



RuRES

Renewable energy sources and
energy efficiency in the function of rural development

A. TITOV; R. BARNA; ZS. KÖMÜVES; SZ. BERKE, K.
TÓTH; B. NAGY; B. HORVÁTHNÉ K.

REGIONAL RENEWABLE ENERGY POTENTIAL IN HUNGARY. CASE OF KOPPANY VALLEY.

Hungarian Regional Science Association 15th Annual Meeting

The Dualities of Regional Science and Studies

Mosonmagyaróvár, 19–20 October 2017

Széchenyi István University Faculty of Agricultural and Food Sciences

CONTENT

- RuRes project. Aims of the research.
- Regional solar energy potential
- Regional biomass energy potential
- RES public acceptance survey
- Conclusions

RURES PROJECT. AIMS OF THE RESEARCH.

RENEWABLE ENERGY
SOURCES AND ENERGY
EFFICIENCY IN THE
FUNCTION OF RURAL
DEVELOPMENT

- INVESTIGATION OF THE SOLAR, THE WIND AND THE BIOMASS POTENTIAL OF ELIGIBLE SETTLEMENTS
- SURVEY OF THE ATTITUDE, THE SOCIO-CULTURAL CIRCUMSTANCES AND ENVIRONMENTAL CONSCIOUSNESS OF THE CITIZENS OF RURAL AREAS REGARDING RES AND EE



Magyarország-Horvátország
Határon Átnyúló Együttműködési Program



RESEARCH AREA

Koppányvölgy Natúrpark  

Koppányvölgy Natúrpark túristatérképe, látnivalói és szolgáltatásai
8,075 views

[SHARE](#)

