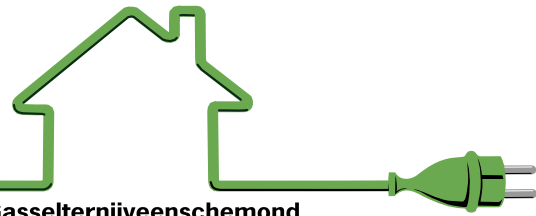# Sustainable energy in de Veenkoloniën
Communicating rooftop solar potential

Jeroen Schilleman, Georgios Anastasiou, Samantha Martín del Campo Muñoz, Hans Nienhuis
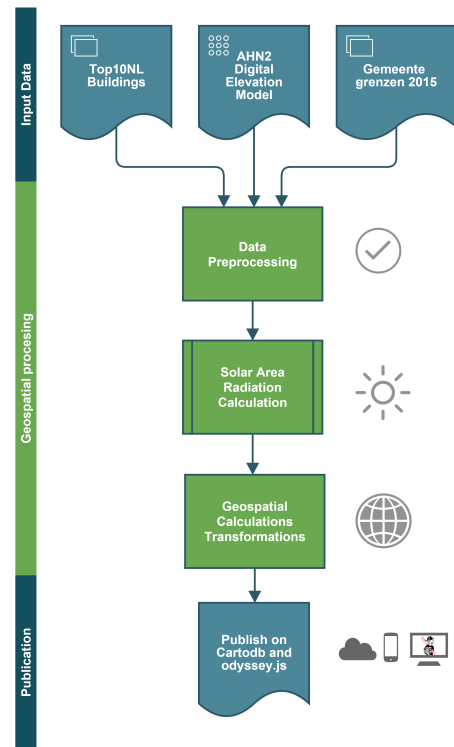*MSc Geo-Information Science, Wageningen University*

Gasselternijveenschemond

Introduction

The **Veenkoloniën** are located in the north of the Netherland. Energy production by peat excavation and gas extraction has been an important economic driver in this area since the beginning of the industrial era. **Energie Bureau Veenkoloniën** started a pilot in 2013 to aid in the proces of creating awareness and to form a stronger civic society focused on local, small-scale energy production and energy saving measurements rather than large scale energy harvesting. Achieving **public participation of the villagers** in this process is crucial.

For the village of Gasselternijveenschemond, it resulted in a **Village Energy Plan** (dorpsenergieplan). Part of the plan is creating a PR Van to inform inhabitants of several Veenkolonial villages about energy saving solutions and the potential of their home roofs for solar power. By providing an **easy to understand application**, the villagers are stimulated to discover the potential of this source of energy within their own environment. Estimates of the economical break-even point, the yearly return, and the initial investment costs are shown.
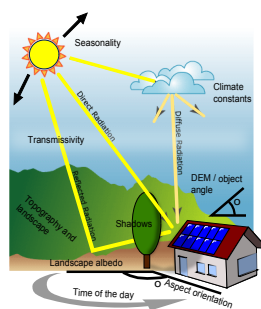
About the application

The application's primary function is to (a) **visualize** and (b) **communicate** the potential for Photovoltaic (PV) panels within Gasselternijveenschemond. It accomplishes this by providing users a roof top view within which the application will show an estimation of the following information:
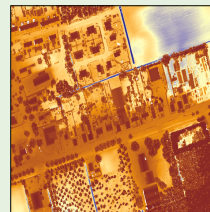
- **Total suitable roof area for solar panels**
- **Number of panels per roof**
- **Inital investment costs of installation**
- **Yearly yield in electricity and revenue**
- **Estimated break-even point of the investment**

The calculation algorithm is part of the ArcGIS Solar toolset, which makes the algorithm repeatable for other villages. The final application is hosted on CartoDB, enabling the application to be free of charge. It is usable for the intended end-use, and accessible directly via a browser interface.

Geospatial variables

- **Geographical constants**
  Latitude and surface area of the village, solar constants, climate assumptions
- **Cadastral, and Elevation data**
  Number of buildings, location, aspect, allowance, and shadow causes
- **Roof properties of each building**
  For the whole village, the slope, orientation, size, and shape of each roof is calculated in order to make yield calculations possible for each building. This data is derived from the AHN2 Digital Elevation Model (DEM)
- **Investment**
  Mounting, and connecting costs of a solar panel installation job
- **Properties of solar panels**
  Pricing, type, yield, aging, and yield degredation

Methodology

Physical factors included

Rooftop calculations

The **AHN2 DEM** is used to obtain highly accurate height data of both objects and roofs. The resolution is 0,5 m^2 and this dataset is available for the whole Netherlands, which makes it possible to request data with the same detail for every other village in- and outside the Veenkoloniën

Zoning data from the Casaster and Top10NL is used as an overlay to clip the buildings from the DEM. Every building got its own identity by the cadastral registration number, making separate calculation per building possible.

