Solar Potential Assessment using Big Data and Cloud Geospatial techniques

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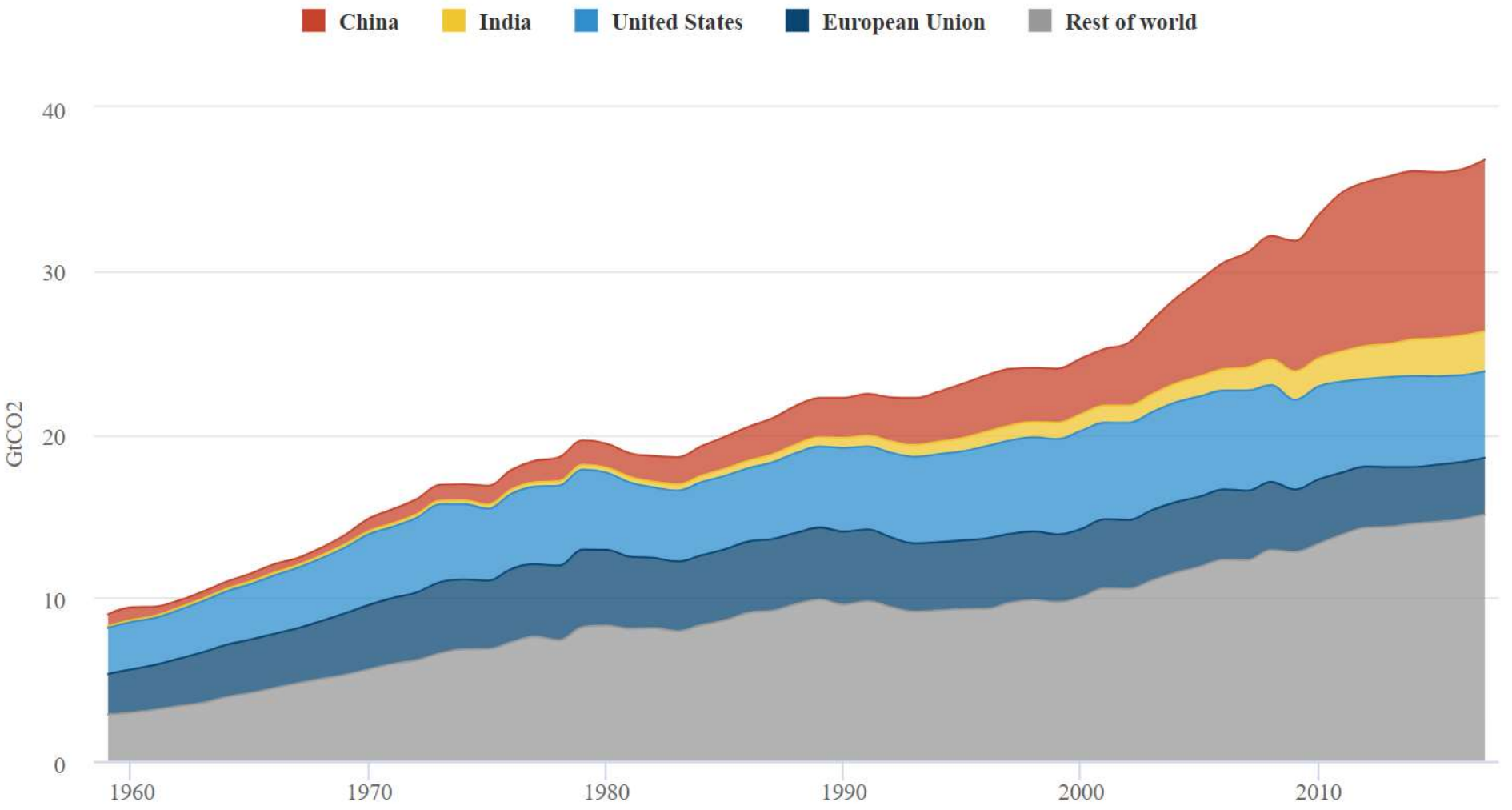
Why Solar Energy?