Koppányvölgy Natúrpark

 Koppányvölgy Natúrpark

Koppányvölgy Natúrpark települések

 Törökkoppány

 Szorosad

 Somogydöröcske

 Somogyacsa

 Koppányszántó

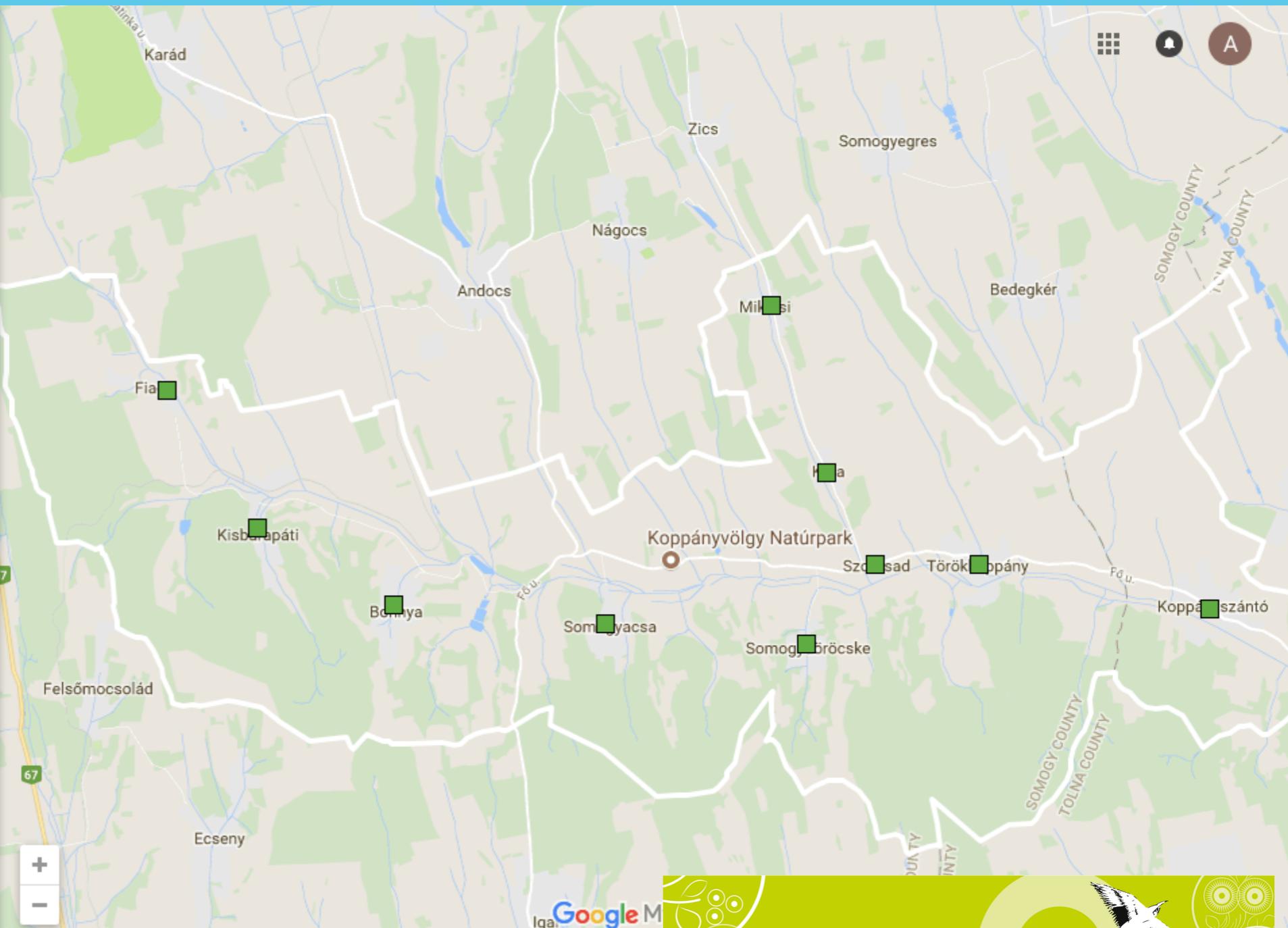
 Bonnya

 Kisbárapáti

 Fiad

 Kára

 Miklósi



Google Map



Völgy Hangja
Egyesület

ALAPÍTVA : 2004

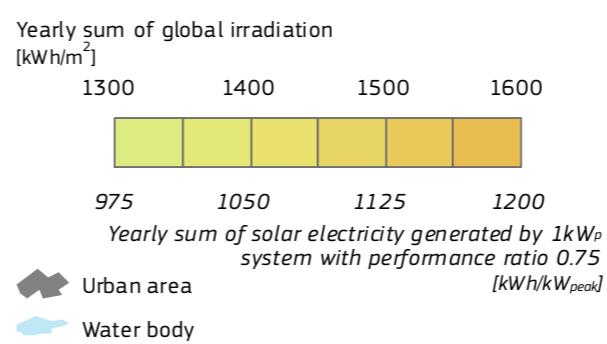
SOLAR ENERGY POTENTIAL IN HUNGARY

The average amount of the inland solar energy potential is 1000-1150 kw/h



Global irradiation and solar electricity potential
Optimally-inclined photovoltaic modules

HUNGARY / MAGYARORSZÁG



Projection: Lambert Azimuthal Equal Area, WGS84, lat 52° lon 10°
Source of ancillary data: CORINE Land Cover
DTM SRTM-30
GISCO database
Geonames
Natural Earth

REGIONAL SOLAR ENERGY POTENTIAL

KOPPANY VALLEY

Methodology based on PVGIS photovoltaic software

 PHOTOVOLTAIC GEOGRAPHICAL INFORMATION SYSTEM

European Commission > PVGIS > Tools > Interactive tools

Home Tools Download Documentation About us News

Cursor:
Selected: 46.602, 18.049
Elevation (m): 131

Use terrain shadows:
 Calculated horizon
 Upload horizon file

[Download csv](#) [Choose File](#) no file selected

GRID CONNECTED

- TRACKING PV
- OFF-GRID
- MONTHLY DATA
- DAILY DATA
- HOURLY DATA
- TMY

PERFORMANCE OF GRID-CONNECTED PV

Solar radiation database*
PV technology*
Installed peak PV power [kWp]*
System loss [%]*

