RESEARCH REPORT

UNITED NATIONS ENVIRONMENT PROGRAMME (UNEP)

AVERTING LAND DEGRADATION IN SOUTH ASIA

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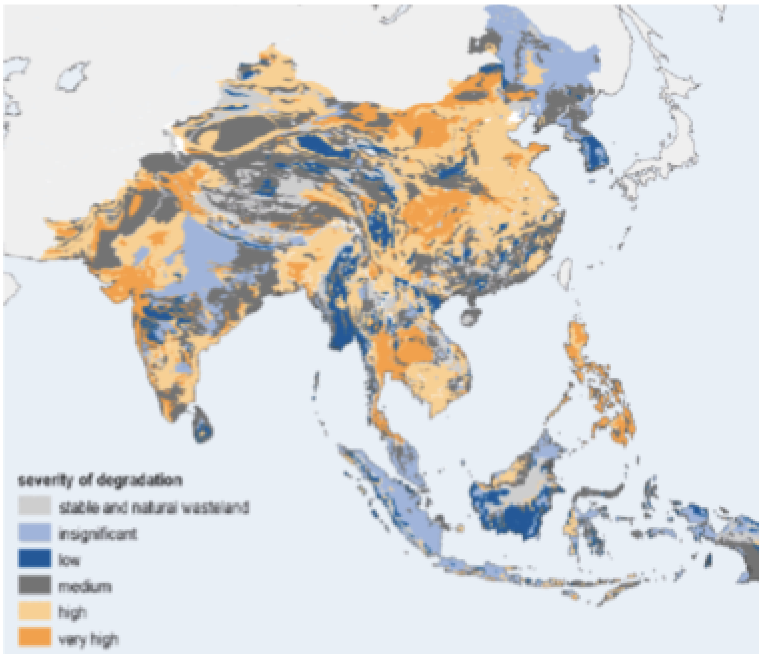
Basic Overview of the Issue

South Asia is home to 7% of the world's mangrove habitat, and 3% of the world's forests, as well as rangelands, wetlands, and peatlands. These ecosystems combined host 15% and 12% of the world's flora and fauna respectively, highlighting the region's importance for food supply in Asia (ICIMOD). However, despite the region being the 'food bowl of Asia', 51% of the population is food-energy deficient, as it faces critical land degradation. (ICIMOD)



A map depicting the categorization of land in asia by the severity of land degradation.

Studies estimate that land degradation causes an annual loss of 10 billion dollars in South Asia, with an average annual rate of topsoil loss of 12 tons per hectare. As the region has 487 million hectares of agricultural land, the total topsoil loss would be approximately 5.8 billion tons. Degraded land makes agricultural activity difficult, reducing agricultural production. If this issue is not addressed, it will have serious economic, environmental, and social consequences.

Explanation of Important Terms

Land Degradation

Land degradation means reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes (UNCCD)

Overgrazing

Grazing is an animal to feed in a field, and eat grass or other plants. Overgrazing occurs when plants are exposed to intensive grazing for extended periods of time, or without sufficient recovery periods. It can be caused by either livestock in poorly managed agricultural applications, game reserves, or nature reserves.

Overcultivation

Cultivation is preparing and using lands for crops, including breaking up soil in preparation for sowing or planting. Overcultivation is the act or practice of cultivating land to an excessive degree in the growing of crops so that soil quality is degraded and productivity is reduced. (Merriam-Webster)

Vegetative cover

Vegetative cover refers to the layer of vegetation, including grasses, shrubs, and trees, that covers the surface of the soil, playing a crucial role in preventing soil erosion, maintaining soil fertility, and supporting biodiversity. (Study Smarter)

Soil erosion

Soil erosion is a gradual process that occurs when the impact of water or wind detaches and removes soil particles, causing the soil to deteriorate. Soil deterioration and low water quality due to erosion and surface runoff have become severe problems worldwide. The problem may become so severe that the land can no longer be cultivated and must be abandoned. (Al-Kaisi)

Sedimentation

Sedimentation, in the geological sciences, process of deposition of a solid material from a state of suspension or solution in a fluid (usually air or water). Broadly defined it also includes deposits from glacial ice and those materials collected under the impetus of gravity alone, as in talus deposits, or accumulations of rock debris at the base of cliffs. (Britannica)

Deforestation

Deforestation, the clearing or thinning of forests by humans. Deforestation represents one of the largest issues in global land use. In the practice of clear-cutting, all the trees are removed from the land, which completely destroys the forest. (Britannica)

Irrigation

Irrigation, in agriculture. the artificial application of water to land. Some land requires irrigation before it is possible to use it for any agricultural production. In other places, irrigation is primarily a means to supplement rainfall and serves to increase production.

