



**INTERNATIONAL INSTEP SCHOOL
PRESENTATION**

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**INVESTIGATING THE ENERGY
SAVING POTENTIAL OF
BRATISLAVA'S HISTORIC
STREET**

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INVESTIGATING THE ENERGY SAVING POTENTIAL OF BRATISLAVA'S HISTORIC STREET

WHAT AM I GOING TO TALK ABOUT?

- RELEVANCE AND IMPORTANCE OF THE TOPIC
- OBJECTIVES
- LITERATURE REVIEW
 - SOLAR ENERGY, PV
- EXAMINATION OF THE BUILDINGS
- METHODOLOGY OF POTENTIAL ESTIMATION OF SOLAR ENERGY
- EXAMINATION ON THE ROOFS AND ON THE STREET LEVEL
- PRESENTATION OF THE RESULTS



[https://www.google.sk/search?q=hail+proof+solar+panels&hl=hu-SK&source=lnms&tbn=isch&sa=X&ved=0ahUKEwiO7MWT89DeAhUrJ8AKHWIUBOAQ_AUIDigB&biw=1920&bih=938#imgrc=nEzp7x4t1LG-PM:](https://www.google.sk/search?q=hail+proof+solar+panels&hl=hu-SK&source=lnms&tbn=isch&sa=X&ved=0ahUKEwiO7MWT89DeAhUrJ8AKHWIUBOAQ_AUIDigB&biw=1920&bih=938#imgrc=nEzp7x4t1LG-PM;)

RELEVANCE AND IMPORTANCE OF THE TOPIC

GROWING POPULATION, FAST GROWING ENERGY DEMAND

IS THERE AN UPPER LIMIT OF THE EARTH'S
SUSTAINABILITY, AND IF THERE IS, WHEN WE REACH

THIS?



BECOMING AN ENERGY CONSCIOUS CONSUMER

EUROPEAN PARLIAMENT AND COUNCIL :

DIRECTIVE 2010/31 / EC ON THE ENERGY
PERFORMANCE OF BUILDINGS

- they wanted to increase the number of nearly zero-energy buildings,
- in the future, the use of solar energy in buildings will come to the fore



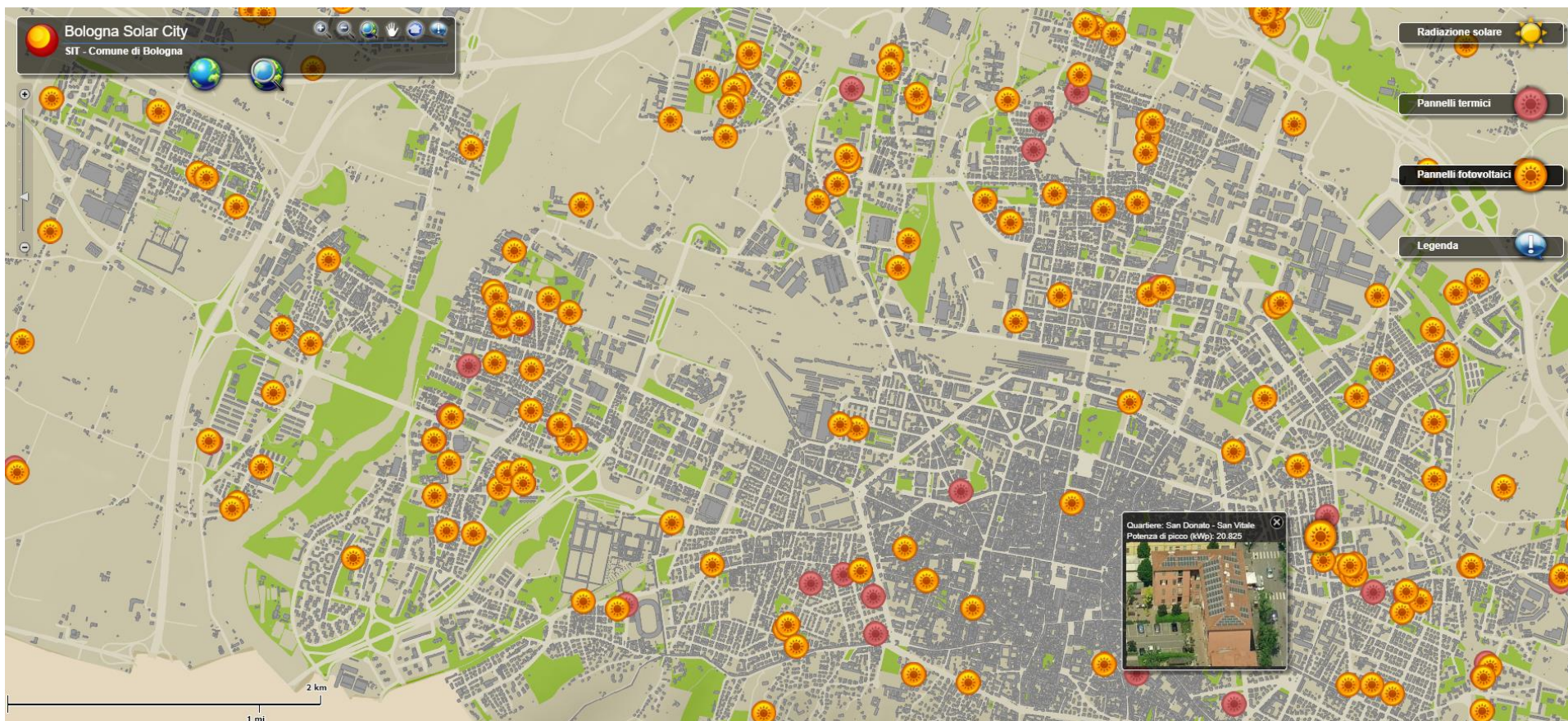
https://www.google.sk/imgres?imgurl=https://sitkeaselviytyja.fi/wp-content/uploads/2018/05/idealamppu-2.jpg&imgrefurl=https://sitkeaselviytyja.fi/2018/05/24/saanko-olla-inhimillinen/&h=1280&w=1920&tbnid=ilelGAnrnFm7_M&tbnh=183&tbnw=275&u sg=K_Z215w6C1T1T3alosT13wvJoMf2Q=&hl=hu-SK&docid=OtnBBR-NX_K6oM