Fixed mounting options

Mounting position*
Slope [°] 35
Azimuth [°] 0

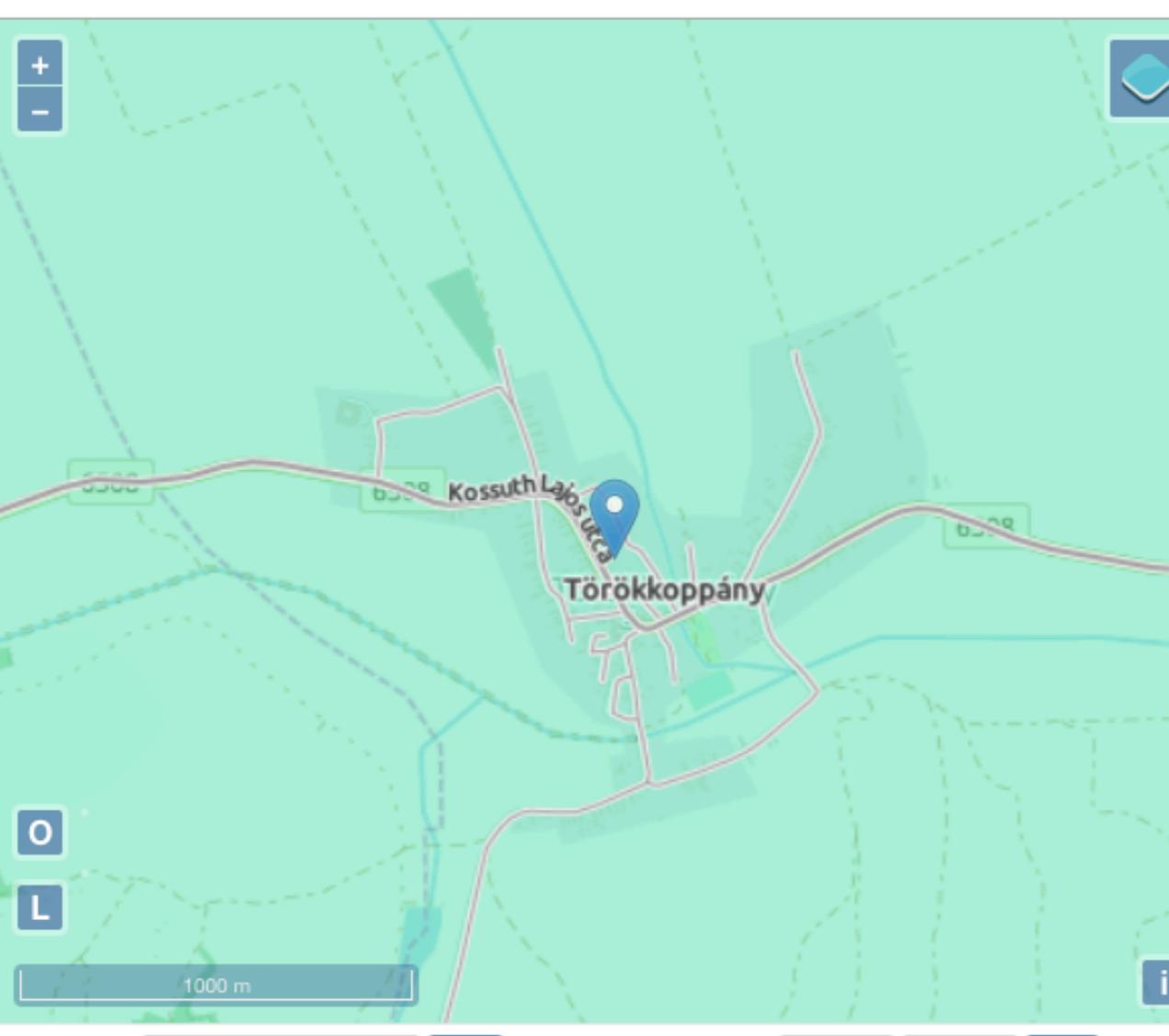
PV electricity price
PV system cost (your currency)
Interest [%/year]
Lifetime [years]

Building integrated
 Optimize slope
 Optimize slope and azimuth

[Visualize results](#) [Download csv](#)

O
L
1000 m

Address: Eg.Ispra, Italy Go! Lat/Lon: 46.602 18.049 Go!



