Implement the plan</li> <li>2. Evaluate the plan</li> </ol>

Each of the nine steps in natural resource planning contains a planning standard, list of inputs and list of products. The steps are discussed hereby:

1. Identify problems and opportunities: Firstly, one has to identify the problems that affects the resources. This will be beneficial in further planning process. Onsite visit, where resource exists is required for this process.
2. Determine objectives: During this step, the stakeholders identify their objectives. Experts guide the process and it includes the stakeholder needs and values and the resource uses, resource problem reduction and on-site and off-site ecological protection. An inventory of problems, opportunities, and concerns to be analyzed. As new information is gathered the objectives may need to be revised and modified accordingly and can be finalized until fourth step of the planning process.
3. Inventory resources: In this step complete inventory (including air, water, soil, plants and animals) about the appropriate natural resource, economic and social information for the planning area is collected. On availability remote sensing can be used to identify, locate, and gather available resource information. It is important to collect as much information as possible as it will be helpful in planning and will fit both the needs of the owner and the natural resources. The collected information will be used throughout the entire process to define alternatives and to evaluate the plan.
4. Analyze resource data: This step includes analyze the collected resource data and clearly describe existing conditions for all of the natural resources, including limitations and potential for their desired use. This step provides the information required to prepare and assess alternatives. The analyses should clearly establish the cause and effect relationships and provide information about existing and future conditions. This step includes identification of link between planning areas and ecological processes. Also, identify the resource stressors, which can be natural or human induced actions, responsible for changes in the existing condition of an ecological system. For example, in case of water resources it must include

encroachment on aquatic bodies by land users, runoff from different sites into the water body or exotic species invasion. Determine their short-term and long-term impacts.

5. **Formulate alternatives:** Prepare alternatives that can solve the identified problems, achieve the client objectives, take advantage of opportunities, and prevent additional problems from occurring. A broad range of technically feasible alternatives should be developed with the client. Alternatives may include replacing of raw material, improving the efficiency of the process, and designing appropriate structural measures such as terraces, dams, and waterways. It also incorporates adopting non-structural measures such as crop residue management, livestock exclusion, and flood-proofing, opting market-based measures such as cost-sharing and local tax incentives, and applying institutional measures such as zoning or local regulations, and country laws and regulations. The selected alternatives must be related to identified problems and opportunities and are developed in view of the ecological, cultural, social, and economic conditions of the planning area.
6. **Evaluate alternatives:** Assess the alternatives to determine their effectiveness in addressing the client problems, opportunities and objectives. Attention must be given to ecological values which are covered or protected under laws and regulations. The alternatives must be compared with benchmark conditions to assess their ability to solve problems, meet quality criteria, and meet the client's objectives. Cost effectiveness analysis, cost-return analysis, net present value analysis, partial budgeting, break-even analysis, and internal rate of return can be used to calculate the monetary impacts of each alternative.
7. **Make decisions:** At this point the developer, component or resource owner chooses the best project or plan for their situation. Discuss the advantages and disadvantages of each alternative, including limitations imposed by law. In the case of an area wide plan, public review and comment could be obtained before decision making.
8. **Implement the plan:** In this step, technical assistance is provided which will help with the installation of adequate and properly designed conservation practices. Implementation is carried out by obtaining necessary permits, surveys, land rights, final designs, funding and inspections for structural practices. In addition to this operation, maintenance, and management aspects are covered to assure proper functioning of practices after installation.
9. **Evaluate the plan:** Conservation planning is an ongoing process which must be continued after the implementation of conservation practices. Evaluation is done to ensure the proper functioning and achieving the objectives as planned, to find out reasons for lack of progress in plan implementation if any, and to obtain results of the applied treatment. In cases where the actual results differ from those expected, provide feedback in the planning process. By assessing the effectiveness of an implemented conservation plan, stakeholders can decide whether to continue with other aspects of an overall area wide plan.



