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Green Technology

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ABSTRACT: Green tech refers to a type of technology that is considered environmentally friendly based on its production process or its [supply chain](#). Green tech—an abbreviation of "green technology"—can also refer to clean energy production, the use of alternative fuels, and technologies that are less harmful to the environment than fossil fuels. Although the market for green technology is relatively young, it has garnered a significant amount of investor interest due to increasing awareness about the impacts of climate change and the depletion of natural resources. Green technology is an umbrella term that describes the use of technology and science to create products and services that are environmentally friendly. Green tech is related to [cleantech](#), which specifically refers to products or services that improve operational performance while also reducing costs, energy consumption, waste, or negative effects on the environment. The goal of green tech is to protect the environment, repair damage done to the environment in the past, and conserve the Earth's natural resources. Green tech has also become a burgeoning industry that has attracted enormous amounts of investment capital.

KEYWORDS: green technology, supply chain, resources, environment, capital, investment

I. INTRODUCTION

The use of green tech can be a stated goal of a business segment or a company. These goals are typically outlined in a company's [environmental, sustainability, and governance](#) (ESG) statement, or can even be found in the [mission statement](#) of a firm. Increasingly, socially responsible investors are looking to narrow down their prospective investments to only include companies that specifically employ or produce green technologies.

Types of Green Tech

Green technology is a broad category that encompasses several forms of environmental remediation. While climate change and carbon emissions are now considered among the most pressing global issues, there are also many efforts to address local environmental hazards. Some seek to protect specific ecosystems or endangered species. Others seek to conserve scarce natural resources by finding more sustainable alternatives.²

Alternative Energy

In order to provide a viable alternative to fossil fuels, many businesses are seeking to engineer alternative sources of energy that do not generate atmospheric carbon. Solar and wind power are now among the most inexpensive sources of energy, and solar panels are affordable to U.S. homeowners at a consumer scale. Other alternatives, such as geothermal and tidal energy, have yet to be deployed at scale.³

1) Electric Vehicles

Nearly a third of U.S. greenhouse gas emissions are released by transportation activities, according to the Environmental Protection Agency.⁴ Many manufacturers are exploring ways to reduce automotive emissions, either by designing more fuel-efficient engines or shifting to electrical power.

However, electric vehicles require a host of innovations in other spheres, such as high-capacity rechargeable batteries and charging infrastructure. In addition, the benefits of electric vehicles are limited by the fact that many power grids still rely on fossil fuels.^{4,5}

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2) Sustainable Agriculture

Farming and livestock have a substantial environmental footprint, from the high costs of land and water usage to the ecological consequences of pesticides, fertilizers, and animal waste. As a result, there are many opportunities for green technology in the area of agriculture. For example, organic farming techniques can reduce the damage due to soil exhaustion, innovations in cattle feed can reduce methane emissions, and meat substitutes can reduce the consumption of livestock.

3) Recycling

Recycling seeks to conserve scarce resources by reusing materials or finding sustainable substitutes. While plastic, glass, paper, and metal waste are the most familiar forms of recycling, more sophisticated operations can be used to recover expensive raw materials from e-waste or automobile parts.^{6,7}

4) Carbon Capture

Carbon capture refers to a group of experimental technologies that seek to remove and sequester greenhouse gases, either at the point of combustion or from the atmosphere. This technology has been heavily promoted by the fossil fuel industry, although it has yet to deliver on those expectations.⁵ The largest carbon capture facility can absorb 4,000 tons of carbon dioxide per year, a minuscule amount compared to annual emissions.⁶

II.DISCUSSION

While green tech is a broad and hard-to-define category, some types of green technology have experienced wide adoption. Several countries have launched initiatives to eliminate single-use plastics, a goal that would require sizeable investments in alternatives, such as paper substitutes, bioplastics, or recycling technologies. Singapore, for example, has pledged to reach 70% recycling^{8,9}

While green technologies have the shared goal of preserving biodiversity and conserving the earth's resources, there are few ways to do so without affecting the environment in other ways. In some cases, reducing environmental costs in one area means causing adverse impacts in another.¹⁰

For example, the batteries in electric vehicles rely on lithium, an element that is often strip-mined from South American rain forests.¹⁰ Hydroelectric dams have low carbon emissions, but high impacts on the salmon and other species that rely on those waterways.¹¹ Green energy devices such as solar panels and wind turbines require a host of rare minerals, that can only be extracted by diesel-powered mining machinery.¹²

This does not necessarily mean that green technology is a lost cause, but it does require careful accounting to ensure that the benefits outweigh the costs.

