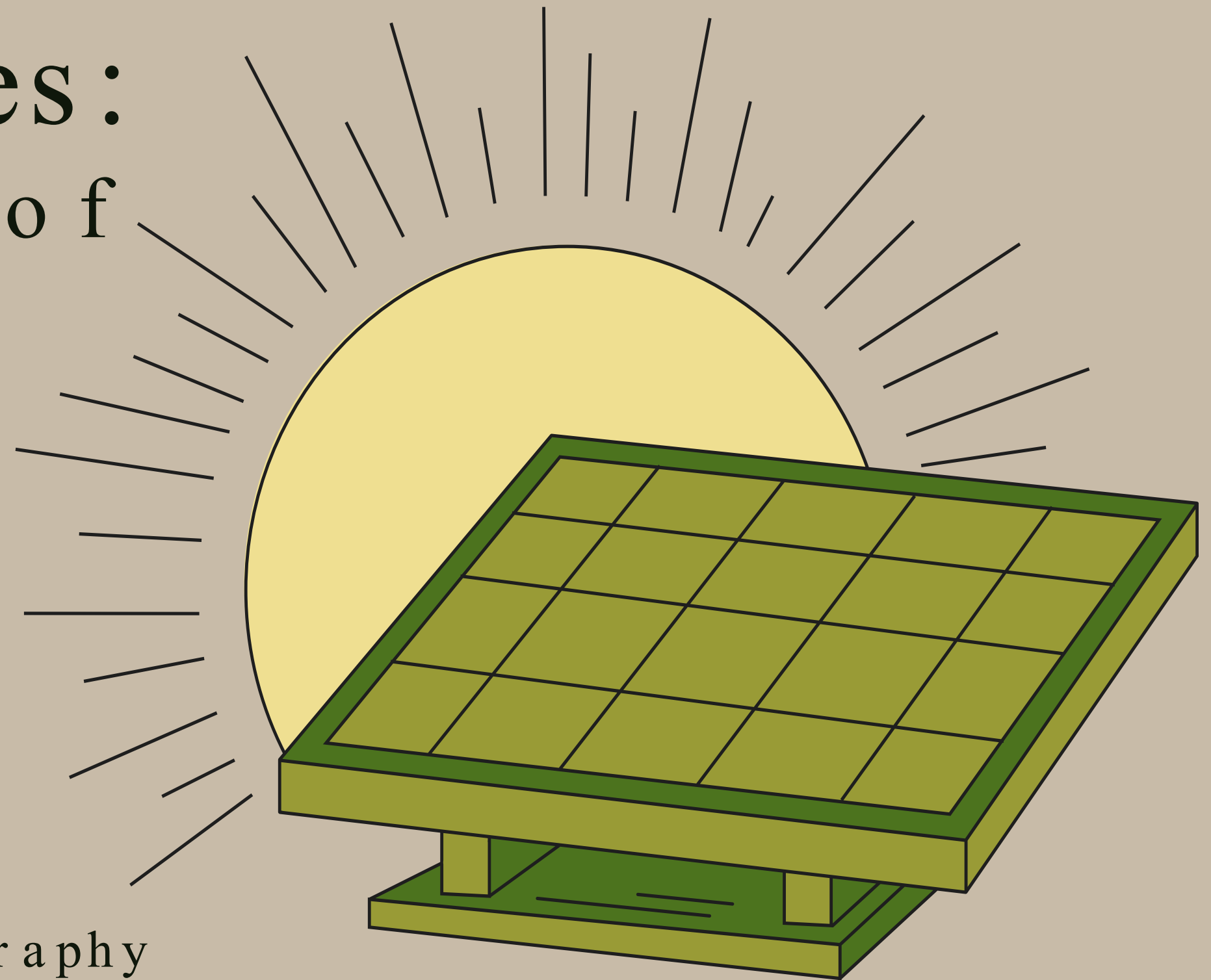


Energy landscapes:

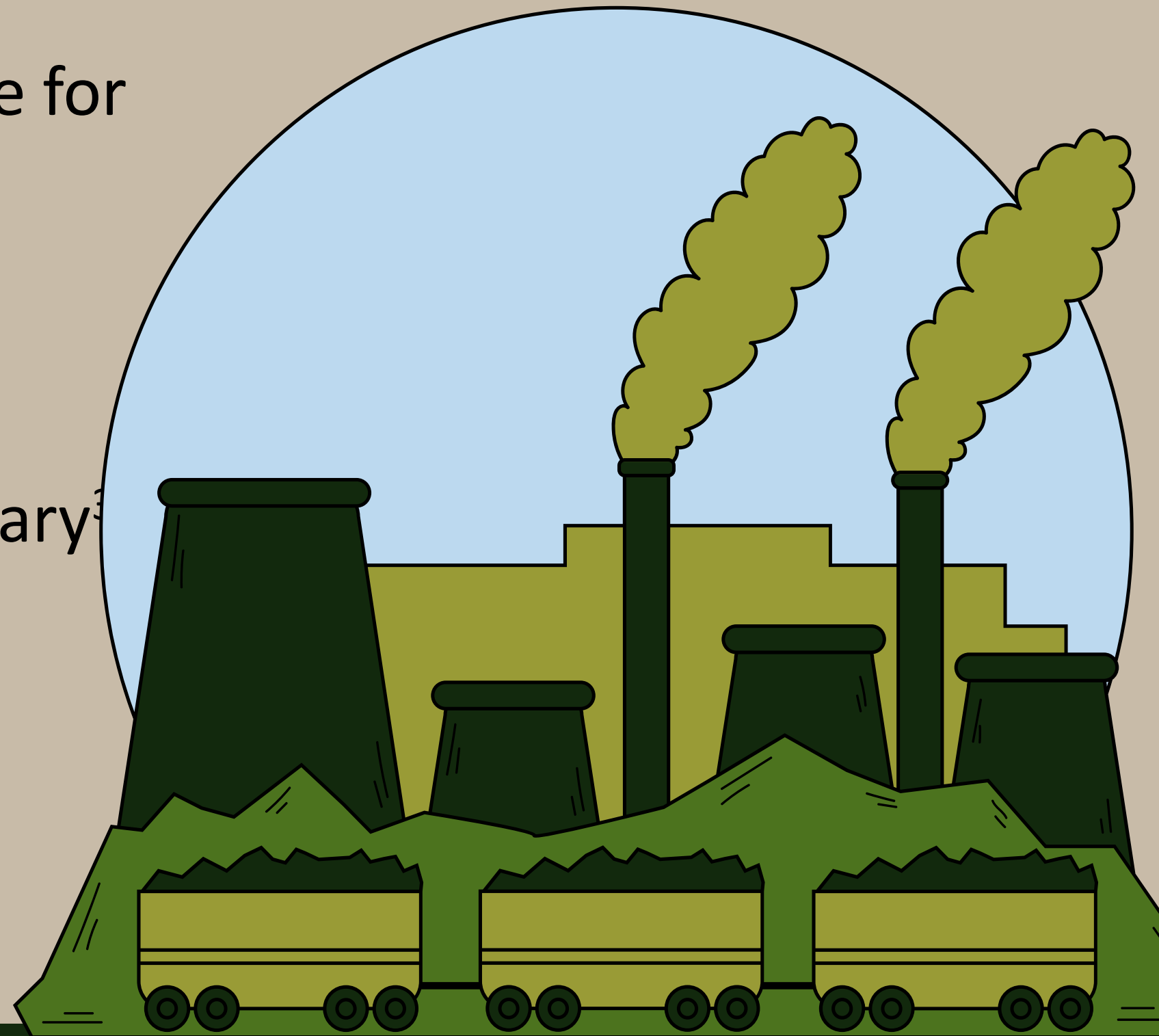
Exploring the spatiality of
clustering renewable
energy for a
low-carbon future