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## 14.4 NATURAL RESOURCE CONSERVATION

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Conservation is the protection and care of natural resources so that they can persist for future generations. Non-renewable resources can be maintained for long times by using them wisely and carefully. Renewable natural resources, in principle, can be sustained in infinity so long as their rate of use does not exceed their rate of regeneration. Hence, two different conservation approaches are required in respect of both renewable and non-renewable natural resources. Various international conventions, declarations and protocols have recognized several legal principles for natural resources conservation. The foremost and major step was the United Nations Conference on Human Environment or Stockholm Conference held in Sweden during 1972 where Mrs. Indira Gandhi, Prime Minister of India, mentioned poverty the greatest polluter. She declared that many of the advanced countries today have reached their prosperity by their domination over other races and countries, and the exploitation of their own men and own natural resources. The World Conservation Strategy (WCS) 1980 while pointing the requirements for sustainable development focuses on three main objectives of living resource conservation (WCS, 1980). Further, the second section of the Agenda 21 is about the conservation and resources management (atmosphere, forest, water, waste, etc.). There are different strategies, and steps to conserve various types of natural resources. Therefore, we will discuss basic concepts related with conservation of natural resources. In general avoid misuse of resources. Maximize their use and reuse by adopting repair, and recycling practices. Reduce the resource use by using better processes and technologies. Alternatives can be adopted, promoted and used like use of renewable sources of energy in place of non-renewable ones. Create awareness among people regarding wise and judicious use of natural resources. Additionally, by adopting principles of resource conservation like equity and equitable distribution, common property and reasonable use, and common but differentiated responsibility will help in resource conservation. Therefore, effective conservation of natural resources can be accomplished by coordinated collective actions and implementation of multisectoral and multilevel strategies of an individual, family, partnership, private and public juridical, and state agents with varied immediate goals, capabilities and interests (Bachev, 2013).

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## 14.5 NATURAL RESOURCE ACCOUNTING

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An accountant is concerned with supplies and flows of money – with inventories, with inputs and outputs, and with giving advice based on assessment of risks. Natural resource accounting is the collection and organization of data of natural resources in terms of stocks and flows, within an accounting framework. The flows could be natural inputs flow from the environment to the economy, flows of products within the economy and flows from the economy to the environment i.e., wastes /residuals. The natural resource accounting (NRA) or green accounting provides information on the available natural resource stocks at a particular point in time and activities which utilizes that particular resource. The accounting can be for forests, minerals, agricultural land, fisheries, petroleum, water etc. It also includes interpretation of data and reporting and involves both physical units and monetary values. There are various categories of natural resource accounts i.e. stock, flow, a combination of stock and flow, emission,

waste and environmental expenditure accounts. NRA includes the resources which contribute to marketable forms of production as well as environmental or non-commercial resources such as water, air and biological life. The aim of natural resource accounting is to provide information on the status of natural resources and the changes affecting them. Terms like Green GDP, environmental accounting and resource accounting are also used for natural resource accounting. The conventional System of National Income Accounts (SNA) normally does not incorporate the cost of depletion, degradation or pollution of natural resources which promotes unsustainable use of natural resources. Therefore, NRA is thus an attempt to integrate environmental issues into the conventional national accounts.

NRA is a tool used to support environmental policy, environmental impact assessments at a project level, integrated environmental and economic analyses for policy work at the sectoral and macro-economic levels, and public investment/expenditure reviews (Kirk, 1996). In general, natural resource accounting is a mean of displaying linkages between the economy and the environment.

Natural resource accounting is used in:

- the display of accountability for the management and protection of natural resources
- identifying environmental problems such as resource depletion
- analysing government policies
- undertaking resource management and decision-making
- monitoring sustainable development
- drawing up (macro-economic) indicators for environmental performance or prosperity
- improving standards for measuring a country's national product

Natural resource accounting is applied both at macro-economic and the micro-economic levels. System of Environmental and Economic Accounts (SEEA) used by the United Nations is one of the well-known macro-economic applications of natural resource accounting at macro-economic level. SEEA contain data on the value of natural resources and the financial effect of environmental degradation, and thus allow modifications in the state of natural resources to be related to economic development. At the microeconomic level, environmental accounting is used by an individual firm or for a specific project.

