SEEP

Solar Energy Estimations & Projections

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Data Needs Assessment

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6 Pages

Data Needs Assessment – Summary

This document details the progress of the solar energy estimation project – to date, most datasets needed have been acquired, and the process of organizing the data has already begun. A data inventory and checklist accompanies this document, providing additional details on the datasets needed for this project.

The data assessment was done in steps: brainstorming dataset themes, limiting the spatial extents, data modelling, finding the best data supply, determining costs for the data, locating the most recent data, gathering the appropriate attributes required, and finally, looking back to determine our gap assessment – listing the data we're missing.

Contents

1 Introduction – Dataset Themes

Many themes of data converge in solar energy: from the incoming solar radiation of an area, to the costs of solar energy systems. Because of the large variety of data available, an overview of the dataset themes was discussed, to limit and refine the project's scope.

The resulting dataset themes were condensed into the following list:

Solar radiation/insolation

- Is simulated using elevation surfaces, and other parameters
- Elevation data is produced from LiDAR datasets

Socioeconomic data

- Used to refine the extents within Airdrie, as needed

Building footprints

- Helpful information to reduce processing time
- Allows for rooftop suitability analyses

Community boundaries

- Helpful to limit study extents depending on location specified

Costs – Energy, Material, Installation, Maintenance

- Various costs to be implemented for estimations and projections

Building Addresses

- Used for geocoding purposes

2 Data Procurement Strategy

Data to this point in time has been entirely sourced from open sources, such as the Calgary Region Open Data website (Calgary Regional Partnership, 2016) or the NREL.

Most data required was found using this strategy. The gaps in data are being filled by contacting appropriate organizations. Section 11 discusses the data gap assessment.

3 Spatial Extents

The spatial extent of our solar energy estimation web application will be the city limits of Airdrie, Alberta, as shown below.

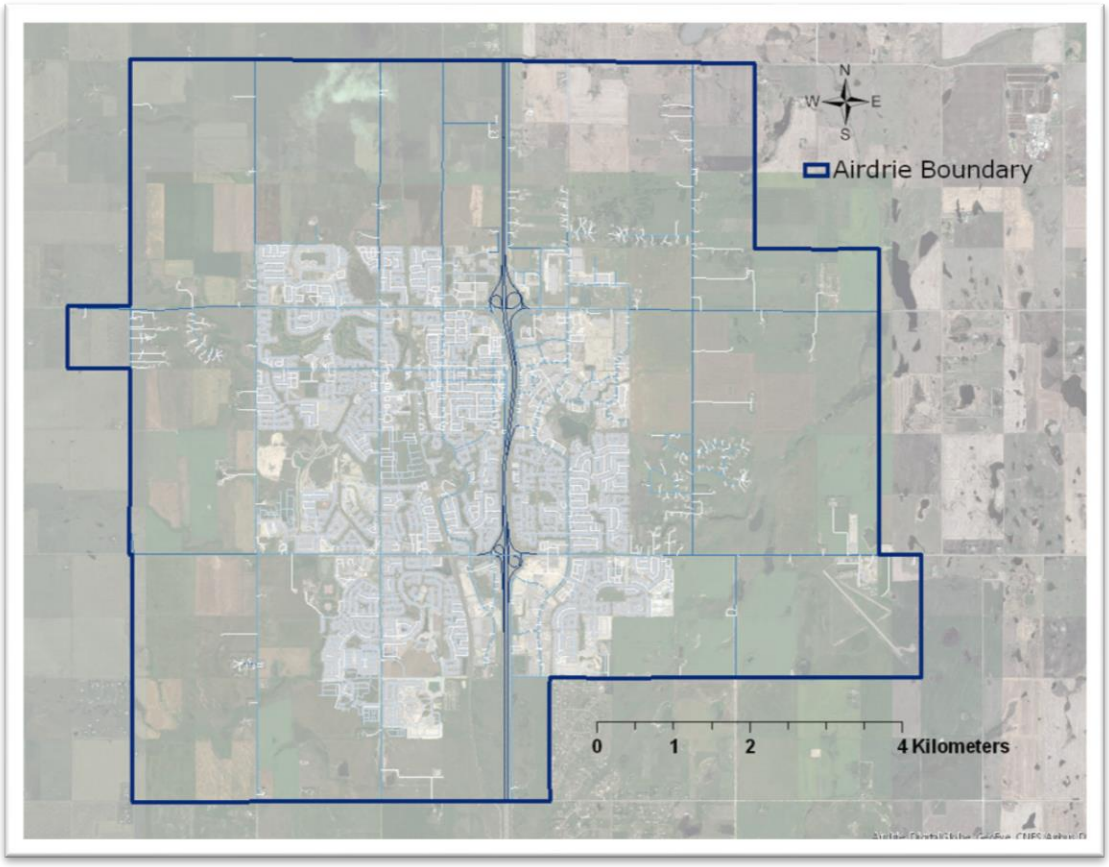

Figure 1 - Spatial extents of the project; Airdrie, Alberta, located to the North-East of Calgary.