Solar Area Calculation is used to determine incoming radiation (kWh/m^2), for the entire Area. After that Rooftops are extracted and categorized into low, medium, and high potential.
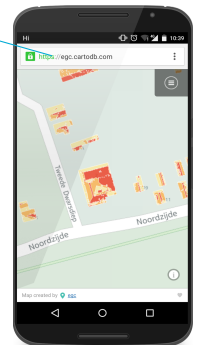
Application

CartoDB - Nokia Here Basemap
The basemap is georeferenced and allows searching by address.

Browser-interface
Enabling the application to be used platform-indipendent and usable on several tools (PC, laptop, tablet, phone)
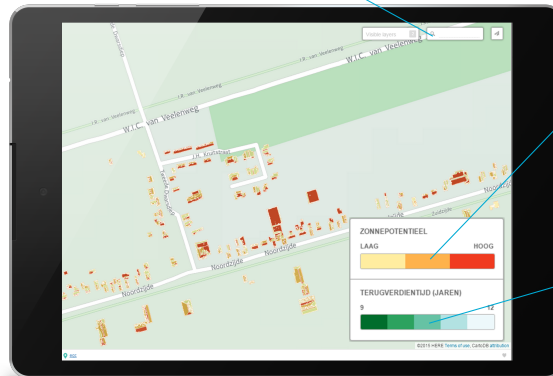
Roof potential
Shows the suitability of a roof in three discrete classes, for quick indication purposes

Break-even time
The break-even between costs and yield for individual houses are visualized using a choropleth map

The Village Energy Plan

The Village Energy Plan has been established to state the intentions of saving energy and promoting sustainable energy sources to generate innovation and employement. It deals with more than just the rooftop solar potential. The setup of the Village Energy Plan is also to fight the negative public image of the Veenkoloniën by stimulating the **cohesion of communities**.

Clickable roofs
Just click on your roof, by visually locating your home or with some help of the Village Energy Team when in the PR Van

TERUGVERDIENTIJD (JAREN)	
10	
GESCHATTE INSTALLATIEKOSTEN €	17900
JAAROPBRENGST HOOG GESCHAT €	1992.72
JAAROPBRENGST LAAG GESCHAT €	1337.22
AANTAL PANELEN 1.6M X 1M	44
OPPERVLAKTE ZONNEPANELEN M2	72.25

Accuracy
Resolution of 50 cm (0.25 m^2) enabling a highly accurate estimation

Tutorial - Oddysey.js
A storymap created with Oddysey.js is used to demonstrate the application´s functionality

Dutch language
The application is primary meant for use in the Veenkoloniën: no need for English or German.

Village Energy Project: the stakeholders

- **Inhabitants of the Veenkolonial villages**
  Farmers, tenants, house-owners and small businesses
- **Energiebureau Veenkoloniën**
  Initiative to share knowledge about local energy projects in the Veenkoloniën
- **Kenniswerkplaats Veenkoloniën**
  Joint initiative between Energiebureau Veenkoloniën, AOC Terra (Secondary School), Van Hall Larenstein (University of Applied Sciences), and the Wageningen University it aims to improve and stimulate knowledge and innovation in the Veenkoloniën area
- **Village Council of Gasselternijveenschemond**
  Strives to be/become a national forerunner in sustainable energy use
- **Aa en Hunze Municipality**
  The municipal body strives to support the local community
- **Village Energy Team**
  Organizes activities to raise awareness and spark enthusiasm in villagers.
- **Enexis (future)**
  The local grid operator. Needs to be involved when the Village Energy Project gains momentum, but is not involved yet at this moment

Publishing solutions

The application runs on **CartoDB**, an open source solution for showing and visualizing spatial data. A tutorial has been made using **odyssey.js**.

Concluding remarks

In creating **awareness** and enabling inhabitants of the Veenkolonial villages to save and produce energy locally, solar power potential is highly important, especially taking into account the historic function energy production has played in this region. Calculating the theoretical roof production yield in a realistic way, and presenting this in a user-friendly, accessible way is feasible as has been demonstrated by this short term project.
The application works with a free to use, and open dataset which can be created per village and is platform independed. **Computer processing power** is the main limiting factor, as necessary processing time is quite long (using a desktop pc it takes 72 hours for a village like Gasselternijveenschemond.

WAGENINGEN UR — For quality of life
KENNISwerkplaats Veenkoloniën
Energie bureau VEENKOLONIËN
Agenda voor de Veenkoloniën
DORPSBELANGEN
Energy Consultancy Team