#### 14.5.1 Types of Environmental Accounting

As mentioned above terms like environmental accounting and resource accounting are also used for natural resource accounting. Environmental accounting can be categorized into four categories (INTOSAI, 2010) as:

- i) *Natural resource asset accounts* which primarily focus on stocks of natural resources. It contains data on opening and closing stocks, and changes to stocks. The changes to stocks can be either due to economic activity (e.g., mining minerals) or due to natural processes (e.g., growth and reduction

of trees in a forest account). The natural asset accounts can further divided into two parts i.e. physical asset accounts which track the physical quantity of a resource and monetary asset accounts which establish a economic value for the total national wealth of a resource.

- ii) *Pollution and material physical flow accounts* which provide information at the industry level about the quantity of resources like water, materials and energy that are used, and quantity of residues in the form of air emissions, solid waste, and wastewater produced by them.
- iii) *Monetary and hybrid accounts* which focus on expenses and taxes related to protecting and managing the environment, as well as the economic contribution of environmental services. It includes charges collected by the government for resource use, such as taxes on minerals, forests, and amount spent on solid waste management and water treatment.
- iv) *Environmentally-adjusted macroeconomic aggregates* which uses the earlier three types of environmental accounts to amend product and income accounts to calculate overall environmental health and economic progress. Environmentally-adjusted GDP and Net Domestic Product (NDP) are examples of this category.

The international organisations active in the field of natural resource accounting are the United Nations (UN), the United Nations Statistical Division (UNSD), the United Nations Environment Programme (UNEP), the Organisation of Economic Cooperation and Development (OECD), the World Resource Institute (WRI), the World Bank, the Statistical Office of the European Communities (EUROSTAT) and the Worldwide Fund for Nature (WWF).

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## **14.6 RESOURCE MANAGEMENT PLANNING**

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Resource management planning is a process to properly manage the resources within a particular area or project site. It includes both planning (relates to predictions and expectations) and management (relates to reality and actions) of resources. Resource management planning is beneficial in assessing the existing state and condition of the region's natural resources, processes that threaten them, and opportunities for their protection and management. It is based upon the principles of working together for success, knowledge building, striving for balance, thinking innovatively, managing holistically, working within limits, preventing the degradation of natural resources, and by adopting evidence-based approach (Natural Resources Management Plan, 2015). The basic approach to any resource management plan comprises of inventory, resource analysis, management strategies recommendations, and applies actions. Inventories help to decide what information is necessary to the planning process, what is lacking, and what is unavailable or outdated. The resource analysis summarizes about existing conditions of the resources, trends in resources, threats and resources degradation, and information and research requirements. Recommendations will focus according to the planning goals, addresses future outreach, monitoring, restoration, and regulatory changes. The action plan first focus on priority area and determine strategies, actions, and timeframes and should involve responsible parties (ACEC Program website, 2004).



Natural resource management (NRM) is the efficient use of natural resources while protecting their capability for renewal. NRM has two basic aspects: i) sustaining the integrity of natural resources like air, water, energy and ii) supplying products like minerals, food, energy, water consistent with requirement and sustained production even for future generations. As per Indian Planning Commission report (2007) the main challenges which directly impacts the sustainability and productivity of natural resources are: technology fatigue, huge technology transfer gaps, serious knowledge deficits and gaps, poor institutional credit and insurance supports. Other challenges include non-remunerative prices and highly inadequate marketing infrastructure and regulations, huge post-harvest losses and negligible value addition, worsening input-risk-output imbalance, ineffective enabling mechanisms and regulatory frameworks, and capital stock depletion and inadequate investment.