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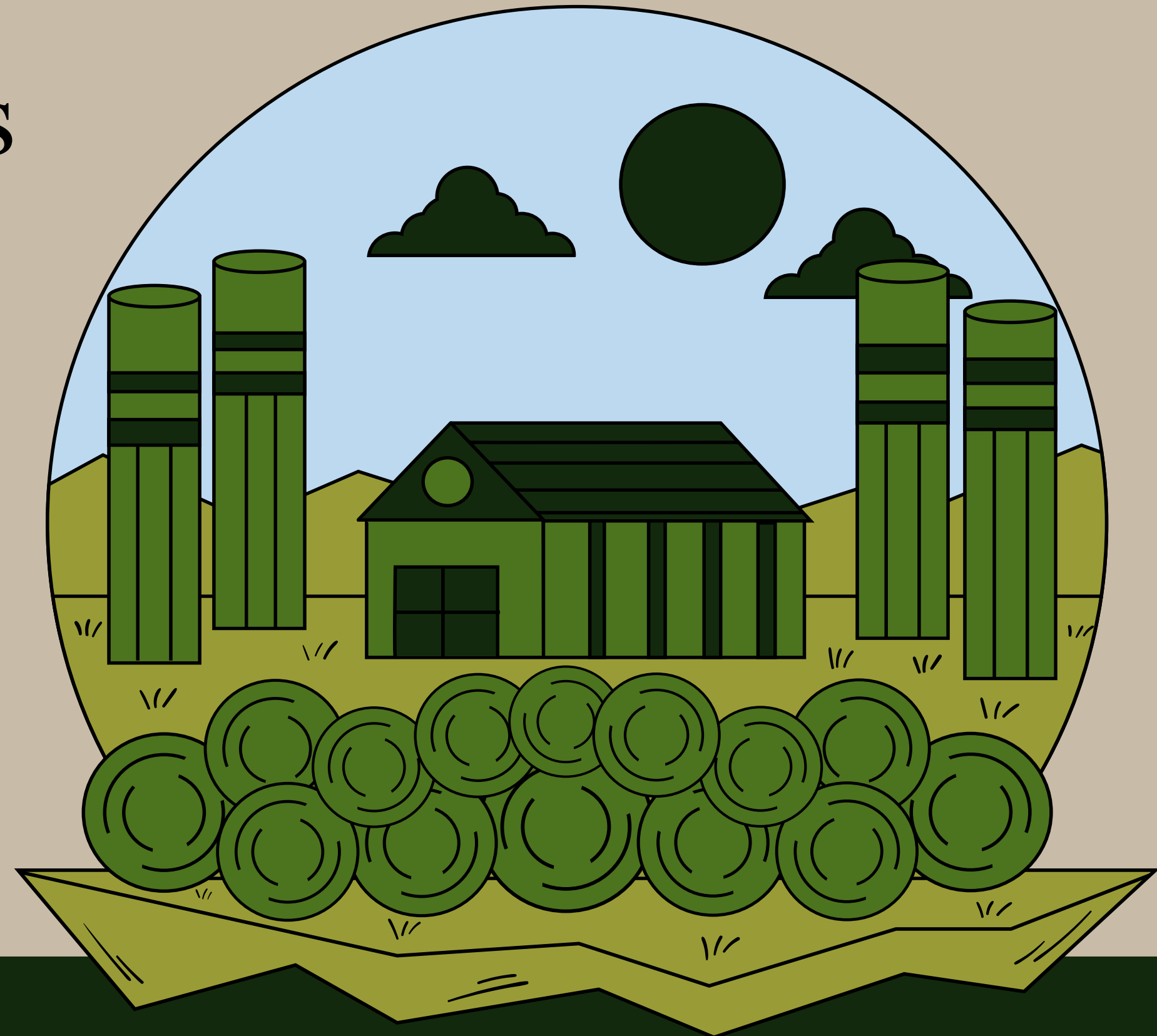
Context

- Energy is a crucial environmental resource for human wellbeing¹
- Global increase in energy demand has led to rise in CO₂ emissions²
- Transition to low-carbon energy is necessary³