URBAN INSTALLATION  ALMOST ONLY THE USE OF SOLAR ENERGY FROM
RENEWABLE SOURCES

TARGET:

USING A BROADER VARIETY OF SOLAR ENERGY IN THE CITIES
(SOLAR POTENTIAL ESTIMATION)

LITERATURE REVIEW



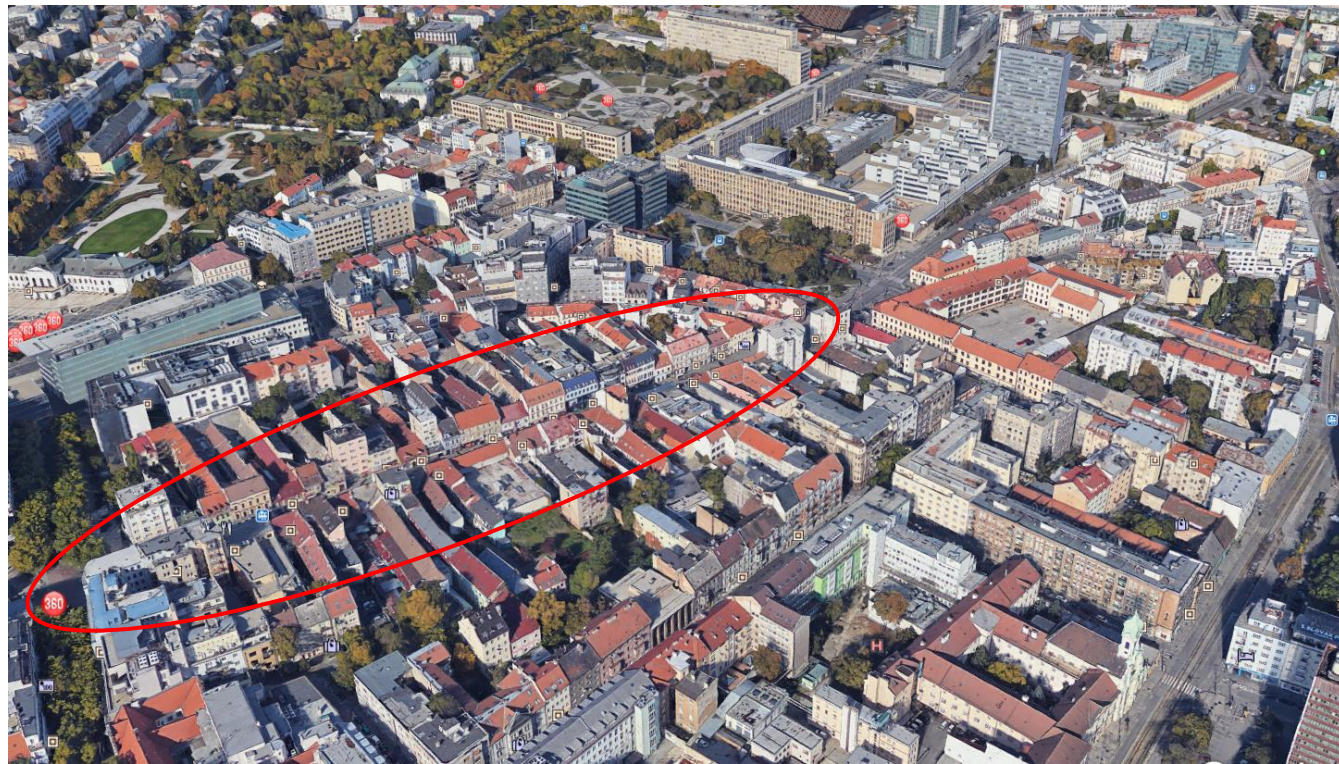
<http://sitmappe.comune.bologna.it/BolognaSolarCity/index.html>