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## **14.7 PROTECTING TRADITIONAL KNOWLEDGE, CUSTOMARY LAWS AND PRACTICE RELATED TO TRADITIONAL KNOWLEDGE**

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From centuries, indigenous peoples and local communities have used traditional knowledge and biological resources to cure diseases, provide food, and fulfil everyday livelihood needs. Traditional knowledge is a broad term which comprises traditional innovations and traditional practices. Traditional knowledge is the personal knowledge and understanding of a particular resource which acquired through generations of direct observation, interaction, and learning-by-doing. Traditional innovations are the products or processes developed by the communities through ongoing interactions with a particular location and resources e.g. development of crop varieties and herbal medicines. Whereas, self-management and behaviour and sets of rules developed and practised by a community to conserve their resources comes under traditional practices. In modern times, many people have benefitted from the use of this knowledge and biodiversity to develop medicines, crop varieties and livestock breeds, cosmetics, and other products. However, the indigenous peoples and local communities will not get proper benefits, compensation and incentives for their knowledge.

### **14.7.1 Customary Law**

Custom is mainly considered purely as a social phenomenon. Custom is generally that body of law, which is primarily verbal than written, and which derives its authority from sources other than the State (Snyder, 1981). Customary laws do not represent a single body of law, but are flexible, adaptive, developing body of rules and standards directing the behaviour of communities over ages. Therefore, the law-in-action may well be quite separate from the law-in-books (Vani, 2002). There are many customary laws that prevail in India, which directly or indirectly protect the natural resources like plantation, protection and restrict cutting of Banyan and Peepal and even fruit bearing trees. In addition, certain areas or green patches were declared as sacred with complete ban on hunting and cutting. To protect wildlife, hunting was restricted in certain

months. Khasi tribes in Rural Meghalaya have their own customary laws like fuel wood collection for domestic use only by hands, and using rivers upstream for drinking and downstream for washing purpose meant for sustainable use of their resources (Devarani, 2016).

The need for natural resources conservation was felt by our ancestors and in India there was a tradition of respecting and preserving nature and natural resources. Natural resources were conserved in the form of sacred groves/ forests, sacred pools and lakes, sacred species etc e.g. the River Ganges, Lake Pushkar in Rajasthan, Lake Sri Renkuaji in Himachal Pradesh. In our country the conservation of natural forests is known from the time of King Ashoka. Tribals dedicate forest patches of different dimensions known as sacred forests to their deities and ancestral spirits. Hunting, cutting down trees, and other human interferences were strictly prohibited in these sacred forests. This practice is prevalent particularly in peninsular, central and eastern India and has resulted in the protection of a large number of animals and plants species. Similarly, several water bodies, e.g., Sri Renkuaji in Sirmour district of Himachal Pradesh is considered as sacred by native people, thus, protecting aquatic flora and fauna. Worshipping certain plants like peepal (*Ficus religiosa*), banyan (*Ficus benghalensis*), tulsi (*Ocimum sanctum*), banana (*Musa Paradisiaca*, *M. acuminata*, *M. balbisiana*), bael (*Aegle marmelos*), etc. has not only preserved them but also encouraged their plantation and survival. History recalls numerous instances where people have laid down their lives for protecting trees. Amrita Devi Bishnoi along with her three daughters lay down their lives by clinging the trees in Khejarli village of Rajasthan. This massacre was continued and about 300 people were killed for non-obedience and for trying to protect the trees. This sacrifice not only inspired the Chipko movement by Sunder Lal Bahuguna but also this led Indian Government to form “Amrita Devi Bishnoi Smriti Paryavaran Award” for contributing to environment conservation. The Chipko movement in 1970 is another example started by women in Gopeshwar village in Garhwal in the Himalayas in Uttarakhand (then Uttar Pradesh). The villagers mainly women stopped the felling of trees by hugging them when the lumbermen arrived to cut them. It achieved a major success in 1980 with a 15 year ban on green tree felling in the Himalayan forests of that state by the order of Mrs Indira Gandhi, the then Prime Minister of India. Maiti tradition of planting a tree sapling by newlywed couple on wedding started by Kalyan Singh Rawat in 1996 in Uttarakhand is a very good effort to conserve our fast-depleting forest resources. In addition, there are several customary laws and practices related to traditional knowledge in India, which directly or indirectly helps in resource conservation. Different mountains, lakes, ponds, rivers, landmark, trees, forests, shrubs, reptiles, animals, birds, fruits and flowers are still considered as sacred in different religions. Rules of taking bath in holy rivers, planting and watering of trees, constructions of wells and ponds, feeding of animals, and birds are having an important role in conserving and maintaining our environment and resources (Sharma and Kaushik, 2002). “Vasudev Kutumbakam” is the essence of Indian culture, which means that the whole mother earth is one big family, a concept that is visualized in the modern times as concept of “global village”. There is a need to understand, revive, adopt and continue practising our traditional beliefs so as to save our precious resources.