Detailed Background of the Issue

Land degradation in South Asia is driven by a variety of factors, including environmental, socio-economic, and policy-related factors. If this issue persists in the next 50 years, South Asia is expected to face severe land degradation, desertification, and a permanent decline in water availability, affecting the lives of millions of people.

Effects of Climate Change

Since the Industrial Revolution, the greenhouse gases in our atmosphere have increased due to human activity, making temperatures rise and causing instability in the Earth's climate. This is also true in the South Asian region, where a warming trend of about 0.75°C has been observed in annual mean temperatures over the last 20 years. The high rate of urbanization in the area is causing energy consumption and fossil fuel to grow rapidly, adding to the issue at hand.

Changes in Rainfall Cycles

With climate change, the frequency of more intense rainfall events in South Asia has increased, causing severe floods, landslides, and mudflows. At the same time, the number of rainy days and the total annual amount of precipitation has decreased, concentrating rainfall in a few days, creating a variety of problems (Sivakumar and Stefanski 18). When rainfall regimes change, it is expected to drive changes in vegetation cover and composition, and vegetation cover is a key factor in determining soil loss through water, causing land degradation. This change in precipitation is also a direct lead to water erosion, the most serious problem for land degradation in the region, as it is widely found in both the dry and humid zones.

Altered Wind Patterns

Climate change also impacts wind patterns around the world, reducing wind in some regions, while increasing storm intensity in others. This increases the risk of wind erosion, especially in hotspots like western Rajasthan, coastal regions of India, and dry regions of Pakistan. Changes to wind patterns also increase sedimentation, where winds in dry, arid cover fertile soil with sand.

Mistakes in Agricultural Practices

One of the most serious factors of land degradation in South Asia is faults in agricultural practices. Due to the rising population in the region, there has been a significant increase in demand for livestock and agricultural products. This leads to overgrazing, overcultivation, deforestation, and water mismanagement.

Overgrazing and Overcultivation

An increasing population also increases the demand for livestock and crops, causing overgrazing and overcultivation. Excessive livestock production increases grazing in the region as well, removing vegetation cover, and exposing soil to wind and water erosion. In regions like Rajasthan (India) and parts of Balochistan (Pakistan), overgrazing has turned fertile lands into semi-arid regions.

The increase in crop demands, on the other hand, causes intensive farming, which leads to farming without proper crop rotation or soil restoration. Overcultivation creates a degraded soil structure, reducing fertility. The Green Revolution in the Indo-Gangetic Plains have led to the overuse of land, depleting soil from essential nutrients.

Deforestation

In response to the demand increase for crops, farmers and landowners of the South Asian region have also turned to deforestation to create space for new agricultural activity. However, the large-scale clearing of forests for cropland reduces soil stability significantly. Deforestation leads to an increased risk of erosion, making land degradation worse in the region. It also contributes to desertification, reducing land moisture and increasing arid conditions. Parts of Rajasthan and Balochistan are turning into desert-like landscapes due to deforestation.

Water Mismanagement

The over-extraction of groundwater and unsustainable irrigation practices are critical factors contributing to land degradation in South Asia. With the increase in agricultural practices, the need for water and groundwater has also increased. The excessive withdrawal of groundwater for irrigation has been causing groundwater levels to decrease year on year, especially in Pakistan and northwest India. This groundwater crisis forces deeper extraction, often bringing up saline water and damaging soil. Over-extraction makes land more vulnerable to erosion and desertification; and in regions like Punjab and Dhaka, over-extraction has led to land sinking, making it impossible to continue agricultural activity. Furthermore, as groundwater levels drop, salt starts accumulating on the surface, reducing soil fertility.

Moreover, the lack of awareness of the farmers of the region leads to inefficient and unsustainable irrigation. Traditional flood irrigation methods waste large amounts of water and can lead to soil erosion. There is also a risk of over-irrigation, which causes waterlogging, and a decline in agricultural productivity. In the Indo-Gangetic plains, and Sindh (Pakistan).