SITE SELECTION

INSTEP PROJECT – V4 COUNTRIES

BRATISLAVA: OBCHODNA STREET

- TIGHT BUILDING
STRUCTURE
- MALL
- TRAM
TRANSPORT



Google Earth Pro

EXAMINATION OF THE BUILDINGS

EXAMINATION OF 2 BUILDINGS

PLANS – FROM SLOVAK UNIVERSITY OF TECHNOLOGY IN BRATISLAVA



THE CURRENT
STATE OF THE
ENERGY
EXAMINATION

INAPPROPRIATE
LAYERS.

DOES NOT MEET
THE REQUIREMENTS



EXAMINATION OF THE BUILDINGS

SUGGESTIONS FOR RENOVATION

- **FACADE CLEANING**
- **REPLACEMENT OF DOORS AND WINDOWS**
- **THERMAL INSULATION**
- **PLASTERING**
- **MODERNIZATION OF BUILDING EQUIPMENT**

ENERGY EXAMINATION FOR THE RENOVATED VERSION

HERE, EVERY LAYER ALREADY MEETS THE REQUIREMENTS (AA +)

	House 25		House 66	
	current	renovated	current	renovated
Annual heat loss [kWh/a]	282 694,38	112 236,64	342 088,94	95 553,09
Net heating energy demand [kWh/a]	252 551,00	84 042,34	310 535,09	64 847,54
Annual specific energy demand for heating [kWh/m ² a]	212,02	62,50	234,64	45,11
Annual specific energy demand for DHW systems	25,43	21,33	28,10	23,71

METHODOLOGY OF POTENTIAL ESTIMATION OF SOLAR ENERGYB

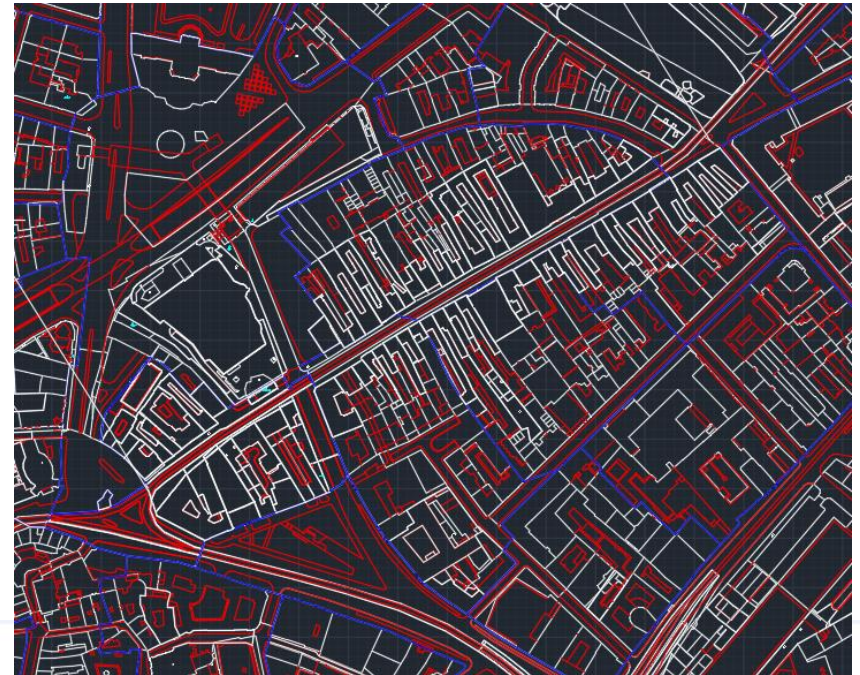
MODEL BUILDING

AVAILABLE:

- AUTOCAD 2D DRAWING
- ORTHOPHOTO

USED:

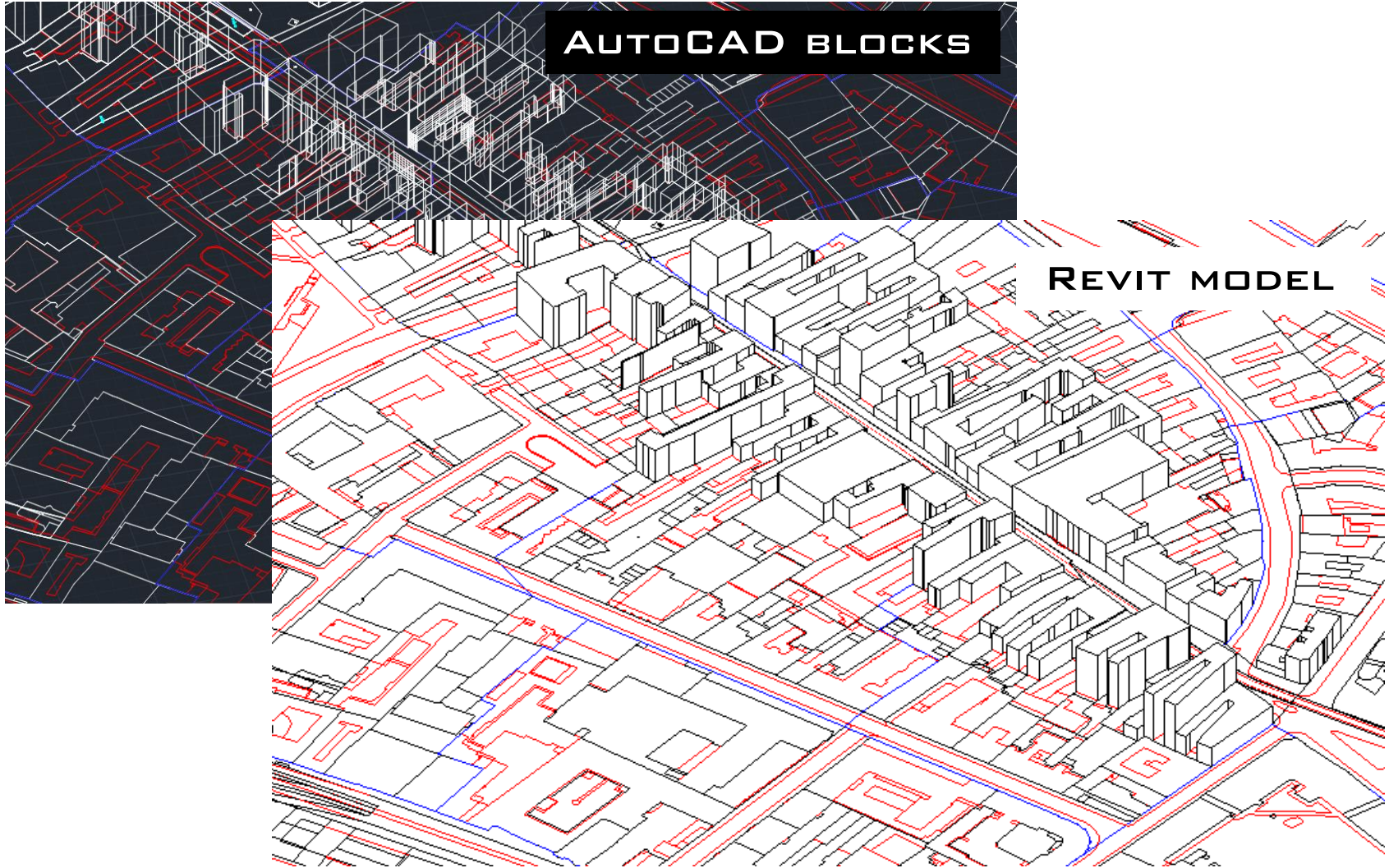
- GOOGLE MAPS DISTANCE MEASUREMENT



SOLAR ENERGYB POTENTIAL ESTIMATION METHODOLOGY

AUTOCAD BLOCKS

REVIT MODEL



SOLAR ENERGY POTENTIAL ESTIMATION METHODOLOGY

MODEL BUILDING

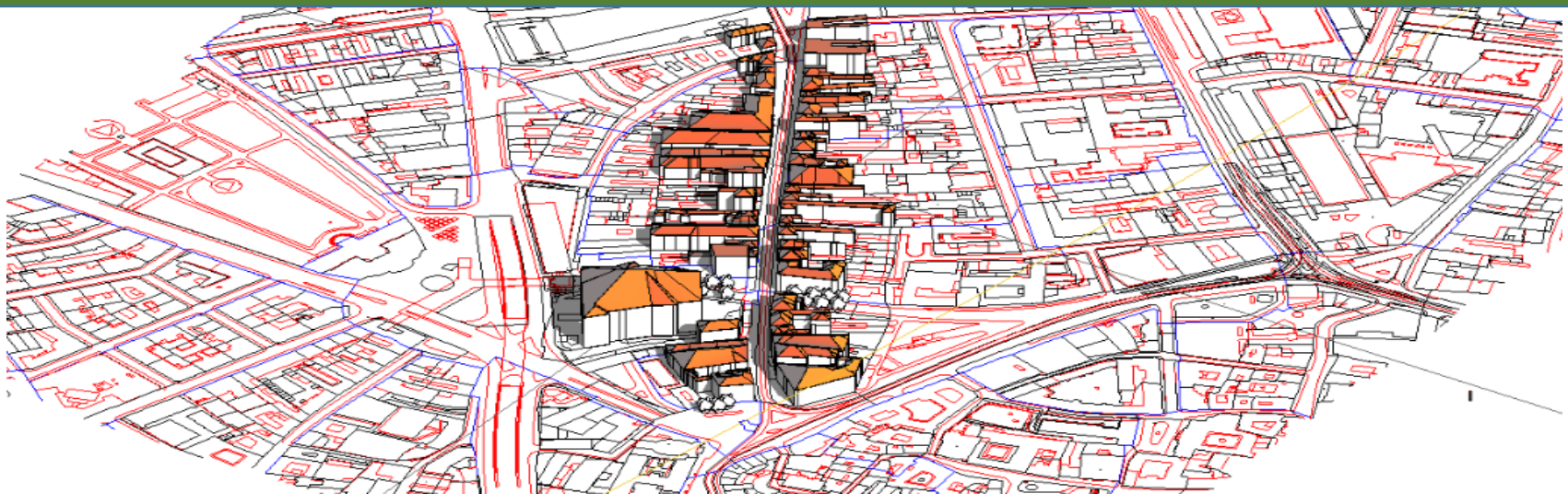