4 Data Model

The data required for this project will be a mix of both raster and vector. The majority of the data will be in raster format (surfaces generated: solar surfaces and LiDAR based elevation surfaces as examples) with some vector format data (building footprints, communities, and socioeconomic data). Using a combination of raster and vector makes the most sense as each have strengths for the building a solar tool.

5 Data Sources & Vendors

The data that is required for our web application will be supplied by ENMAX, the NREL, and the City of Airdrie. From ENMAX we are seeking energy consumption data; this will assist us in providing more information on the app and also assist in identifying which communities might receive more benefit from a renewable energy system. The City of Airdrie has provided their data on the Calgary Regional Partnership Open Data site (2016), and includes socioeconomic information, as well as shapefiles for their infrastructure, boundaries, and building footprints. Costs data – energy, material, installation, maintenance – will come from a variety of sources, such as the City of Airdrie, the NREL and ENMAX.

6 Anticipated Acquisition Costs

The anticipated data acquisition costs are estimated to be zero dollars. All of the necessary data is available from open sources, or will be acquired through contacts – these may require agreements to be signed, such as non-disclosures or data-sharing.

7 Expected Data Possession Date

Our team is planning on having the entirety of the data collected by June 30, 2016 at the latest. This will ensure that we have enough time to provide a completed and polished end product. If for any reason the data, we plan to collect is not attainable we will refer to our project plan's risk management table – and may require planning changes.

8 Data Time Span Requirements

Our data will need to be relatively modern; this is due to the nature of Airdrie's population growth. The city of Airdrie estimates that between the years 2014 and 2015 the city's population grew by 5,331 people or 15 new residents per day. This growth has reflected in the number of new homes that have been built since April 15th 2015: a total of 1,620 new homes had been built, early in the year (City of Airdrie, 2015).

Datasets for LiDAR and imagery were updated recently, in 2015, and will be used for this project. Socioeconomic and cost data is also recent, with census information available for 2015, and cost information is largely modern as well – the NREL's data was updated in 2016 (City of Airdrie, 2015 & NREL, 2016).

9 Level of Detail – Resolutions Required

The level of detail needed is tied directly to the elevation data. The better resolution of data that can be acquired will directly influence the accuracy and resolution of the outputs generated by the solar radiation tools – excellent LiDAR data for Airdrie was found on the Open Data site.

Accurate energy cost information is still needed, and being sought out – the better the accuracy by location, the more accurate the cost comparisons will be. Yet, costs for the solar energy systems can still be accurately determined using the NREL's studies (NREL, 2016).

10 Data Attributes Needed

The specific data attributes needed to complete this project include:

- Solar radiation per square meter (in Wh/m^2)
- Cost of energy by location ($/kWh)
- Cost of solar energy systems by square meter
- Building addresses
- Installation costs for solar energy systems
- Maintenance costs for solar energy systems

Other values required can be derived with calculations based on literature review (NREL). This list is not exhaustive, as many attributes may be intermediates, and used in system processes.

11 Data Gap Assessment

At this point in time our group has acquired the necessary elevation data (LiDAR) and shapefiles from the City of Airdrie. We are working towards collecting better accuracy energy use and cost information, and we will continue to refine system cost data found – by filtering the data so it reflects our spatial extents better.

The missing data is helpful but not required to proceed with the project; producing an efficient estimation tool is the main goal, and can be done with the data already on hand. In the even that suitable energy cost and use data cannot be acquired, it will be estimated from socioeconomic data – this would be disclosed to the users of the tool and web app produced.

12 References

Calgary Regional Partnership. (2016). Calgary Regional Partnership Open Data. Retrieved from: http://www.calgaryregionopendata.ca/ on June 21, 2016.

City of Airdrie. (2015). 2015 Official Census Results. Retrieved from: https://www.airdrie.ca/index.cfm?serviceID=1090&ID=374 on June 21, 2016.

National Renewable Energy Laboratory (NREL). (2016). Retrieved from: http://www.nrel.gov/ on June 21, 2016.