Problems Due to Urbanization

Rapid urban expansion and economic development in South Asia have caused large-scale mining, industrialization, road construction, and dam building, leading to deforestation, soil erosion, and water pollution.

Issues Caused by Mining and Industrialization

The South Asian region is one of the most popular for coal, iron, and copper mining. India is home to some of the largest coal mines, like the Gevra Open Cast Mine and Kusmunda Open Cast Mine; and major iron mines are located in Jharkhand and Odisha, India. This makes the region a hotspot for the mining industry to develop. While this is a good thing for the economy in the region, it creates various environmental issues, one of which is land degradation. Mining zones require large-scale land clearing, resulting in deforestation, thus creating soil erosion and a decline in biodiversity. Especially open-pit mining exposes topsoil to wind and water erosion, making the area vulnerable to land degradation. Furthermore, heavy metals and toxic waste from mining operations leach into rivers, negatively affecting soil fertility. For example, the Thar coal project in Pakistan has caused groundwater contamination, hindering nearby agricultural activity.

Issues Caused by Road and Dam Construction

Rapid urbanization has also led to increased road and dam construction, which can cause land degradation. Expanding road networks in the region have triggered landslides and topsoil loss, especially in mountainous areas, as road construction weakens slopes. The

Himalayan region, for instance, has faced severe erosion because of new road construction systems. Roads also disrupt natural drainage channels, increasing the risk of flooding, waterlogging and sedimentation. The most famous example of this issue is the Asian Highway project in Bangladesh, which has damaged local wetlands and farmland.

Moreover, the construction of dams leads to land degradation. Dams trap sediments, preventing them from reaching farmland, causing soil infertility in the region. Flooding can also occur due to dam construction, leading to permanent loss of soil quality in forest areas, and reducing food production. The Tarbela Dam in Pakistan flooded large agricultural areas, for example, causing long-term soil degradation.

Governance Issues and Socio-economic Factors

The weakness of land use policies and poor law enforcement in the area is one of the main issues that cause land degradation in South Asia, as it worsens all the human-caused problems above. The lack of strict environmental regulations allows unregulated mining and illegal deforestation, and inconsistent ownership policies discourage farmers and landowners from opting for more sustainable land use practices. Further, governments often prioritize large-scale irrigation projects over sustainable water management policies, which increase the risk of waterlogging and salinization.

South Asia has one of the world's highest population densities, which has created a huge demand for farmland and crops, causing the issues mentioned above (Faults in Agricultural Practices). The local farmers also use unsustainable farming practices, and they do not own the land they work on, further discouraging them from investing in long-term land conservation techniques.

Possible Consequences

Environmental Consequences

If land degradation in South Asia isn't resolved, it will have significant consequences, most of which will damage the environment immensely. Some possible consequences are desertification, habitat destruction, biodiversity loss, loss of land fertility, and water scarcity. While these are the more prominent environmental consequences, it is important to note that they are not the only ones, and some unpredictable outcomes may arise.

One direct consequence of land degradation is the irreversible process of desertification. The emergence of desert conditions on these lands poses a severe threat to the life-supporting systems in the region. The degradation of habitats in natural and human-dominated landscapes of South Asia makes more species susceptible to extinction. When habitats are lost or broken up, plant and animal species become less diverse and common, soil quality erodes, and water supplies run out. Overall, desertification and changes in cover are the main causes of biodiversity loss.

Land degradation also results in soil degradation. While we can physically observe land degradation, we cannot see soil degradation. Loss of soil organic matter, sealing of the surface, rising salinity, acidity, metal or organic toxicity to the point where land can't support the uses it once had, and soil washing away faster than it is formed are all signs of soil degradation. According to UNEP reports, for instance, Bangladesh's average organic matter has dropped by half in the past 20 years. Numerous reports of soil tests over the last 15 years have also shown a decrease in soil carbon. Overall, reduced organic matter deteriorates soil's physical properties, including its capacity to retain nutrients and hold water. Therefore, there is an urgent need to address these long-term consequences of soil degradation in South Asia.