REGIONAL SOLAR ENERGY POTENTIAL

KOPPANY VALLEY

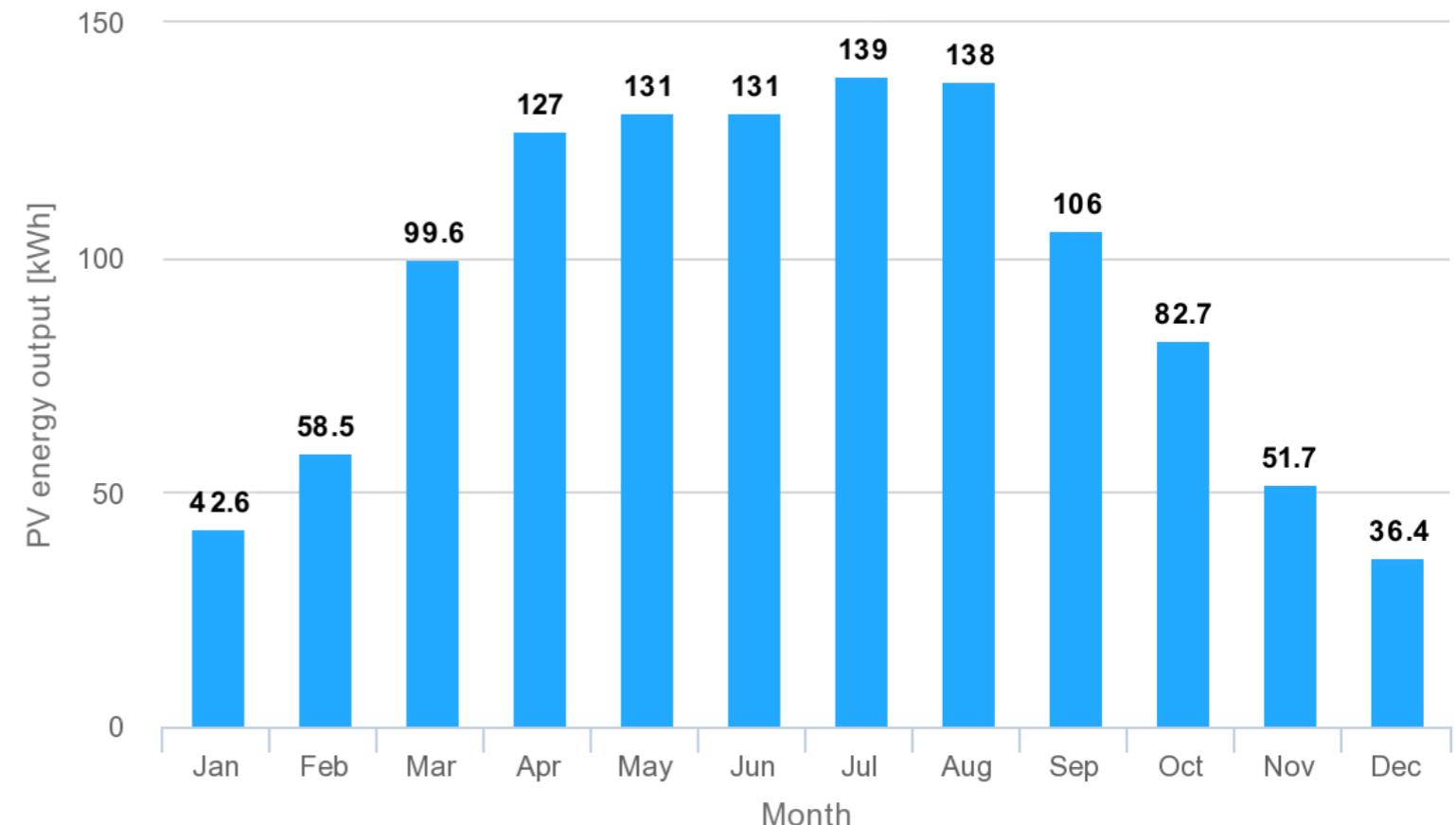
Crystalline silicon technology

Table 1

Provided inputs:	
Location [Lat/Lon]:	46.602, 18.049
Horizon:	Calculated
Database used:	PVGIS-CMSAF
PV technology:	Crystalline silicon
PV installed [kWp]:	1
System loss [%]:	14
Simulation outputs:	
Slope angle [°]:	35 (opt)
Azimuth angle [°]:	-7 (opt)
Yearly PV energy production [kWh]:	1140
Yearly in-plane irradiation [kWh/m ²]:	1490
Year to year variability [kWh]:	61.30

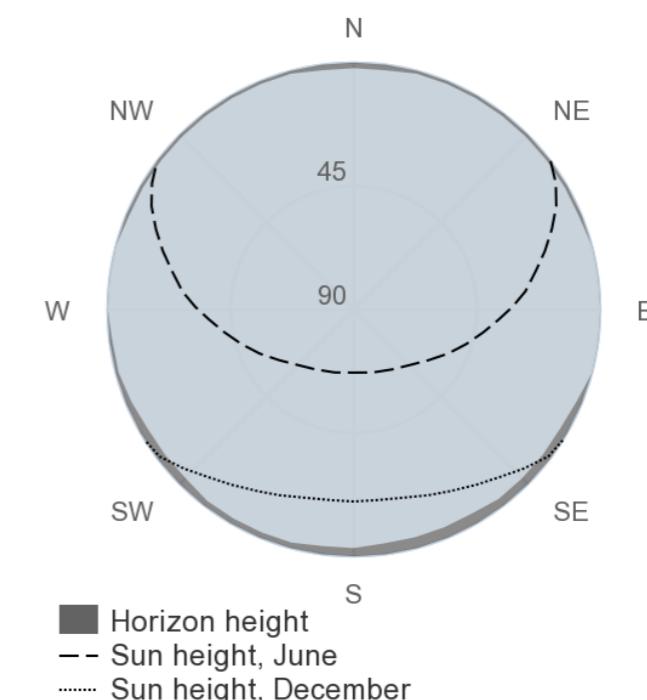
Monthly energy output from fix-angle PV system

