More of the planet is turning into desert. Here's why that's so dangerous.

Humans are driving the transformation of drylands into desert on an unprecedented scale around the world, with serious consequences. But there are solutions.

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As global temperatures rise and the human population expands, more of the planet is vulnerable to desertification, the permanent degradation of land that was once arable.

While interpretations of the term desertification vary, the concern centers on human-caused land degradation in areas with low or variable rainfall known as drylands: arid, semi-arid, and sub-humid lands. These drylands account for more than 40 percent of the world's terrestrial surface area.

While land degradation has occurred throughout history, the pace has accelerated, reaching 30 to 35 times the historical rate, according to the United Nations. This degradation tends to be driven by a number of factors, including urbanization, mining, farming, and ranching. In the course of these activities, trees and other vegetation are cleared away, animal hooves pound the dirt, and crops deplete nutrients in the soil. Climate change also plays a significant role, increasing the risk of drought.

All of this contributes to soil erosion and an inability for the land to retain water or regrow plants. About 2 billion people live on the drylands that are vulnerable to desertification, which could displace an estimated 50 million people by 2030.

Where is desertification happening, and why?

The risk of desertification is widespread and spans more than 100 countries, hitting some of the poorest and most vulnerable populations the hardest, since subsistence farming is common across many of the affected regions.

More than 75 percent of Earth's land area is already degraded, according to the European Commission's World Atlas of Desertification, and more than 90 percent could become degraded by 2050. The commission's Joint Research Centre found that a total area half of the size of the European Union (1.61 million square miles, or 4.18 million square kilometers) is degraded annually, with Africa and Asia being the most affected.

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The drivers of land degradation vary with different locations, and causes often overlap with each other. In the regions of Uzbekistan and Kazakhstan surrounding the Aral Sea, excessive use of water for agricultural irrigation has been a primary culprit in causing the sea to shrink, leaving behind a saline desert. And in Africa's Sahel region, bordered by the Sahara Desert to the north and savannas to the south, population growth has caused an increase in wood harvesting, illegal farming, and land-clearing for housing, among other changes.

The prospect of climate change and warmer average temperatures could amplify these effects. The Mediterranean region would experience a drastic transformation with warming of 2 degrees Celsius, according to one study, with all of southern Spain becoming desert. Another recent study found that the same level of warming would result in "aridification," or drying out, of up to 30 percent of Earth's land surface.

A herder family tends pastures beside a growing desert.

PHOTOGRAPH BY JONAS BENDIKSEN, NAT GEO IMAGE COLLECTION

When land becomes desert, its ability to support surrounding populations of people and animals declines sharply. Food often doesn't grow, water can't be collected, and habitats shift. This often produces several human health problems that range from malnutrition, respiratory disease caused by dusty air, and other diseases stemming from a lack of clean water.

Desertification solutions

In 1994, the United Nations established the Convention to Combat Desertification

(UNCCD), through which 122 countries have committed to Land Degradation Neutrality targets, similar to the way countries in the climate Paris Agreement have agreed to targets for reducing carbon pollution. These efforts involve working with farmers to safeguard arable land, repairing degraded land, and managing water supplies more effectively.

The UNCCD has also promoted the Great Green Wall Initiative, an effort to restore 386,000 square miles (100 million hectares) across 20 countries in Africa by 2030. A similar effort is underway in northern China, with the government planting trees along the border of the Gobi desert to prevent it from expanding as farming, livestock grazing, and urbanization, along with climate change, removed buffering vegetation.

However, the results for these types of restoration efforts so far have been mixed. One type of mesquite tree planted in East Africa to buffer against desertification has proved to be invasive and problematic. The Great Green Wall initiative in Africa has evolved away from the idea of simply planting trees and toward the idea of "re-greening," or supporting small farmers in managing land to maximize water harvesting (via stone barriers that decrease water runoff, for example) and nurture natural regrowth of trees and vegetation.

"The absolute number of farmers in these [at-risk rural] regions is so large that even simple and inexpensive interventions can have regional impacts," write the authors of the World Atlas of Desertification, noting that more than 80 percent of the world's farms are managed by individual households, primarily in Africa and Asia. "Smallholders are now seen as part of the solution of land degradation rather than a main problem, which was a prevailing view of the past."