Desertification, land degradation, and prolonged drought conditions significantly affect the availability of water resources in the region and their quality in the area. These environmental issues contribute to water scarcity, characterized by insufficient fresh water to meet the demands of human consumption, agriculture, and industry. As desertification spreads and fertile land transforms into arid regions, the natural ability of ecosystems to retain water is further reduced. Drought also leads to lower river flows, shrinking lakes, and diminished groundwater levels, ultimately threatening ecosystem balance and human survival. Consequently, the interplay between these factors intensifies the challenges of managing water resources effectively.

Economic Consequences

A substantial body of research quantifies the economic consequences of land degradation by assessing its impact on crop productivity and farmers' livelihoods. In South Asia, where agriculture remains a primary source of income for millions, land degradation exacerbates poverty and vulnerability by diminishing yields and increasing production costs.

Its effects act as a threat multiplier, disproportionately affecting already disadvantaged communities. Regions experiencing severe degradation in many instances overlap with those facing entrenched poverty, food insecurity, and limited livelihood alternatives. In many instances, the depletion of soil fertility and water resources forces smallholders to engage in unhealthy coping strategies, which further deepens the economic precariousness of these individuals.

Social and Political Consequences

As land degrades and deserts expand in some regions, food production declines, water sources dry up, and populations have to migrate to more hospitable areas. As well documented in the literature, desertification gives rise to several health hazards, one of which is an increased risk of malnutrition because of decreased food and water supplies. In most cases, an increase in the number of diseases that are transmitted through water and food is caused by a lack of clean water and poor hygiene. Dust in the atmosphere triggers respiratory diseases, primarily due to wind erosion and other air pollutants. Additionally, as populations migrate in response to deteriorating environmental conditions, the spread of infectious diseases becomes more likely.

Furthermore, as desertification worsens, water shortages are predicted to exacerbate political and ethnic tensions in arid regions, fueling wars where water resources cross national boundaries. In some countries, land degradation has led to massive internal migrations, forcing whole villages to flee their farms for already overcrowded cities.

Major Parties Involved

India

As one of the countries in South Asia, India is severely affected by land degradation in the region. According to the United Nations Convention to Combat Desertification (UNCCD), between 2015 and 2019, 30.2 million hectares of India’s total land was degraded, which is 9.45% of the country’s landmass. The report also expressed that 854.4 million of the country’s people were exposed to drought from 2015-2018. With this serious problem at hand, India joined the voluntary Bonn Challenge and pledged to restore 13 million hectares of degraded land by 2020, and 21 million hectares in total by 2030 (this was later increased to 39 in 2019). Of this, India managed to restore 9.8 million hectares between 2011 and 2017. To combat land degradation and desertification, India introduces a variety of programs, including the Green India Mission, Compensatory Afforestation Fund Management and Planning Authority, and Mahatma Gandhi National Rural Employment Guarantee Scheme. Despite these improvements in environmental policies, India is still facing a massive challenge with 32% of its land degraded.

Pakistan

Pakistan is also severely affected by land degradation, with a reported area of 20 thousand km square of degraded land. The main cause of land degradation in Pakistan is thought to be soil erosion. Water erosion has damaged about 13.05 million hectares of the total land of Pakistan, while wind erosion affected 6.17 million hectares. The Sustainable Land Management Programme (SLMP), is one of the policies Pakistan has to reduce land degradation and its effects. The SLMP focuses on mitigating land degradation in Pakistan's drylands, encouraging farmers to participate in sustainable land management practices, in attempts to restore degraded land. The Billion Tree Tsunami was a land restoration project, that worked towards restoring 350.000 hectares of degraded land. Following the Billion Tree Tsunami's success, the Pakistani government launched the Ten Billion Tree Tsunami in 2018.

United Nations Environment Programme (UNEP)

UNEP actively addresses land degradation in South Asia, contributing to various programs and taking part in collaborations. The South Asia Co-operative Environment Programme, for example, is an intergovernmental organization established in 1981, with the help of UNEP. They deal with problems like soil degradation, nutrient depletion, and salinization. Further, UNEP attempts to combat land degradation through reforestation of lands, aiming to improve soil health, enhance food security, and support biodiversity in the region. Global campaigns, organized by UNEP, like World Environment Day, are also crucial in creating awareness against the faults in agricultural practices and water mismanagement.