## 14.8 IMPLICATIONS FOR ACCESS BENEFIT SHARING

Implications are the effects or consequences of access and benefit-sharing (ABS) that may happen in the future. Access and benefit-sharing refers to the manner in which resources may be accessed, and how the benefits that result from their use are shared between the users (people or countries using the resources) and providers (the people or countries that provide them). India signed the Convention on Biological Diversity (CBD) on 5th June 1992 and ratified it on 18<sup>th</sup> February 1994. It is mentioned in CBD about the equitable sharing of benefits arising from the use of traditional knowledge, innovations and practices relevant to the conservation of biological diversity and the sustainable use of its components. The Nagoya Protocol which was adopted on 29 October 2010 in Nagoya, Japan and entered into force on 12 October 2014 is a supplementary agreement to the CBD. It provides a transparent legal framework for the effective implementation of the fair and equitable sharing of benefits arising out of the utilization of genetic resources.

If the community members, the actual users of the forests and natural resources knew that they would continue to have long-term access to forests, forest products, common forestry resources and other natural resources, then they would have the motivation to conserve them (Roy, 1996). The TBGRI-KANI model of Kerala is a very good example of access and benefit sharing from the indigenous people point of view as per Convention on Biological Diversity (1992). A drug named *Jeevani* was developed from Arogyapacha (*Trichopus zeylanicus* spp. *travancoricus*), a perennial rhizomatous herb. Fifty percent of the royalty from the drug is shared with Kanis (Kanikar tribe) through a charitable trust (Bijoy, 2007). This model has won the United Nations Development Programme (UNDP) 'Equator Initiative Prize-2002' for innovation in poverty eradication and sustainable development. However, with the commercialisation of arogyapacha resulted into restricted, illegal and destructive collection and become criminalised and punishable under law by the forest officials. The arogyapacha plant is now considered endangered due to its over-harvesting.

Second example related to implications for access benefit sharing is from desert plant named *Hoodia* between San community and the Council for Scientific and Industrial Research, South Africa to explore plant potential for diet products. *Hoodia* also known as bushman's hat (botanical name *Hoodia gordonii*) is a desert plant traditionally known for his anti hunger properties during long hunting trips. However, another community named "Nama" also claimed of having same knowledge. The agreement was undermined due to lack of clarity (Bavikatte et al., 2009).

On the eastern boundaries of Nagarhole National Park (also known as Rajiv Gandhi National Park) in Kodagu and Mysore districts of Karnataka there is heavy pressure on the forests due to livestock grazing, and firewood, bamboo and small timber collection for local use. Regulatory measures turn into conflict with a relatively large fraction of the local population enrolled in grazing and timber cutting which resulted into law and order problem (Karanth, 2007).