(C) PVGIS, 2017



Outline of horizon

(C) PVGIS, 2017



REGIONAL SOLAR ENERGY POTENTIAL

KOPPANY VALLEY

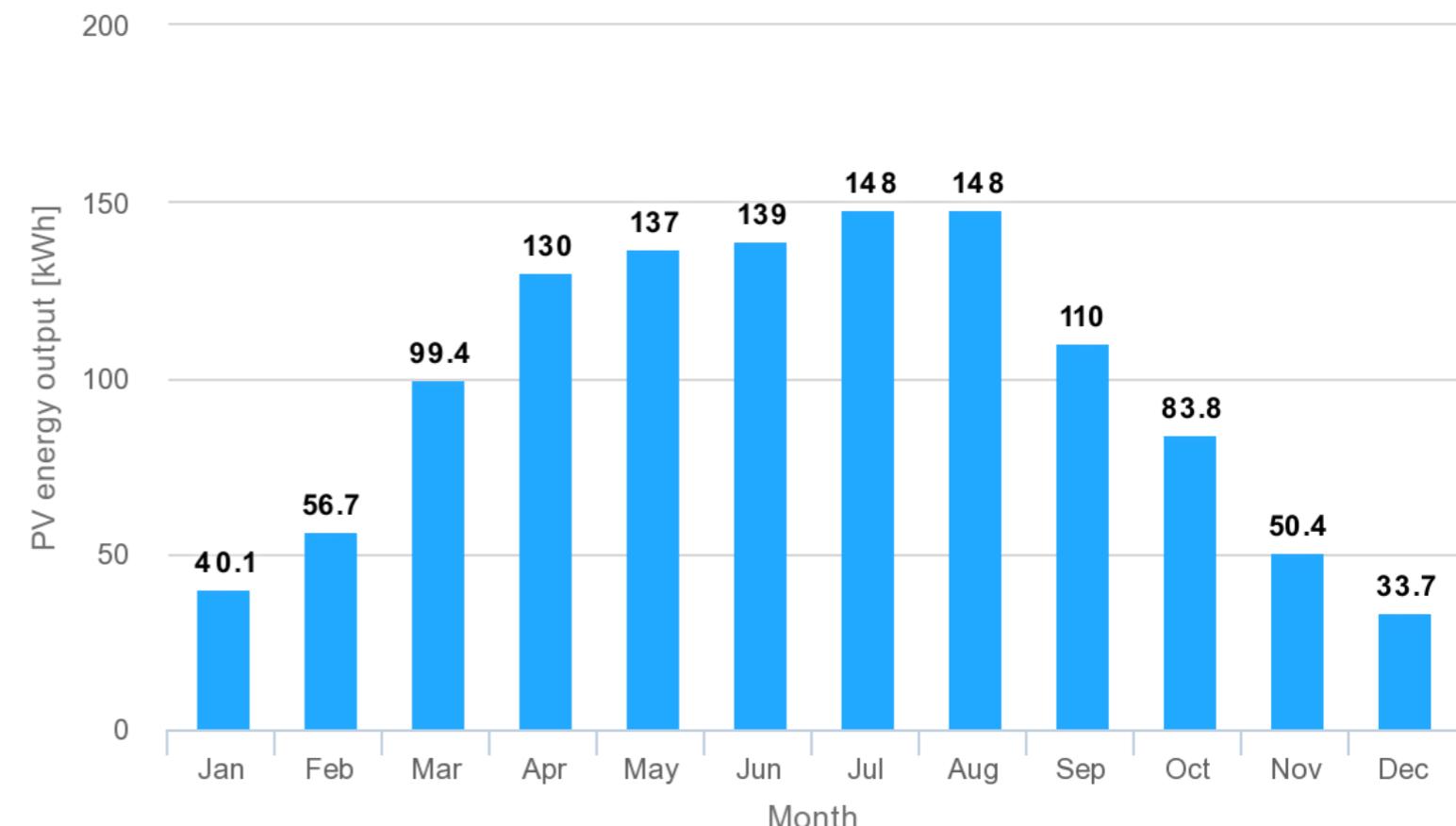
Cadmium telluride technology

Table 1

Provided inputs:	
Location [Lat/Lon]:	46.602, 18.049
Horizon:	Calculated
Database used:	PVGIS-CMSAF
PV technology:	CdTE
PV installed [kWp]:	1
System loss [%]:	14
Simulation outputs:	
Slope angle [°]:	35 (opt)
Azimuth angle [°]:	-7 (opt)
Yearly PV energy production [kWh]:	1180
Yearly in-plane irradiation [kWh/m ²]:	1490
Year to year variability [kWh]:	65.70