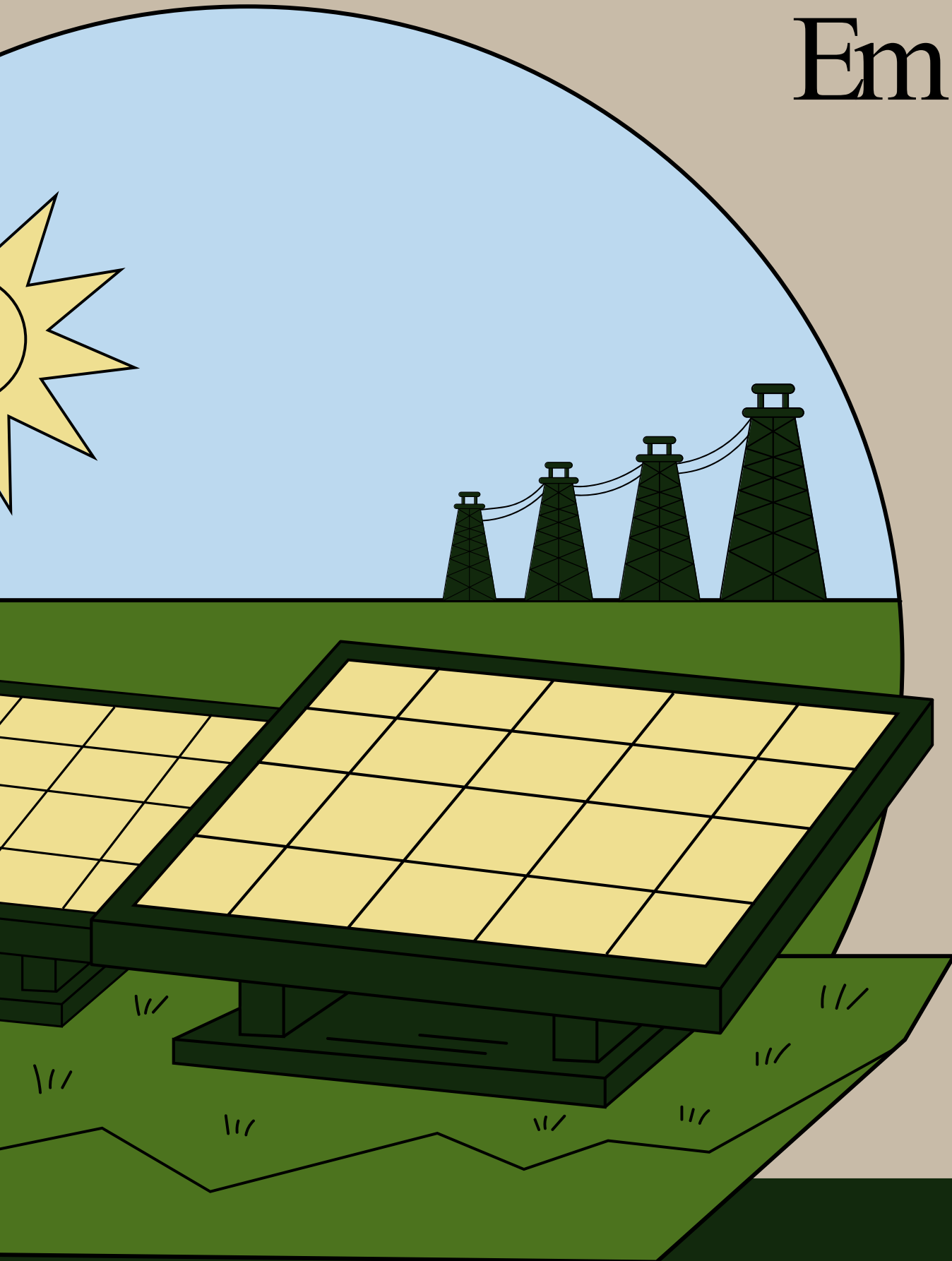


Challenges in Energy Transitions

- Carbon-lock in³
- Power density⁴
- Land demand⁵
- Customizability⁶



Emerging systems



- Production of renewable energy increasingly involves implementing smaller, flexible energy system⁷
- Energy clusters: a collection of smaller renewable energy systems in geographical proximity to one another⁸
- Scalability and flexibility of renewable energy clusters position them as an ideal model for varying landscape and community needs across the globe

Knowledge Gap

- No widespread information about the spatiality of these clusters are or how they work
- No current scholarship on if and how these energy models are being customized to varying landscapes and needs



