WORKSHEET
GEOGRAPHY CLASS-12
Forest resources and Impact of population

NAME: **DATE:**

Losses of biomass through deforestation and the cutting down of tropical forests put our supply of oxygen (O_2) gas at risk. The Earth's forests did not use to play a dominant role in maintaining O_2 reserves because they consume just as much of this gas as they produce. Today forests are being destroy at an astronomical rate. No O_2 is created after a forest is put down, and more CO_2 is produced in the process. In the tropics, ants, termites, bacteria, and fungi eat nearly the entire photosynthetic O_2 product. Only a tiny fraction of the organic matter they produce accumulates in swamps and soils or is carried down the rivers for burial on the sea floor. The O_2 content of our atmosphere is slowly declining. The content of the atmosphere decreased at an average annual rate of 2 parts per million. The atmosphere contains 210,000 parts per million. Combustion of fossil fuels destroys O_2. For each 100 atoms of fossil-fuel carbon burned, about 140 molecules of O_2 are

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The world's forests provide goods and services essential to human and planetary well-being. But forests are disappearing faster today than ever before. Due both to deforestation and human population growth, the current ratio of forests to human beings is less than half what it was in 1960. Yet we not only need more forests, we need forests more than ever before–to protect the world's remaining plant and animal life, to prevent flooding, to slow human-induced climate change, and to provide the paper on which education and communication still depend. More efficient consumption of forest products and eventual stabilization of human population–a prospect that appears more promising today as birthrates decline–will be needed to conserve the world's forests in the coming millennium.

consumed.

Scientists will need to become more involved in assessing the viability of response options aimed at storing excess carbon in terrestrial or ocean systems. Land use changes from agricultural to forest ecosystems can help to remove carbon from the atmosphere at rates of 2 to 20 tonnes of carbon per hectare per year for periods of 50 years or more, until a new ecosystem equilibrium is reached. Similarly, soil conservation practices can help build up carbon reservoirs in forest and agricultural soils. Proposals to extract CO_2 from smoke stacks and dispose of it in liquid form in underground reservoirs or deep oceans also need careful evaluation in terms of long-term feedbacks, effectiveness and environmental acceptability. However, much remains to be learned about the biological and physical processes by which terrestial and ocean systems can act as sinks and permanent reservoirs for carbon.

The impact of deforestation

The CO_2 concentration in the atmosphere is being affected by deforestation and, as a consequence, this human activity:

* removes a large sink for CO_2, and it
* adds a large source of CO_2 to the atmosphere (via burning after logging, or and decomposition)

Deforestation is the removal of trees, often as a result of human activities. It is often cited as one of the major causes of the enhanced greenhouse effect. Trees remove carbon (in the form of carbon dioxide) from the atmosphere during the process of photosynthesis. Both the rotting and burning of wood releases this stored carbon carbon dioxide back in to the atmosphere.

Pressure has been exerted on forests by the worldwide demand for wood and by local people who clear forests in their quests to establish an agrarian land base. Clearing of forests for the development of pasture for cattle has also resulted in deforestation as has the encroachment upon forests due to increasing human populations.

Deforestation promotes erosion of soil. Under normal circumstances trees and bushes and the forest floor act as a 'sponge' for rainfall, slowing its' overland and underground flow and releasing it back into the atmosphere through transpiration. Without the buffering effect of forest cover, rain impacting bare soil runs off, often causing flooding. In this environment, nutrients in the soil are leached off and the microorganisms which can replenish these nutrients are disturbed. Forests are rich in biological diversity. Deforestation causes the destruction of the habitats that support biological diversity.

Some societies are making efforts to stop or slow deforestation. In China, where large scale destruction of forests has occurred, each citizen must plant at least 11 trees every year. In western countries, increasing consumer demand for wood products that have been produced and harvested in a sustainable manner are causing forest landowners and forest industries to become increasingly accountable for their forest management and timber harvesting practices. A **rainforest** is a biome, a forested area where the annual rainfall is high. Some mention 1000 mm of rain each year as a limit of what is a rainforest, but that definition is far from complete. Rainforests are primarily found in tropical climates, although there are a few examples of rainforests in temperate regions as well. As well as prodigious rainfall, many rainforests are characterized by a high number of resident species, and a great biodiversity. ***It is also estimated that rainforests provide up to 40% of the oxygen currently found in the atmosphere.***

Forests store large amounts of CO_2, buffering the CO_2 in the atmosphere. The carbon retained in the Amazon basin is equivalent to at least 20% of the entire atmospheric CO_2. Destruction of the forests would release about four fifths of the CO_2 to the atmosphere. Half of the CO_2 would dissolve in the oceans but the other half would be added to the 16% increase already observed this century, accelerating world temperature increases. Another impact of tropical rainforest destruction would be to reduce the natural production of nitrous oxide (NO). Tropical forests and their soils produce up to one half of the world's NO which helps to destroy stratospheric ozone. Any increase in stratospheric ozone would warm the stratosphere but lower global surface temperatures.