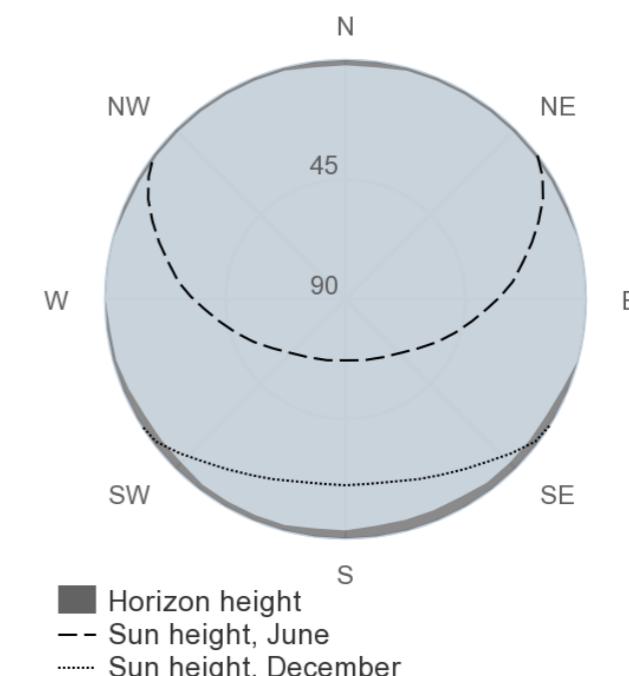
Monthly energy output from fix-angle PV system

(C) PVGIS, 2017



Outline of horizon

(C) PVGIS, 2017



REGIONAL SOLAR ENERGY POTENTIAL

KOPPANY VALLEY

Regional solar energy potential based on **PVGIS 5** might be improved through:

- Usage of different solar radiation database (PVGIS-CMSAF, PVGIS-SARAH, PVGIS-ERA5, PVGIS-COSMO);
- Different PV cells technology (Crystalline silicon, CdTE, CIS);
- Adding tracking options.

REGIONAL SOLAR ENERGY POTENTIAL

KOPPANY VALLEY

Current situation in the research:

PVGIS software allows 90m resolution by the solar potential map;

- horizon height is strictly built on the landscape shape;

Improvement in the project:

6-10m resolution of the map: detailed horizon file to be uploaded to the software's simulation model;

- incorporating the shadowing effect of buildings and trees...
- plus identification of ideal surfaces (size, slope, N-S exposure);

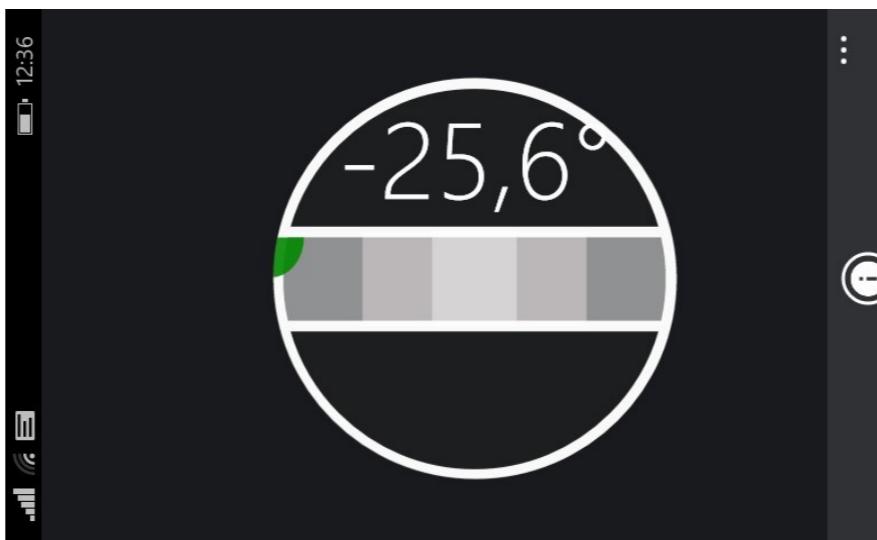
Method:

- field research with a manual device for measuring the horizon height at a certain place;
- measuring points will be defined as grids, supplemented with GPS information.