Chronology of Important Events

Date	Description of Event
1982	The South Asia Cooperative Environment Programme (SACEP) was established
June 17, 1994	The United Nations Convention to Combat Desertification (UNCCD) was established
12 February, 1996	Nepal and India signed the Mahakali Treaty, emphasizing joint water resource management
2002	Pakistan's National Action Programme to Combat Desertification (NAP-CD) was launched
2014	The Billion Tree Tsunami was established
December 31, 2015	Bangladesh's Commitment to Land Degradation Neutrality (LDN) by UNEP
2015	Sri Lanka's National Action Programme was updated
2016	Nepal's National Biodiversity Strategy and Action Plan was adopted
September 3, 2018	The Ten Billion Tree Tsunami was launched

Relevant International Documents

- World Soil Resources Reports, "Land degradation in South Asia: Its severity, causes and effects upon the people" prepared by the Food and Agriculture Organization (FAO), United Nations Development Programme (UNDP) and UNEP
- Land Degradation Neutrality, by the UNCCD

- The Bonn Challenge
- UN Decade on Ecosytsem Restoration 2021-2030

Past Attempts to Resolve the Issue

South Asian countries, along with international organizations, have initiated various programs and policies to combat land degradation in the past. These efforts mostly revolve around reforestation, desertification control, and soil conservation. India initiated the Green India Mission in 2014, which was established to restore 5 million hectares of degraded forest land. Pakistan launched the Living Indus Initiative in 2021, with a goal of restoring the degraded ecosystems in the Indus Basin. Bangladesh has ongoing coastal reforestation programs, that aim to reforest mangroves in the Sundarbans, in an attempt to reduce coastal erosion. The South Asian countries have also developed National Action Plans (NAPs) under the UNCCD.

The UN Decade on Ecosystem Restoration 2021-2030, established under UNEP, aims to prevent and reverse ecosystem degradation "on every continent and in every ocean". All of the South Asian countries contribute to this program, raising hopes for averting land degradation in the region.

However, the weak law and policy implementation makes all of these efforts inefficient. Governments also prioritize short-term solutions instead of long-term, trying to make their countries look good in terms of sustainable development. For example, the Billion Tree Tsunami was able to achieve the planted tree goal, but overlooked water management and soil erosion issues. Further, corruption and land grabbing being popular in the area, as well as the unsustainable farming practices that are popular in the area, reduce the effect of these programs, worsening land degradation faster than it can be resolved. Most of the projects also don't integrate the public into the project, leading to a lack of awareness among the people.

Solution Alternatives

While climate change is a big factor in this issue, it is harder to solve and would require more long-term commitment. Thus, it is better to focus on the human-caused factors. To tackle this issue, the problems presented in the section above should be solved. There should be policies that promote stricter law enforcement, with increased penalties for illegal deforestation, land grabbing, and industrial pollution. Urban expansion should also be limited, with protected areas for forests and agricultural zones.

To deal with the faults in agricultural practices, farmers and landowners should be made aware of the long-term consequences and encouraged to take on new practices, that are more sustainable for land. Practices like agroforestry (tree planting on farmland), conservation agriculture with minimal soil disturbance, crop diversification, and organic farming can help reduce land degradation, and prevent it from developing again in the long term. Local governance bodies and NGOs can create awareness and training campaigns to help farmers in the process of these changes in agricultural practices. To further encourage farmers to use sustainable practices, financial compensation can be provided for land conservation.

Reforestation and grassland restoration should also be a goal to tackle this problem. To deal with reforestation rapidly, fast-growing, native trees can be planted to restore degraded land faster. Grassland restoration can be achieved by implementing rotational grazing, and assisting natural regeneration. However, none of this would be truly effective if water management isn't dealt with properly. Thus, extraction should be supervised to avoid the over-extraction of groundwater.

Another way of solving the issue could come from creating regulations that limit the population growth within a state as the increased population tends to be the primary reason for the increased demand for such products. One could also argue that international bodies or other nations that are succesful in solving the issue could aid countries that are actively struggling with the management of their solid, providing expert opinion or conducting scientific research that normally would not be possible due to the lack of technology.

Useful Links

- BBC NEWS | South Asia | Indian land 'seriously degraded'
- Soil erosion: Why fertile earth is being degraded and lost
- Half of world's pastures degraded by overuse, climate change, UN report says | Reuters

- Desertification eating into agricultural land in India, satellite images show | Reuters
- U.N. report highlights land use trends and costs of degradation | Reuters
- Soil Degradation Study: There Goes the Farm - The New York Times

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