



Impacts of large scale exploitation of solar energy resources

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DESCRIPTION

The sun is a massive source of energy that has only lately been discovered. It has vast resources that can be used to generate clean, non-polluting, and sustainable electricity, resulting in no global warming emissions. In recent years, it has been discovered that solar energy may be captured and stored on a worldwide scale, with the goal of eventually replacing traditional energy sources. Solar energy has grown in importance as the globe shifts its focus to cleaner energy.

Solar energy systems provide enormous environmental benefits over traditional energy sources, and so contribute significantly to the long-term development of human activities. However, the widespread deployment of such systems may have detrimental environmental consequences at times. These potential issues may provide a significant obstacle to continued improvement of these systems in some users. The possible environmental implications of solar power can be grouped into various categories, including land use impacts, ecological impacts, water, air, and soil impacts, and other impacts such as socioeconomic impacts, and can vary widely depending on the technology.

ENVIRONMENTAL IMPACTS

Impact on Biodiversity

Desert vegetation regulates the passage of sand, dust, and sediments in dry or semiarid environments. Soil loss from storms and floods is caused by the removal of vegetation, grading of land, and construction of roads by solar energy infrastructure. Large-scale solar energy infrastructures may obstruct the mobility and seasonal migration of wildlife species, potentially disrupting gene flow across species. This habitat loss and fragmentation

may endanger biodiversity and upset the balance of the eco-system. Large-scale solar plants have a significant influence on the landscape due to site preparation, grading, vegetation removal, and road construction. All of these activities produce dust and particle emissions, particularly in desert and dry areas. Dust emissions can affect plant fertility and the soil's ability to retain water. Physiologically, dust emissions can adversely affect photosynthetic processes, and water consumption of desert plants. Mobilized dust particles can expose plant roots, bury plants, and scratch plant leaves and stems. Dust damage to plants can have an adverse effect on the quantity and quality of nutrients and habitat.

Impacts on Land Cover Change

Large-scale solar systems have a smaller influence on land-use and land-cover change than other energy systems. When compared to wind, hydroelectric, and biomass, PV systems require the most land. The amount of solar radiation is the key element determining the land needed for solar plants. Higher solar radiation results in less land use for solar plants of the same capacity. Concentrating Solar Power (CSP) plants require relatively flat ground. Solar arrays, heliostats or parabolic troughs, substations, thermal storage facilities, access roads, service buildings, and other infrastructure are all installed on CSP land.

Impact on Microclimate

During warmer seasons, the temperature of photovoltaic panels can reach 70°C or more due to the infrared component of solar insolation. This increase in Photovoltaic (PV) module temperature diminishes the module's electrical production, heats the air surrounding the system, and alters the site's environment. Furthermore, such temperature variations may be a problem in the outdoor built environment, affecting outdoor

thermal comfort conditions and generating a heat island effect. Passive cooling can help prevent PV array overheating.

Thermal facilities can improve the albedo in deserts by 30%-56%, influencing local temperatures and precipitation through changes in wind patterns and evapotranspiration.

Furthermore, big concentrating power plants, particularly those that are dry-cooled, may generate a significant quantity of waste heat that can be carried by wind, resulting in drought conditions. The heat produced by solar tower facilities, particularly at the focal point, has the potential to burn birds and insects.