REVIT - USING INSIGHT SOLAR ANALYSIS

Entering data into the Revit:

- Geometry of the model
- Location
- 3D view



Results in Revit 3D view
Possibility to export data

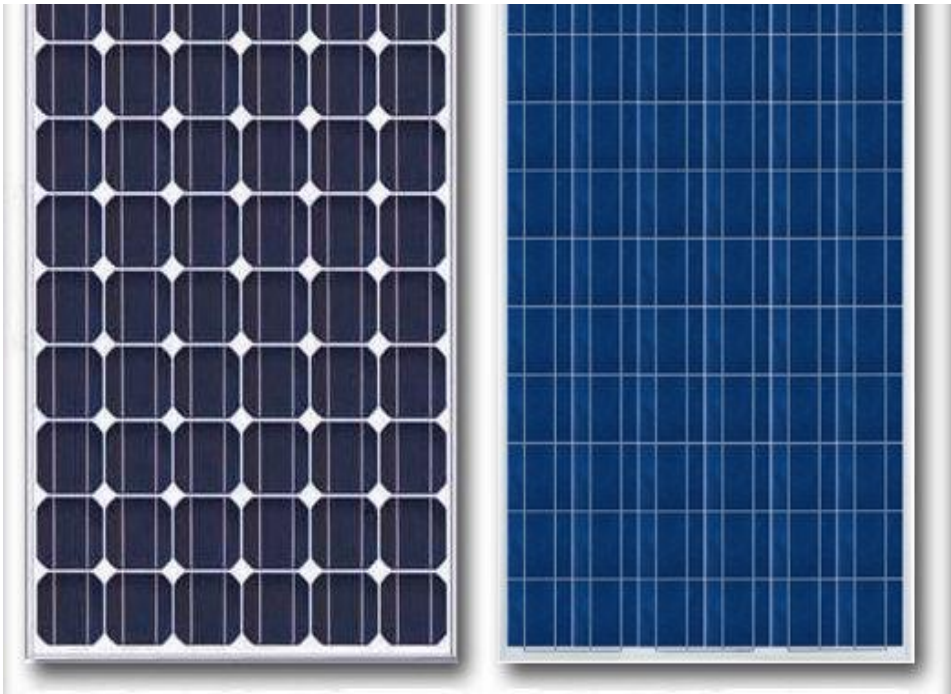
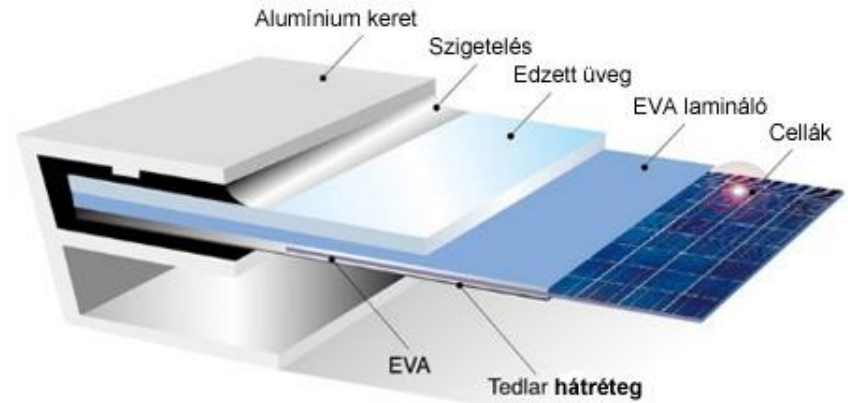