RESEARCH QUESTION

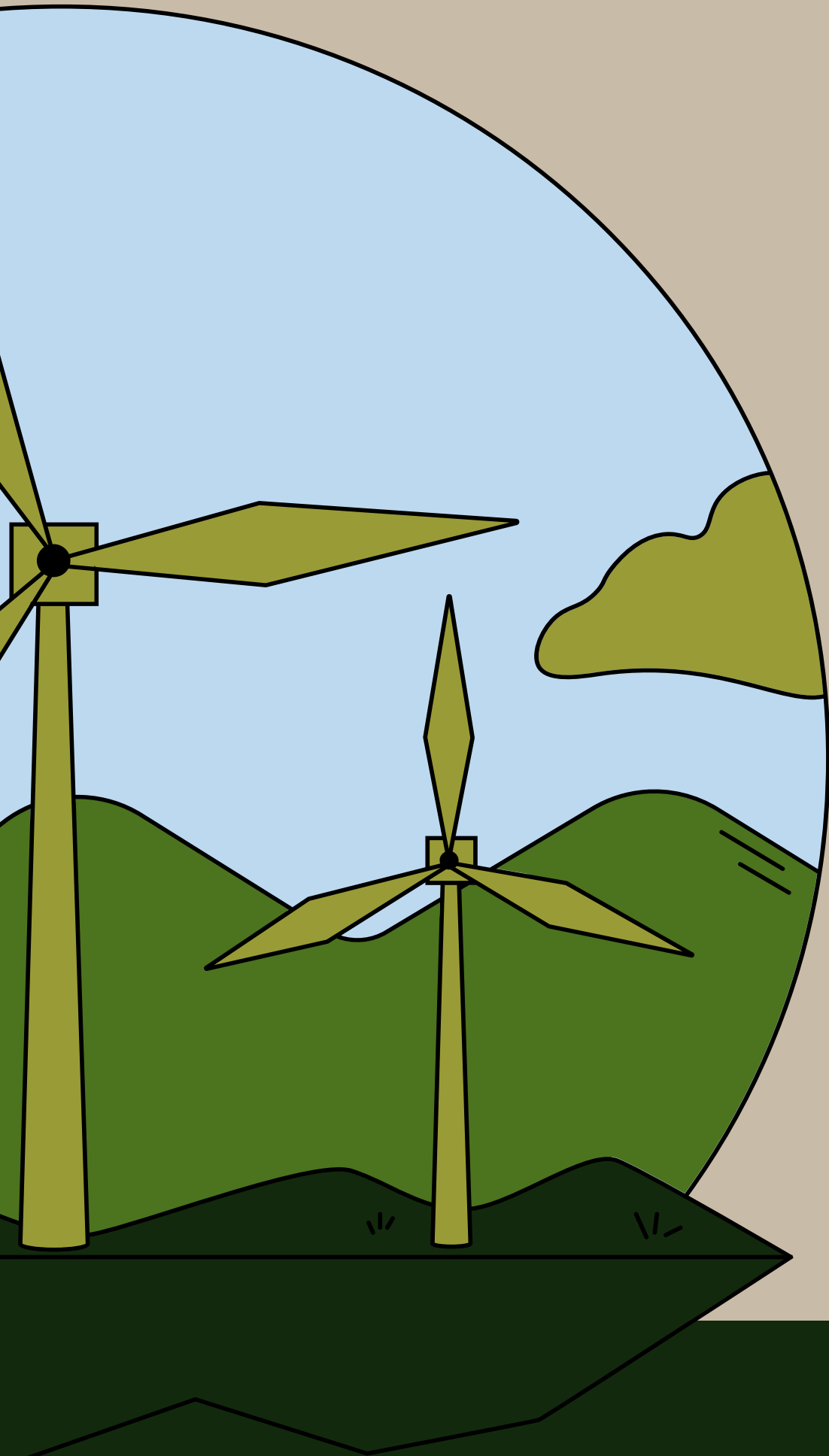
How and if clustering renewable energy technology creates the potential for customizable energy systems that facilitate a low-carbon future:

- 1. What types of environments are SHRECs forming in?*
- 2. Are there common factors between operational renewable energy cluster projects that could be encouraged in future potential projects?*

