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# Land and Energy

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EIA-923 Power Plant Operations Report, 2022, U.S. Energy Information Administration
GAP/LANDFIRE National Terrestrial Ecosystems 2011 data, 2011, USGA

## Background

Land use has and will continue to be a complicated topic. We need land to succeed as a country and a species, but it is equally as important to keep the land as pristine as possible to not affect natural ecosystems. As population continues to increase, urbanization and economic growth has inevitably had an impact on climate change.[1] Parallel to an increase in land development is an increase in power generation. As cities grow, technology evolves, and energy use goes up. With this increase in technology, new sources of power generation are emerging. While fossil fuels have always been the standard source of energy, renewable energy sources such as wind and biomass are on the rise.[2] This change is not happening fast enough, as increasing development has brought with it loss in forests, farmland, species diversity, and an increase in pollution.[3]

I examined the relationship between land use in the United States and the types of energy generated. I hypothesize that areas with a high percentage of developed land will have more fossil fuel generated power, and areas with a high percentage of agriculture will have more renewably generated energy.

Fig 1: Scholven Powerplant

Fig 2: Alta Wind Center

Fig 3: Slayton Solar Farm

## Methods

Land Cover Data:

Land Cover Data was conducted in 2011 by the Gap Analysis Project (GAP) group of the United States Geographical Survey. This data was generalized with the Landscape Fire and Resource Management Planning Tools Program Existing Vegetation 2010 Data (LANDFIRE EVT), and the two were summarized in the GAP/LANDFIRE National Terrestrial Ecosystems 2011 data.[4] Land use was separated into three groups by its use, developed, agricultural, or natural.

Energy Source Data

The energy source data used was collected by the U.S. Energy Information Administration from 2001-present.[5] Sources were broken up into nonrenewable sources and renewable sources by if they are considered renewable or not. The generation was measured in megawatthours (MWh).

## Results

This data had no significant correlation between energy generated and percent of land uses (Anova: SumSq = 4.9e10, Df = 1, F = 0, P = 0.99). Developed, agricultural, and natural land all had similar spreads between renewable and nonrenewable energy sources. Figure 4a, 4b, and 4c indicate that in each of the three land types, nonrenewable energy generated more energy than renewable energy. The Anova tests for the individual areas again supported the conclusion that there is no significant correlation between generation and land usage in developed (Anova: SumSq = 2.3e16, Df = 1, F = 0.0148, P = 0.9031), agricultural (Anova: SumSq = 6.3e17, Df = 1, F = 0.4092, P = 0.5227), or natural land (Anova: SumSq = 7.2e17, Df = 1, F = 0.4628, P = 0.4967).

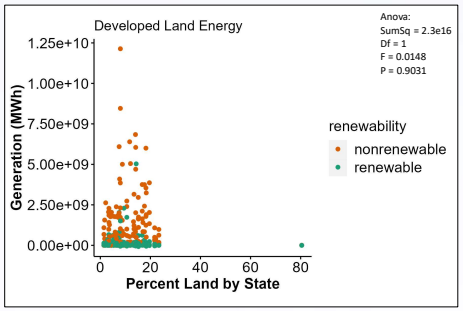

Fig 4a: Generation in megawatt hours on developed land by percent of U.S. state

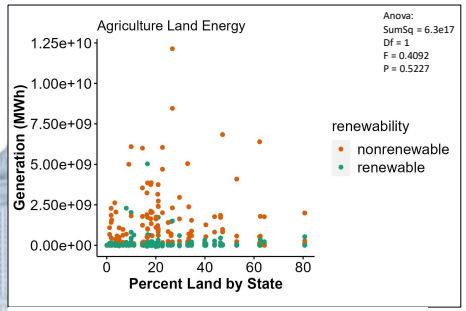

Fig 4b: Generation in megawatt hours on agricultural land by percent of U.S. state

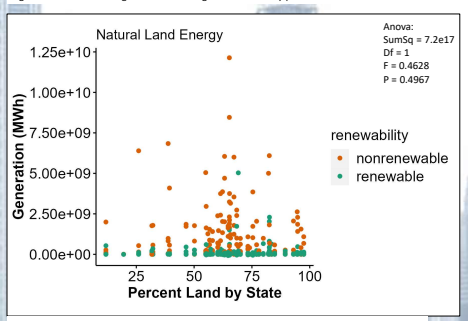

Fig 4c: Generation in megawatt hours on natural land by percent of U.S. state

## Conclusion(s)

There was no correlation between land use and the types of energy generated in the United States. Nonrenewable energy sources are still much more commonly used than renewable sources in developed, agricultural, and natural land areas. In all three of the land areas, the highest generation of energy was fossil fuels, and all were in the state of Texas. This is because of the abundance of fossil fuels in Texas. It will be interesting to see how the relationship between land usage and energy generation changes as renewable source usage continues to trend upwards.

## Acknowledgements

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## References

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