REGIONAL SOLAR ENERGY POTENTIAL

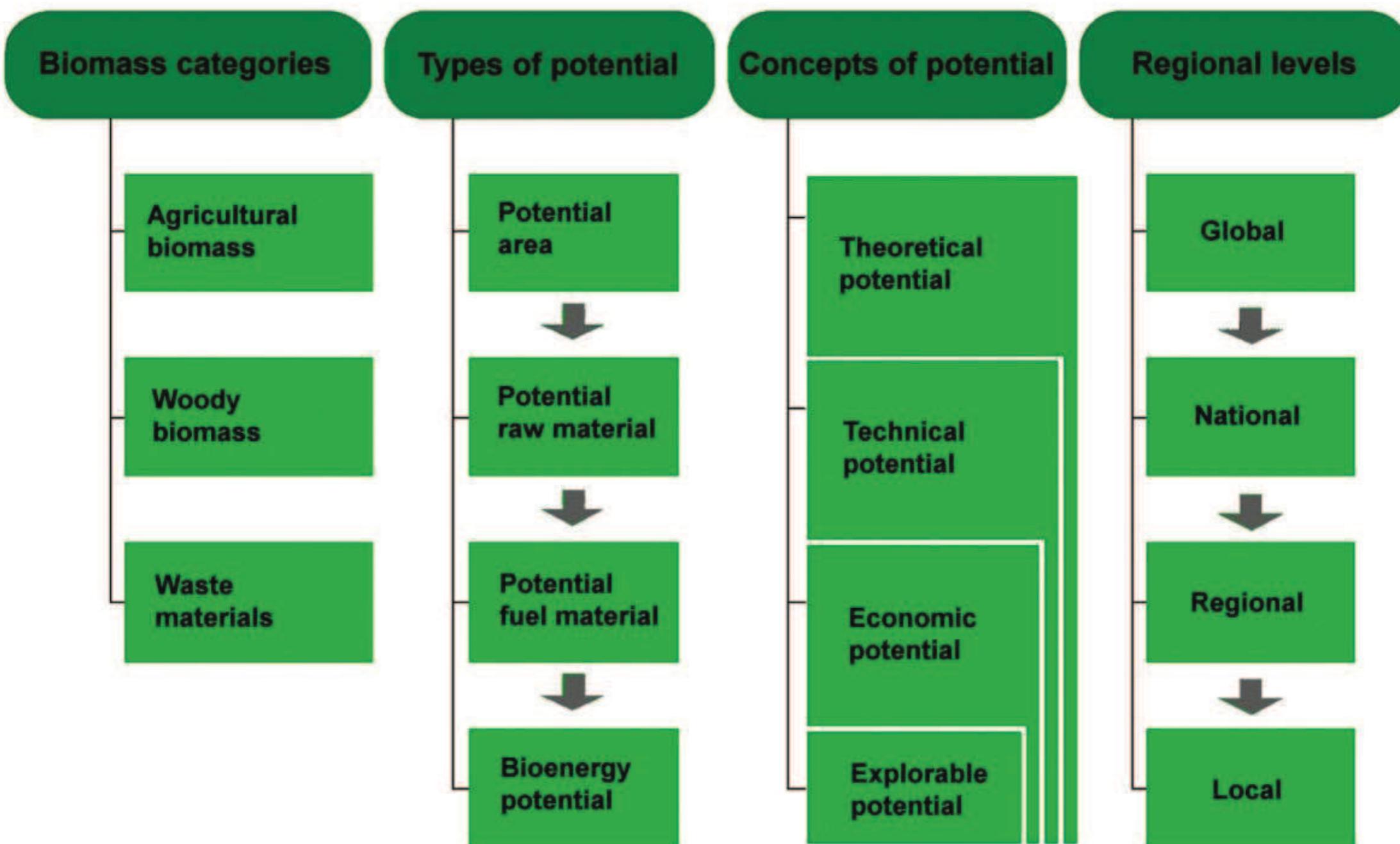
KOPPANY VALLEY

Field experiment



BIOMASS ENERGY POTENTIAL

Biomass potentials form different point of views



Source: Schubert et al. 2012.

REGIONAL BIOMASS ENERGY POTENTIAL

KOPPANY VALLEY

Methodology based on MePar- Agricultural Parcel Identification System

keresés (település, település hrsz, blokkazonosító, koordináta)

HRSZ blokk

Válasszon megyét:
Somogy

Válasszon települést:
Törökkoppány

Helyrajzi szám keresése:
1 keres

A település nevét a felső keresőmezőben is megadhatja, akár helyrajzi számmal együtt.