The cheapest form of alternative energy is solar power, according to the International Energy Agency. In its 2017 World Outlook Report, the Agency found that photovoltaic solar energy is "consistently cheaper than new coal- or gas-fired power plants in most countries, and solar projects now offer some of the lowest-cost electricity ever seen."¹³

The easiest way to [invest in green tech](#) is to buy stock in companies that are making major bets on environmentally-friendly technologies. Investors can attempt to identify individual stocks, or simply invest in a mutual fund, index fund, or another instrument that seeks to reflect the broader market for environmental investments. The advantage to the latter approach is that the investor will gain diversified exposure to the green tech industry, rather than the fortunes of a single company. Nuclear power is a deeply controversial subject, and many scientists have disputed its benefits. Although nuclear power derived from fission can provide reliable, inexpensive electricity without

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greenhouse gases, it also produces highly radioactive waste that must be stored for thousands of years. Some activists have argued that nuclear power can never be safely generated, and a number of high-profile accidents—notably at Chernobyl and Fukushima—have highlighted these concerns. However, it should also be noted that the combined death toll from nuclear accidents is far lower than the annual fatalities from fossil fuel pollution.¹⁴

III. RESULTS AND CONCLUSIONS

There's an overall trend towards environmentalism across all sectors. Whether this means restaurants banning plastic straws, transitioning to clean energy sources, or purchasing carbon offsets, society has witnessed an uptick in sustainability. Recently, green technology has become increasingly popular. Learn all about green technologies and why they are essential.

As “green” in its name implies, green technology features an onus on sustainability. And the technology portion, well, that's pretty wide-ranging. Overall, [green energy concentrates on sustainable technology innovation](#), which factors in short-term and long-term environmental effects. ^{15,16}

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7 Green Technology Examples:

1. LED Lighting

A simple example of green tech is LED lighting. By avoiding incandescent lights, there's a substantial gain in efficiency. LED light bulbs use less energy than traditional incandescent lighting. Plus, LED lights prove vital outside pure visual aids. Instead, they've been implemented in vertical farming and have even combated malaria. Smart LEDs are a simple, smart home upgrade that even apartment dwellers may adopt.¹⁵

2. Solar Panels

While solar panels aren't new, lower prices and monetary incentives such as tax credits in many areas have made solar panels a solid solution. Even a single [solar water heater](#) drastically reduces energy use. Since solar energy is so efficient, there's a pretty quick turnaround for recouping any losses.

3. Wind Energy

Likewise, harnessing wind power is a fantastic example of green tech in action. Commonly, [wind energy](#) is associated with a wind farm. But small-scale windmills offer a nifty method of adopting green tech trends in a residential setting. The amount of energy you can offset with a windmill varies, as does the cost of adoption and installation. Offshore wind turbines provide steady, reliable, clean energy. ¹⁶

4. Composting

Among the best and easiest green tech examples, there's composting. It's straightforward, and virtually anyone can get started. You can make your own worm bin perfect for use in a home, and many cities even tout composting programs. I make use of a paid service that picks up my food waste. In some areas, such as Seattle, it's illegal to dispose of food waste in the trash bin.

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5. Electric Vehicles

Although the price tag of a Tesla may be a bit steep, the flagship electronic vehicle manufacturer isn't the only EV maker on the market. Instead, there's a slew of other electric automobiles from the likes of Nissan, Chevy, and BMW. Advances in EV technology find wireless charging capabilities as the electric auto industry continues to evolve. Granted, charging an electric vehicle off a coal-powered grid isn't as sustainable as it could be, but better gas mileage and zero emissions still make it a better alternative than a petroleum-powered car. EVs may be the [future of the automotive industry](#).

6. Programmable Thermostats

[A programmable thermostat](#) is a low-cost green technology solution. Virtually any home or apartment now boasts one. With a programmable thermostat, you can set a schedule and automatically adjust the temperature around your comings and goings to save energy and money. Moreover, programmable thermostats don't even need to be smart thermostats. Instead, tons of "dumb" thermostats feature the ability to set a schedule. A smart thermostat does add the convenience of monitoring and changing the temperature remotely.¹⁷

7. Vertical Farming

Vertical farming [is an eco friendly technology as simple as its name](#), and this is the concept of growing produce in stacked vertical layers rather than horizontally. The benefit of vertical farming is increased sustainability, and some vertical farming configurations don't even require soil and reduce water use exponentially.

It's Not Easy Being Green Technology

Green tech varies from accessible devices such as programmable thermostats and LED bulbs to pricey wind turbines and solar panels, with electronic vehicles somewhere in between. No-cost solutions like composting are excellent starting places. However, there are many considerations, such as how renewable energy is stored. Combating climate change requires a total disruption of society, including the continued adoption of green technology.¹⁸

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