Project Goal:
This project seeks to advance renewable energy development by creating a reliable framework for selecting optimal solar farm locations in Lithuania and Poland. The goal is to enhance energy independence and sustainability by leveraging geographic information systems and machine learning. This initiative is a step forward in increasing the adoption of solar farms in the Baltic region transitioning towards a more environmentally friendly society.

Description of Research:
Our research strategy combines Fuzzy GIS-Multi-Criteria Decision Making (GIS-MCDM) models with advanced machine learning algorithms to select optimal sites for solar farms in Lithuania and Poland. We address the complexities involved in site selection by evaluating multiple factors, such as sunlight exposure, topography, environmental impacts, and regulatory requirements. These criteria, crucial for determining the feasibility and sustainability of solar farms, are analyzed through our combined GIS-MCDM and machine learning approach. The use of NASA POWER datasets further contributes to our analysis, ensuring a robust and data-driven process. This integration not only allows us to handle a large array of variables but also enhances precision and accuracy in identifying the most suitable locations for solar farms.

Reasons for Research:
The need for this research arises from the growing need for sustainable energy solutions, especially given current geopolitical challenges and environmental concerns. Lithuania and Poland's reliance on imported fossil fuels and the push towards meeting international climate goals underline the importance of developing local, renewable energy sources. This research also responds to societal demands for sustainable development, aligning with global commitments like the Paris Agreement and the European Green Deal.
This research particularly focused on using MCDM with Machine learning because there is a need for handling complex, multi-dimensional data involved in selecting solar farm sites. Here, MCDM provides a structured approach for making decisions in situations where multiple, often conflicting criteria must be considered. It helps in the systematic evaluation of various site selection criteria such as environmental impact, land use, socio-economic factors, and technical feasibility. Machine learning algorithms, in this context, complement MCDM by offering the ability to analyze large datasets and extracting meaningful patterns and insights from them. This synergy between MCDM and machine learning allows for more efficient and effective decision-making, ensuring that stakeholders can make informed and data-driven decisions when investing in solar energy infrastructure.

Expected Results:
The project is expected to deliver a robust and transparent framework for solar farm site selection, significantly improving the efficiency of land use and renewable energy production. The novel combination of GIS-MCDM and machine learning models in this context is expected to provide valuable insights and methodologies, potentially influencing other areas of renewable energy planning and policymaking. The success of this project could be a noteworthy step towards a carbon-neutral future, with implications for both national energy strategies and broader sustainable development goals.