Dense tropical forests also have a great effect on the hydrological cycle through evapotranspiration and the reduction of surface runoff. With dense foliage, about a third of the rain falling on the forest never reached the ground, being re-evaporated off the leaves. Locally, deforestation results in:

a decrease in	an increase in
• evapotranspiration • atmospheric humidity • local rainfall • effective soil depth • water table height • surface roughness (and so atmospheric turbulence and heat transfer)	• seasonality of rainfall • soil erosion • soil temperatures • surface albedo

Computer models have analized the Amazonian deforestation and indicated that the deforestation of a typical rainforest (air temperature 27^oC, mean monthly rainfall of 220 mm) and subsequent degradation to savanna would result in:

- a descrease of local transpiration of up to 40%
- an increase in rainfall runoff from 14% to 43%
- an average increase in soil temperature from 27^oC to 32^oC.

Impact of human activity on the carbon cycle

Concern about the potential effects of human (anthropogenic) activities on the atmosphere is growing. The two major results of human activity resulting in global changes in the Earth's climate are:

- Fossil fuel burning
- Mass deforestation

Action concerning forests

Today about 1.8 billion people live in 36 countries with less than 0.1 hectare of forested land per capita, an indicator of critically low levels of forest cover. Based on the medium population projection and current deforestation trends, by 2025 the number of people living in forest-scarce countries could nearly double to 3 billion. Most of the world's original forests have been lost to the expansion of human activities. In many parts of the developing world, the future availability of forest resources for food, fuel and shelter looks quite discouraging. Future declines in the per capita availability of forests, especially in developing countries, are likely to pose major challenges for both conservation and human well-being.

Why population growth matters to the future of forests

In some countries, forests and other vegetation are being burned away at alarming rates to satisfy the growing demand for agricultural land.

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Half of the world's original forest cover is gone, a loss that reflects humanity's intensive use of land since the invention of farming. Of the forest that remains, less than one-fourth could be considered relatively undisturbed by human activity. The vast

primeval forests of Europe and Asia survive today only as patchwork remnants of secondary growth, much of it vulnerable to logging, encroachment by development, pollution, fire and disease.

Forests are currently expanding in much of the industrialized world, while shrinking in most of the developing world. In just the first five years of the 1990s, 65 million hectares of forest–an area the size of Afghanistan– were converted to other uses in developing countries. By contrast, the industrialized countries gained 9 million hectares of forested land, an area about the size of Hungary. The pattern of forest loss in developing countries today differs from past losses in Europe and elsewhere in two key respects: human populations are much larger than before, and the pace of deforestation is more rapid. In the last four decades, an area half the size of the United States has been cleared of tropical forests, while population in developing countries has doubled to 4.7 billion. Among the most encouraging trends for the future of forests is the fact that fertility and birthrates are now declining in developing countries, leading demographers to revise downward their projections of future population growth.

A new measure of forest resource availability helps illustrate the increasing scarcity of forests in many countries. The forest-to-people ratio– a simple division of a country's forest cover by its population–helps quantify the number of people living with low levels of forest resources both now and in the future. Using a ratio of 0.1 hectare of forest cover per person (roughly a quarter acre) as a benchmark reveals that 1.7 billion people now live in 40 countries with critically low levels of forest cover. Many are vulnerable to scarcities of key forest products such as timber and paper and risk the collapse of vital forest services such as control of erosion and flooding in populated areas. In some countries the forest-to-people ratio declines even though forests expand, simply because their populations grow more rapidly than their forests. By 2025, based on United Nations data on deforestation and projected population growth, the number of people living in forest-scarce countries could nearly triple to 4.6 billion. Many are unlikely to have the options of wealthy countries to import or use substitutes for forest products and the environmental services forests provide.

