As the sun set over the Mediterranean this weekend in Beirut, it plunged the 2.4 million-person city into darkness. The Lebanese power grid shut down on Saturday due to depleted fuel resources, which comes after months of economic crisis in the country. Footage from BBC News shows families gathered at night under solar-powered streetlights, some of the only lights that remained on in the entire city, using the term “electricity refugees” to describe themselves. This most recent outage captured international attention, but the problem of electricity shortages in Lebanon has been ongoing for months.
Residents of Beirut are well aware of the fragility of their power supply. For some who can’t afford a generator and operate medical devices at home, an untimely shortage can even be life-threatening. Even for those with generators available, the fuel required to run them is in short supply. While residents from across the city share their personal experiences with the media, tracking trends and turning points in electricity supply presents a larger challenge.

That is why we at the Payne Institute of the Colorado School of Mines have come up with an innovative solution. Using satellite data that records light radiance across the world, we can select and analyze locations of interest for trends and turning points in light radiance that reflect trends in electricity supply. In a place like Yemen, we have been able to visualize how bombing campaigns have devastated power grids and impacted the local community. In Lebanon, we are working to understand how electricity supply has changed over time and caused the kind of grid instability we are witnessing today.
Across much of the city of Beirut, our algorithm detects a significant change in electricity supply in early 2020 that has resulted in much lower average energy supply over the past year and a half. In addition to this overarching trend, we have also been able to connect our data with major events in the city. For example, Beirut’s devastating port explosion that killed over 200 people in August of 2020 is observable as a drop in light radiance in the electricity grid cell nearest the explosion.

We intend to use our data in Lebanon to assess how electricity trends might correlate with events on the ground in Beirut. Ultimately, we hope that this information can help the international community to better understand and respond to the electricity crisis in Lebanon for the sake of its people, that they no longer have to endure the complete darkness of the night.
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Elsa Barron is an Environmental Journalist at the Payne Institute for Public Policy in addition to a research assistant at the Woodrow Wilson Environmental Change and Security Program and the Center for Climate and Security. Her writing has been published in the Wall Street Journal, the Indianapolis Star, and the Chicago Tribune, amongst others.

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Christopher D. Elvidge has decades of experience with satellite low light imaging data, starting in 1994. He pioneered nighttime satellite observation on visible lights, heat sources including gas flares and wild fires, as well as bright lit fishing vessels. He led the development of these nighttime remote sensed products with images from DMSP, JPSS, and Landsat satellites. These data are very popular and used globally in both public and private sectors. As of February 2018, he has more than 11,000 scholarly publication citations.

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Fen-Chi Hsu was born and raised in Taiwan. He was a trained engineer in Environmental Engineering, later found his passion in remote sensing. He received his PhD degree in the University of Tokyo in 2012, and started working in Earth Observation Group with Dr. Elvidge in the same year. Since then he has learned the secrets of nighttime light production and helped develop critical algorithms for new products as well as tools for robust processing. Besides being a researcher in remote sensing, he is also building up his skill set as a full stack system administrator as well as a web application designer.
ABOUT THE PAYNE INSTITUTE

The mission of the Payne Institute at Colorado School of Mines is to provide world-class scientific insights, helping to inform and shape public policy on earth resources, energy, and environment. The Institute was established with an endowment from Jim and Arlene Payne, and seeks to link the strong scientific and engineering research and expertise at Mines with issues related to public policy and national security.

The Payne Institute Commentary Series offers independent insights and research on a wide range of topics related to energy, natural resources, and environmental policy. The series accommodates three categories namely: Viewpoints, Essays, and Working Papers.

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