Törökkoppány 1

térkép segítség bejelentkezés

keres

MePAR

200 m

2017 (2017-04-07)

Scale = 1 : 5 000

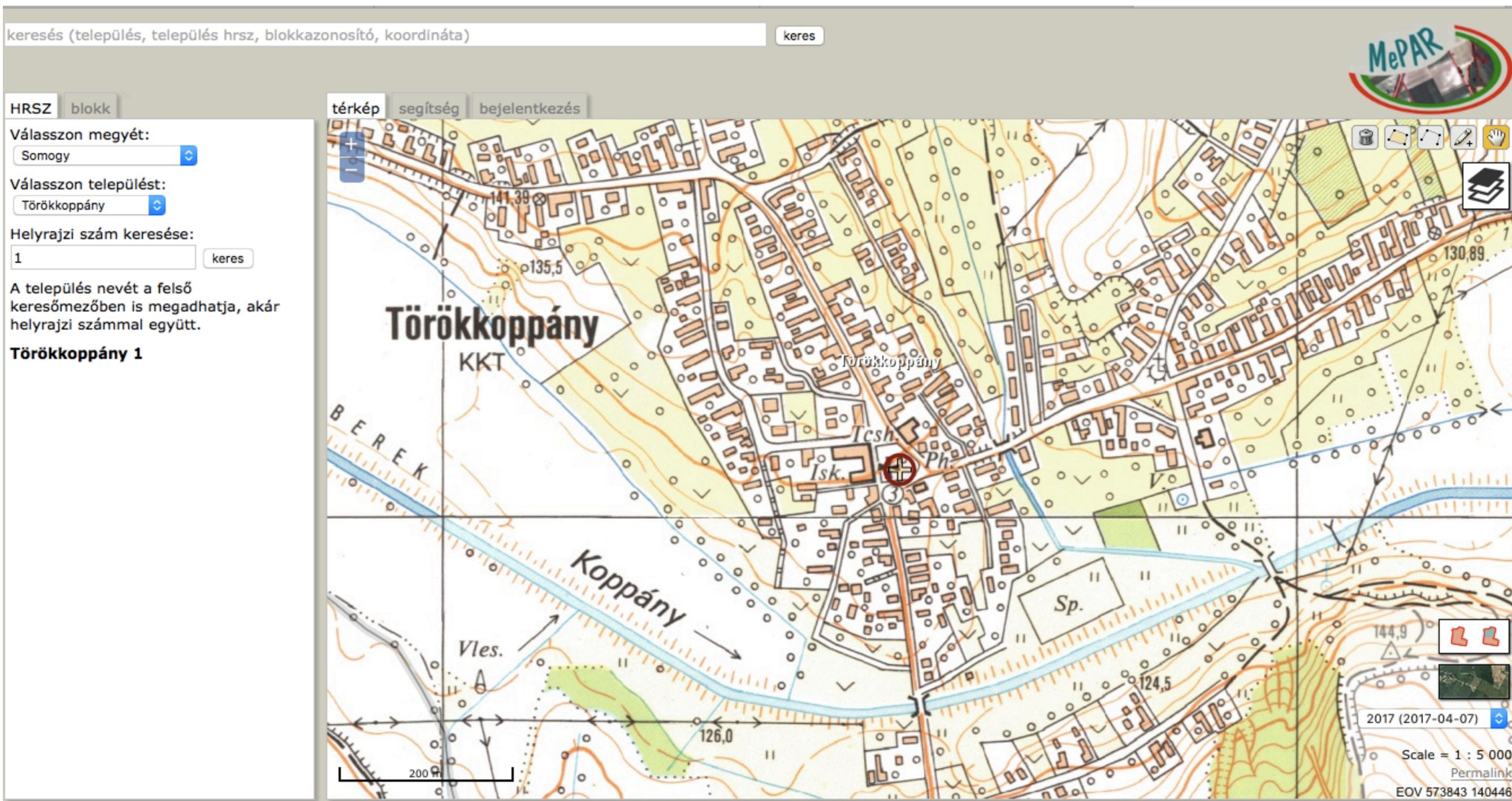
Permalink

EOV 573786 140319

REGIONAL SOLAR ENERGY POTENTIAL

KOPPANY VALLEY

MePar is also applicable for the solar installations on the buildings



REGIONAL BIOMASS ENERGY POTENTIAL

KOPPANY VALLEY

The biomass-based energy data are going to be collected by the following sources:

- MePar system;
- Local agricultural statistics;
- Waste management agency's data;
- Questionnaires for the local residents.

The questionnaire is focused on:

- General knowledge and awareness about RES (types of RES, information sources, reasons to use, etc.);
- Particular emphasis on biomass for energy purposes (domestically used amount of biomass, willingness to be involved into related community activities, influence on the local economy, etc.).

CONCLUSIONS

- Koppány valley is the target research area for the RuRes project;
- Estimated regional solar energy potential in Koppány valley is 1180 kWh that is a bit higher than Hungarian average;
- RES public acceptance survey will be conducted;
- Regional solar and biomass energy potential maps will be created based on collected data;
- Approbated methodology will be provided for other regions.

THANK YOU FOR ATTENTION

Corresponding author: Alexander Titov
alexander.titov62@gmail.com