SUNNY HOURS



EXAMINATION COMPLETION

□ PV ON THE ROOF IS POLICRYST



EXAMINATION COMPLETION

- PV ON STREET LEVEL
- Technology on street level

simulations



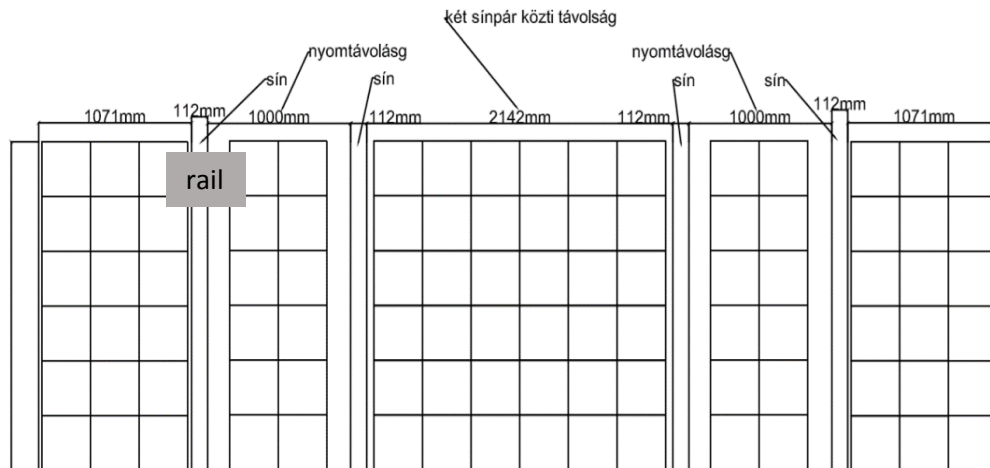
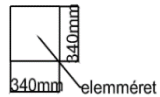
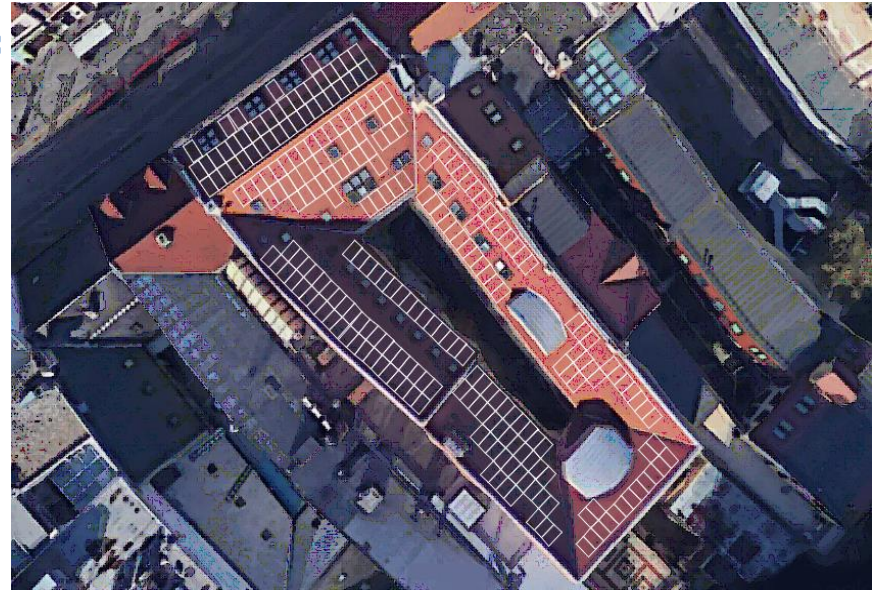
CALCULATING THE DECREASING POTENTIAL

THE PROGRAM IS CALCULATING WITH:

- LOCATION
- METEOROLOGICAL DATA
- INCLINE
- ORIENTATION

THE PROGRAM IS NOT CALCULATING WITH:

- COMPLICATED ROOF
- ELEMENT SIZE



RESULT:

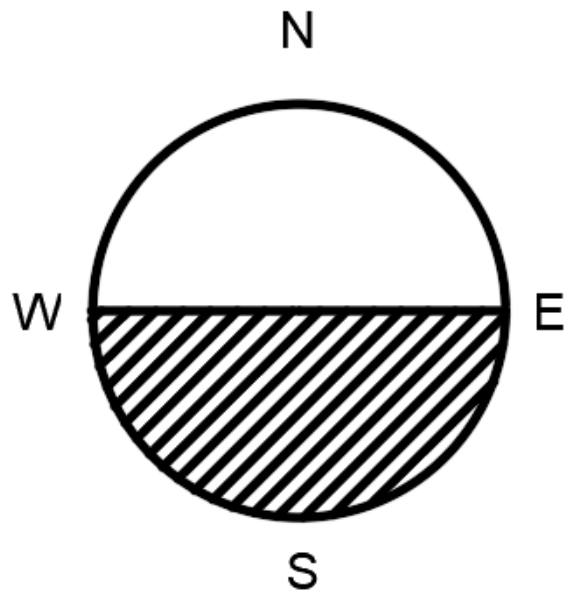
ROOF: 51%

COVERAGE

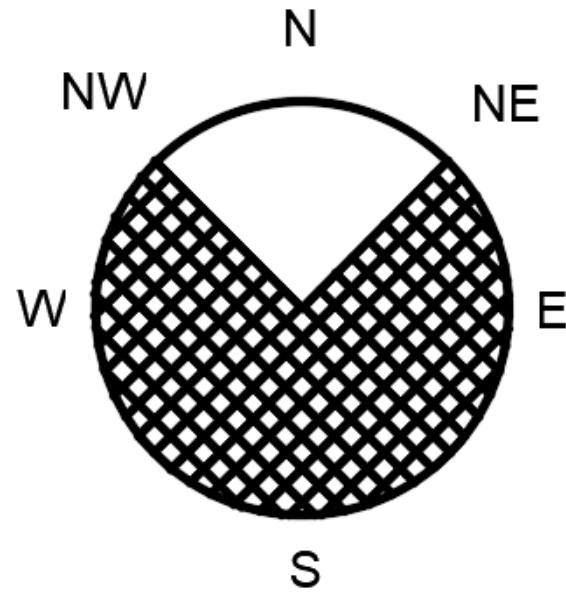
STREET: 75%

SOLAR ENERGY POTENTIAL ESTIMATION RESULTS

THE RESULTS OF THE ROOF SOLAR PANELS:



59,1%



81,8%

EXAMINATION OF 2 BUILDINGS

COST ESTIMATION:

Főösszesítő		
	Anyagköltség	Díj
Felvonulási tételek	0 HUF	390 000 HUF
Zsaluzás és állványozás	350 976 HUF	1 463 040 HUF
Helyszíni beton és vasbeton munkák	561 429 HUF	454 740 HUF
Vakolás és rabilolás, felületképzések	3 571 030 HUF	3 227 000 HUF
Ajzatkészítés, hideg- és melegburkolatok készítése	3 930 004 HUF	2 673 367 HUF
Fa- és műanyag szerkezet elhelyezése	13 580 000 HUF	2 830 130 HUF
Szigetelés	3 564 983 HUF	3 443 010 HUF
Felületképzés	457 366 HUF	3 235 620 HUF
Gépészet, Villamoság	7 881 956 HUF	
Takarítás	140 000 HUF	542 700 HUF
	Összesen 34 037 744 HUF	18 259 607 HUF
Árkockázati fedezet 2%	680 755 HUF	
Anyagigazgatási költség 3%	1 021 132 HUF	
Összesítve:	35 739 631 HUF	18 259 607 HUF
ÁFA 27%	45 389 332 HUF	23 189 701 HUF
Végösszeg:		68 579 033 HUF

