

# SOLAR POWER AND THE ENVIRONMENT

Solar power is clean, safe, and ecologically beneficial. Solar farms help displace dirtier sources of electric generation and don't create any additional pollution; they also improve the air we breathe and don't consume water. Scientific studies conducted across the world consistently find that transitioning from fossil fuels to renewable energy has overwhelming positive net benefits for air quality, water resources, climate change, and human health. Solar energy generation produces no carbon pollution, releases no heavy metals or acid gases, and emits no small particles that can cause respiratory problems.

One recent study examined 32 impacts from utility-scale solar farms, looking at land use intensity, human health and well-being, plant and animal life, geohydrological resources, and climate change. The study measured the impacts of substituting solar energy for existing fossil fuel-based electricity, concluding: "Altogether we find 22 of the considered 32 impacts to be beneficial. Of the remaining 10 impacts, 4 are neutral, and 6 require further research before they can be appraised. None of the impacts are negative relative to traditional power generation."<sup>1</sup>

## Solar Energy and Wildlife

Studies show that in addition to helping displace emissions produced by fossil fuel generation, solar energy facilities can improve biodiversity and benefit wildlife by improving habitat in their immediate vicinity.<sup>2</sup> With proper planning, solar farms can improve the environment and enhance local ecological services by naturalizing areas around solar facilities, improving wildlife habitat, increasing pollination, improving water cycling, increasing erosion control, and even helping threatened species.<sup>3</sup> Solar farms can also help create new habitat, providing pollinator-friendly ecosystems and high-quality hunting and foraging habitat for birds.<sup>4</sup>



Although solar panels may modify wildlife habitat in the project's immediate footprint, evidence suggests that these changes are balanced by other habitat-based benefits, and there is currently no evidence to support a conclusion that solar farms have an adverse impact on wildlife's use of the land surrounding the project.

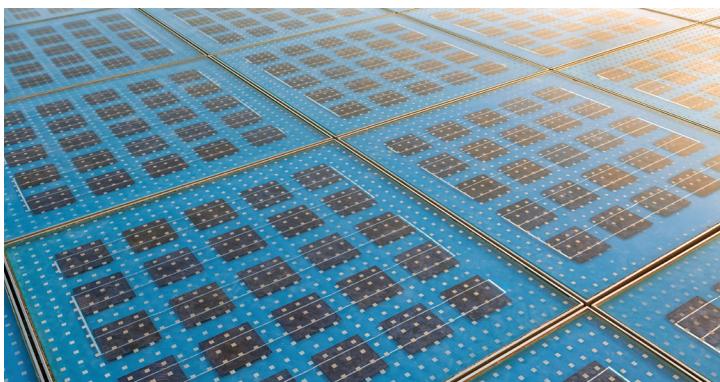


## Solar Energy and Groundwater

Like many products, solar panels may contain some harmful materials. Depending on the type of panel being used, these materials can include cadmium telluride, copper indium selenide, sulfur hexafluoride, and silicon tetrachloride. Cadmium telluride is only used in thin-film solar modules, so many utility-scale solar projects do not contain the material at all. However, it is important to note that no matter the panel type, the harmful substances named above are fully contained and unreactive in the solar panels. Because they are embedded into the panels during manufacturing, there is simply no physical mechanism or chemical reaction that would allow these materials to escape the solar panels during operation.

The materials are solids, so there is no risk that they will leach into soil or groundwater. On the contrary, the use of solar power displaces electricity generation from fossil fuels, which poses a greater threat of groundwater contamination, whether from coal ash ponds, oil spills, pipeline failures, or hydraulic fracturing (fracking).

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## Solar Panel Durability and End-of-Life Recycling

Solar panels are durable and are expected to function effectively for up to 40 years.<sup>5</sup> This is largely because they have no moving parts and are designed to withstand rain, snow, ice, and high winds, as well as the harsh conditions of outer space and remote areas. A study of over 50,000 solar energy systems concluded that solar panels are extremely dependable, finding that less than 0.1% per year became defective or underperformed.<sup>6</sup>

Furthermore, although solar energy is relatively new, long-term studies of solar panels indicate that they are performing far better than expected over time. Studies confirm that the average degradation rate for solar panels is approximately 0.5% per year.<sup>7</sup> Because the panels have been performing increasingly well, manufacturers are extending the production warranties on them to 25 years. Typically, warranties today guarantee that solar panels will generate at least 90% of peak energy capacity after 10 years and 80% after 20 years. In a recent study assessing solar panel degradation over time in Ghana, researchers found that after 19 years of continuous outdoor exposure, solar panels met or exceeded warranty provisions.<sup>8</sup>

At the end of a solar facility's useful life, estimated to be about 30 years on average, panels can be removed and recycled.<sup>9</sup> Recycling programs are being developed that are expected to recover about 90% of the materials used in the panels, much of which is glass.<sup>10</sup> In fact, the International Renewable Energy Agency projects that the value of recovered materials could exceed \$15 billion by 2050 and that the material recovered could be used to remanufacture two billion solar panels.<sup>11</sup>

The solar industry is actively developing new systems and protocols in anticipation of the future retirement of solar panels. These efforts include establishing uniform, cost-effective recycling practices (e.g., identifying vendors and service providers, aggregating end-of-life solar components, and streamlining and improving recycling processes).<sup>12</sup>

In general, Apex's land leases require compliance with strict decommissioning requirements at the end of each project's useful life. These lease terms dictate that when a project reaches this point, the project will remove all equipment above ground and up to 30 feet below ground, returning the land to its original state at the time the lease was signed and fixing, repairing, or compensating the landowner for any damages that occurred during decommissioning.

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