Land-energy nexus⁹, energy geography^{10,11}, and ecosystem services^{12,13} approaches

Methodology

- Review of preexisting literature to determine factors that may impact interactions between
- Make use of a global dataset of renewable energy clusters being created by the RE-Imagining Social Energy Transitions (RESET) CoLaboratory at University of Victoria
- Construct a geospatial database of clusters and combine this data with publicly available land and demographic geospatial information



Factors of Energy Clusters

- What is the range of resource combinations?
- Is there a resource or required for clusters to function currently?
- What kinds of environments do they currently exist in?
- Are flexibility measures required for clusters to function currently?
- Are certain actors required for a cluster to function currently?
- Are clusters being formed in places that could compete with agriculture?

Colville Lake cluster

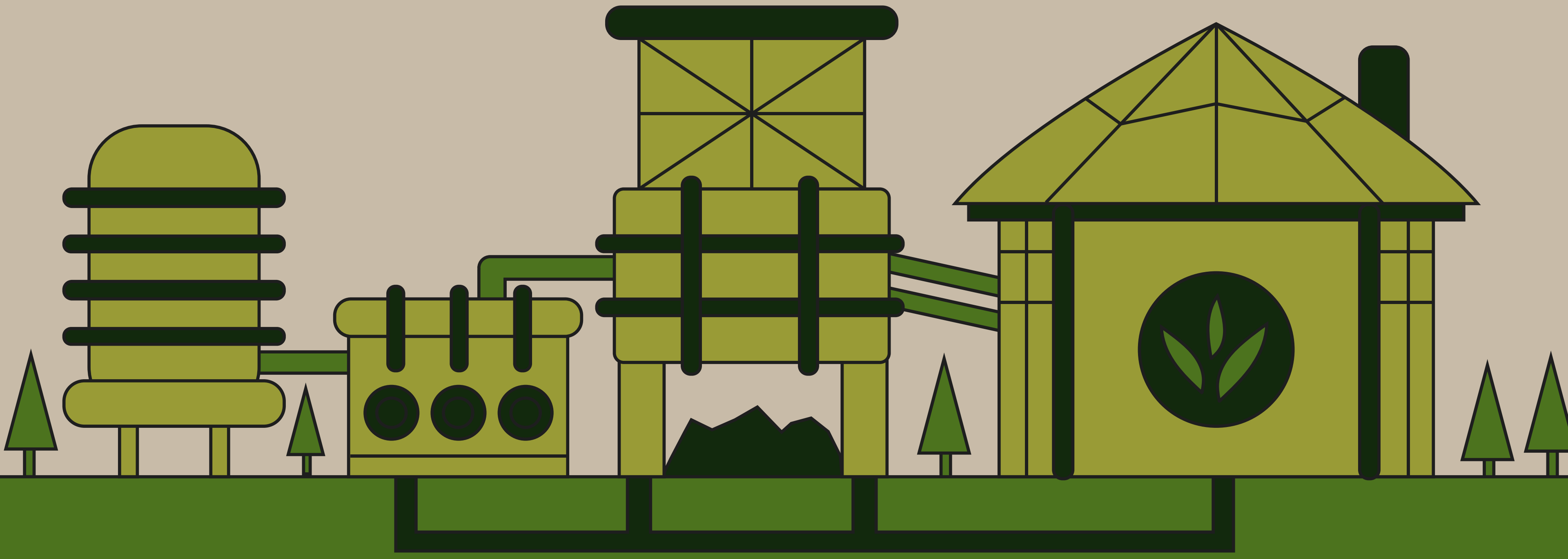
- 200 residents in the NWT, Canada
- Challenges with power outtages
- Expensive biofuel
- 2 solar arrays, 3 batteries, diesel generator
- Reduced annual power outtages from 51 to 10



Next Steps

- Population of total clusters in existence is unknown, convenience sampling was used. I will conduct multi-source cross comparison do identify potential biases from data origins.
- Cluster database will be converted into a GEOJSON format
- All data will be loaded into Google Earth Engine via a Python API and combined
- Multiple regression analysis using the actor/energy type as the dependent variable and the external database factors as independent variables

Thank you



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