Total: 212 118 EUR

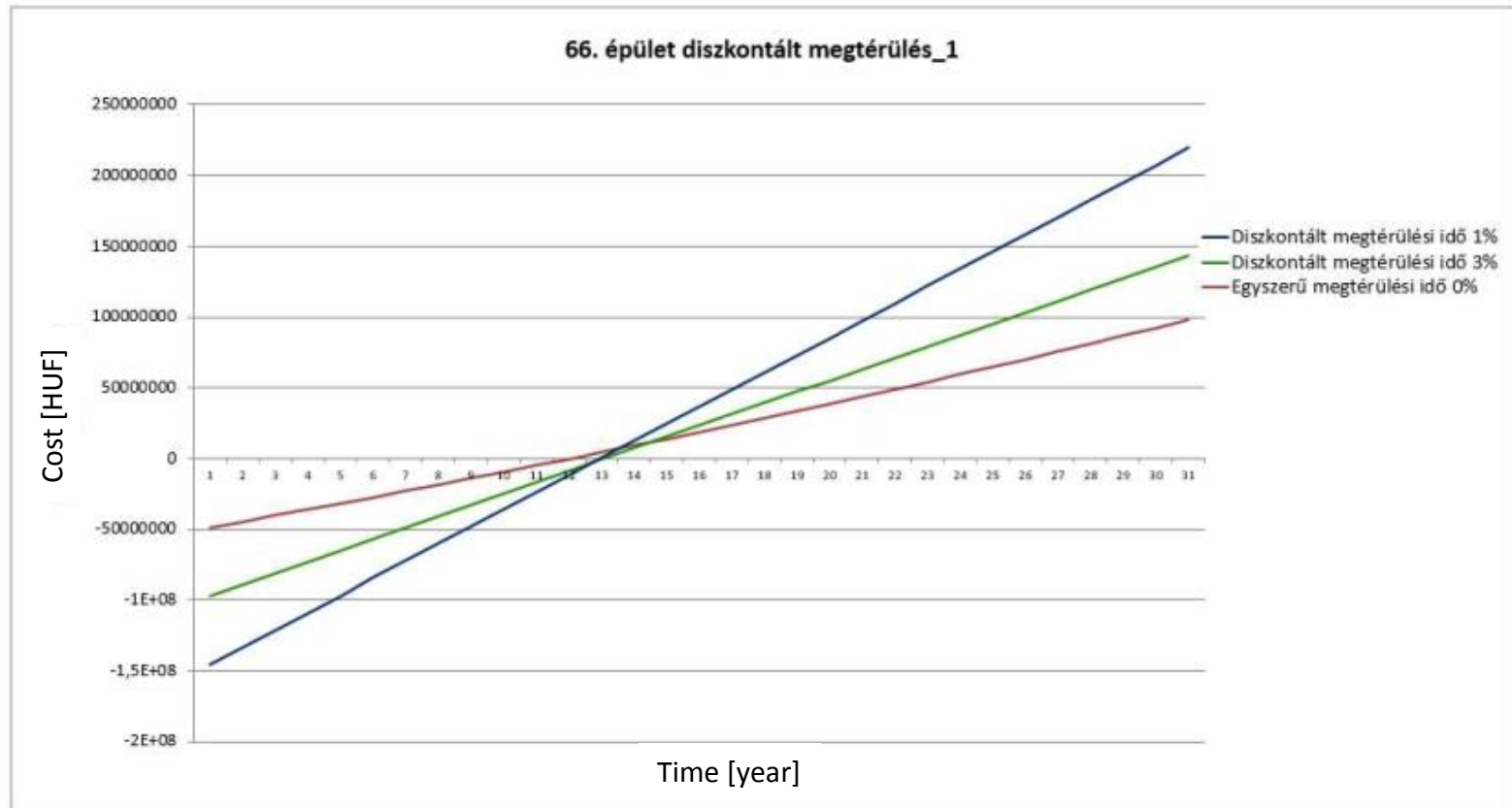
Főösszesítő		
	Anyagköltség	Díj
Felvonulási tételek	0 HUF	429 000 HUF
Zsaluzás és állványozás	478 936 HUF	1 996 440 HUF
Helyszíni beton és vasbeton munkák	300 456 HUF	243 360 HUF
Vakolás és rabilolás, felületképzések	3 776 470 HUF	3 752 175 HUF
Fa- és műanyag szerkezet elhelyezése	10 019 000 HUF	2 180 675 HUF
Szigetelés	3 413 930 HUF	3 124 380 HUF
Felületképzés	329 511 HUF	905 250 HUF
Gépészet, Villamoság	8 587 428 HUF	
Takarítás	157 500 HUF	530 100 HUF
	Összesen 27 063 231 HUF	13 161 380 HUF
Árkockázati fedezet 2%	541 265 HUF	
Anyagigazgatási költség 3%	811 897 HUF	
Összesítve:	28 416 393 HUF	13 161 380 HUF
ÁFA 27%	36 088 819 HUF	16 714 953 HUF
Végösszeg:		52 803 771 HUF

Total: 163 325 EUR

EXAMINATION OF 2 BUILDINGS

COUNTING RETURN:

EXAMINATION OF 6 CASES ON BOTH HOUSES



SUMMARY

IN MY WORK I TRIED TO HIGHLIGHT HOW MUCH ENERGY SAVING CAN BE GAINED BY THE ENERGY UPGRADING OF THE BUILDINGS IN OBCHODNA STREET, BRATISLAVA, AND IN WHAT EXTENT WE COULD REPLACE ENERGY CONSUMPTION WITH SOLAR ENERGY.

I FOUND THAT A GREAT DEAL OF ENERGY SAVING CAN BE GAINED.

STREET LEVEL STATEMENTS:

- THE HEAT LOSS AFTER THE RENOVATION IS REDUCED WITH ABOUT 63.8%
- 74.9% CARBON DIOXIDE EMISSION REDUCTION

I SHOWED THAT THERE IS MUCH BIGGER OPPORTUNITY IN THE USE OF SOLAR ENERGY THAT THE AMOUNT WE ARE USING CURRENTLY, THIS IS WHY I FOUND EXTREMELY IMPORTANT TO DO THE ANALYSIS.

ENERGY PRODUCTION OF PV:

ROOF : 40 OR 50% COVERAGE

ENERGY REPLACEMENT

STREET LEVEL: 75 % COVERAGE,

BUT SMALLER ENERGY PRODUCTION - SHOULD BE RECONSIDERED



RESULTED 51 - 64%



SUMMARY

ADDITIONAL POSSIBILITIES FOR USES PV:

BICYCLE TRAIL, CHARGING ELECTRIC CARS, INSTALLING IN STREET FURNITURE - MOBILE CHARGERS, PUBLIC LIGHTING COLUMNS, SOLAR POWER ROOF REPLACEMENT ETC.



INVESTIGATING THE ENERGY SAVING POTENTIAL OF BRATISLAVA'S
HISTORIC STREET

THANK YOU FOR YOUR ATTENTION