Population dynamics are among the primary underlying causes of forest decline. Poverty, corruption, inequitable access to land and wasteful consumption practices also influence the decisions of governments, corporations and individuals to cut and clear forests. The interaction of these forces is most evident in areas such as South Asia, Central America and sub-Saharan Africa, where poverty, rapid population growth and weak institutions contribute to forest loss and severe environmental degradation.

The dominant force in forest loss is growth in the demand for farmland. Subsistence agriculture is the principal cause of forest loss in Africa, Asia and much of Latin America. Slash-and-burn farming and other traditional techniques were sustainable for centuries when population densities were lower. Today they are a major factor, along with the expansion of commercial farms and livestock grazing areas, in the permanent conversion of wooded land to agriculture. The need to increase food production is

expected to accelerate the forest-to-farmland cycle, especially in countries where alternatives for meeting this demand are limited.

Total wood consumption has tripled during the 20th century. Per capita consumption has changed little on a global basis–actually decreasing slightly–but consumption patterns vary widely between countries. A typical American uses 15 times as much lumber and paper as a resident of a developing country. Reducing wood consumption in the industrialized world is unlikely to stop forest loss in developing countries however, since most of the wood consumed comes from trees in the industrialized countries themselves. Nevertheless, the consumption model offered to the rest of the world threatens accelerated forest loss as both populations and economies grow in developing countries.

Commercial logging of tropical forests has doubled since 1960, accounting for 5 million to 6 million hectares of forest loss each year, an area nearly the size of Sri Lanka. This is about one third the forest area lost each year in the developing world. Illegal logging causes a significant, though unquantified, amount of additional forest loss. Logging's biggest role in deforestation, however, is more indirect. Logging roads provide pathways deep into forests that farmers and other settlers then follow, permanently clearing the land for crops and pasture.

Nearly 3 billion people depend on wood as their main source of energy. The production of fuelwood and charcoal accounts for over 90 percent of the wood harvested in Africa, 80 percent in Asia and 70 percent in Latin America. Population growth is closely linked to rising woodfuel demand. The effects of woodfuel scarcity are most severe in impoverished areas, where more modern fuels are inaccessible or unaffordable.

Women and children are the victims of woodfuel scarcity. The search for fuel consumes the time, energy and health of women and their children. As local wood supplies grow scarce, women risk spinal column damage and uterine prolapse from carrying heavier loads over longer distances. Girls are often kept home from school to help their mothers gather wood, depriving them of educational opportunities. Where wood is unavailable, women cook with inefficient fuels such as animal dung or crop wastes, depriving livestock of fodder and soils of natural fertilizer. This endangers both the nutritional and respiratory health of women and their families.

Forest scarcity threatens the use of paper for education, the activity most likely to improve health and economic well-being. 80 percent of the world's population lack access to enough affordable paper and reading materials to meet basic standards for literacy and communication. Reducing paper consumption could help ensure enough paper for all. These efforts are undermined, however, by broader inequalities in access to education and economic opportunity. Closing the "paper gap" between rich and poor nations ultimately depends on government action to increase spending on education, health and social services in developing countries. Future population growth and forest loss will largely determine whether and when this gap can be closed.

Population policies based on human development and the Scale of Human and Earth Rights offer the greatest hope for the future of forests. This is not an argument for population "control" but for the social investments that allow couples to choose when to have children and how many to have. Programs linking conservation activities with family planning services show promise for achieving both the sustainable use of forests and greater acceptance of reproductive health services.

Sustainable wood consumption is essential for the future of forests. Individuals and institutions alike should promote the ecologically sound and socially responsible use of forest products. Eco-labeling, or the environmental certification of wood products, could speed the adoption of more sustainable forestry practices. Consumer demand for green-certified paper and other wood products is an important complement to recycling and other efforts to reduce wood consumption.

The well-being of the world's forests is closely linked to the health and well-being of women. Investing in education for girls helps them to contribute to their national economies–and to postpone childbearing until they are ready for a family. Providing credit and other economic opportunities for women creates alternatives to early and frequent childbearing. Finally, better access to quality reproductive health services directly benefits women and their families. These approaches increase human capacity, providing the greatest long-term return to societies, individuals and the environment. Moreover, they are likely to lead to an early peak in world population in the coming century–quite possibly at levels that can co-exist with forests that teem with human and non-human life for centuries to come.

Q1- How are population and natural resources related?

Q2-What are the reasons for the depleting forest resources in developed and developing countries?

Q3- Find out the reasons for depleting forests in your own country