From above mentioned case studies we can conclude that consequences of access and benefit-sharing can be resulted into misappropriation, misuse, restricted, illegal and destructive collection of resources. Further it also causes ecological and social conflicts between local communities and law and order problem between society and administration. For effective resource conservation for sustainable development, there must be a proper awareness and coordination and involvement of local community, bureaucracy and judiciary. Polices and laws must be implemented and there must be an honest, and impartial vision towards resource management.

**Check Your Progress 1**

- Note:** a) Write your answer in about 50 words.  
b) Check your progress with possible answers given at the end of the unit.

1. Define natural resources and its types.

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2. Explain the importance of resource conservation.

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3. What are the nine steps in natural resource planning?

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4. Describe natural resource accounting.

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5. Mention some customary laws and practices related to traditional knowledge in resource conservation.

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6. Explain implications for access benefit sharing by using any one example.

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### 14.9 LET US SUM UP

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In this unit, we have understood about resources, their importance, accounting, conservation, planning, and management. We got the knowledge about different steps in Natural Resource Planning. We learnt about the customary laws and practices related to traditional knowledge in resource conservation and their use. In conclusion, a proper awareness and coordination and involvement of local community, bureaucracy and judiciary are must for effective conservation and uses of resources. As it is difficult to discuss the elaborative case studies in this unit, for the student interests some references, and websites are suggested in references and suggested readings section.

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### 14.10 KEY WORDS

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**Natural Resource** : Anything that we use from our



environment e.g. water, air, soil,  
minerals, and plants.

- Conservation** : The practice of caring for resources so that all living beings can benefit from them in present and in the future.
- Natural Resource Accounting** : Collection and organization of data of natural resources in terms of stocks and flows, within an accounting framework.
- Natural Resource Management** : The efficient use of natural resources while protecting their capability for renewal.
- Access and Benefit Sharing** : Fair and equitable sharing of benefits occurring from the resource use.
- Traditional Knowledge** : Personal knowledge and understanding of a particular resource acquired through generations of direct observation, interaction, and learning-by-doing.

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## 14.11 REFERENCES AND SUGGESTED FURTHER READINGS

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*Suggested websites related to Natural Resource Conservation and Management:*

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[https://www.nrcs.usda.gov/wps/portal/nrcs/detail/nh/technical/cp/?cid=nrcs144p2\\_015695](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/nh/technical/cp/?cid=nrcs144p2_015695) (accessed on 09.02.2019)

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## **14.12 ANSWERS TO CHECK YOUR PROGRESS**

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Your answers should include the following points:

1. Natural resource means anything that we use from our environment e.g. air, soil, minerals, plants etc. The resources are of two types natural (e.g. water) that provided by the nature and artificial (e.g. electricity) that are developed by human being. They can also be categorized into non-renewable and renewable.
2. Natural resources are vital for our survival like oxygen and water. Without them human being cannot survive. Other natural resources are important for our wellbeing and in our daily life e.g. furniture, utensils, etc. We all depend on natural resources for our survival and sustenance. The resources are important in maintaining natural balance and maintaining living standard.
3. Nine steps in resource planning are to identify the problems and opportunities, determine the objectives, inventory of resources, analyze the collected resource data, formulate alternatives, evaluate alternatives: make decisions and choose the best project or plan, implement the plan, and finally evaluate the plan.
4. The natural resource accounting (NRA) is the collection and organization of data of natural resources in terms of stocks and flows, within an accounting framework. The flows could be natural inputs flow from the environment to the economy, flows of products within the economy and flows from the economy to the environment.

5. Self-management and behaviour and sets of rules developed and practised by a community to conserve their resources come under traditional practices. Natural resources were conserved in the form of sacred groves/ forests, sacred pools and lakes, sacred species.
6. Implications of access and benefit-sharing are misappropriation, misuse, restricted, illegal and destructive collection of resources. It also causes ecological and social conflicts between local communities and law and order problem between society and administration. The TBGRI-KANI model of Kerala is one of such example.



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