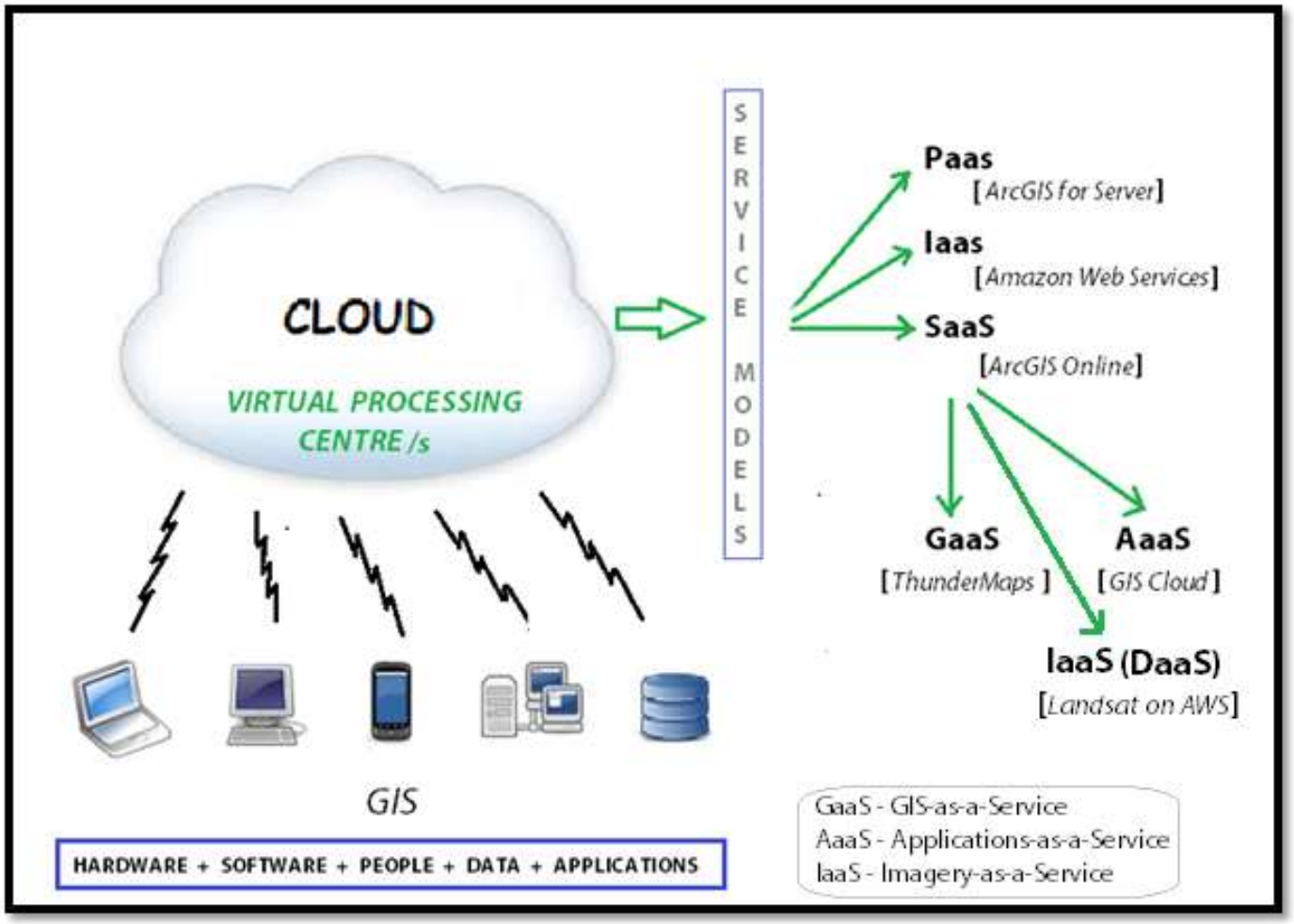
Annual CO^2 emissions from fossil fuels by country, 1958-2017



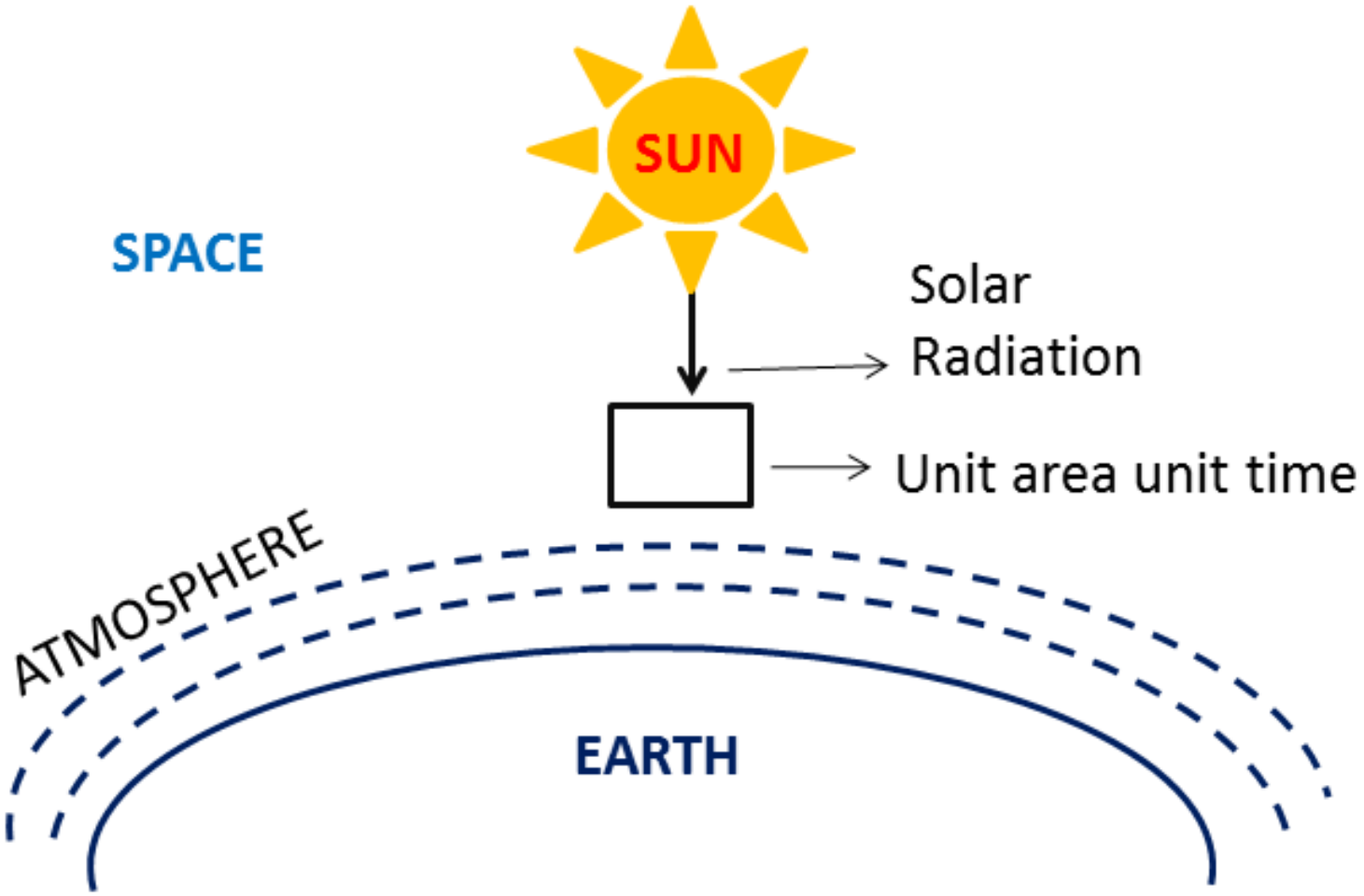
Source: https://www.carbonbrief.org/analysis-global-co2-emissions-set-to-rise-2-percent-in-2017-following-three-year-plateau

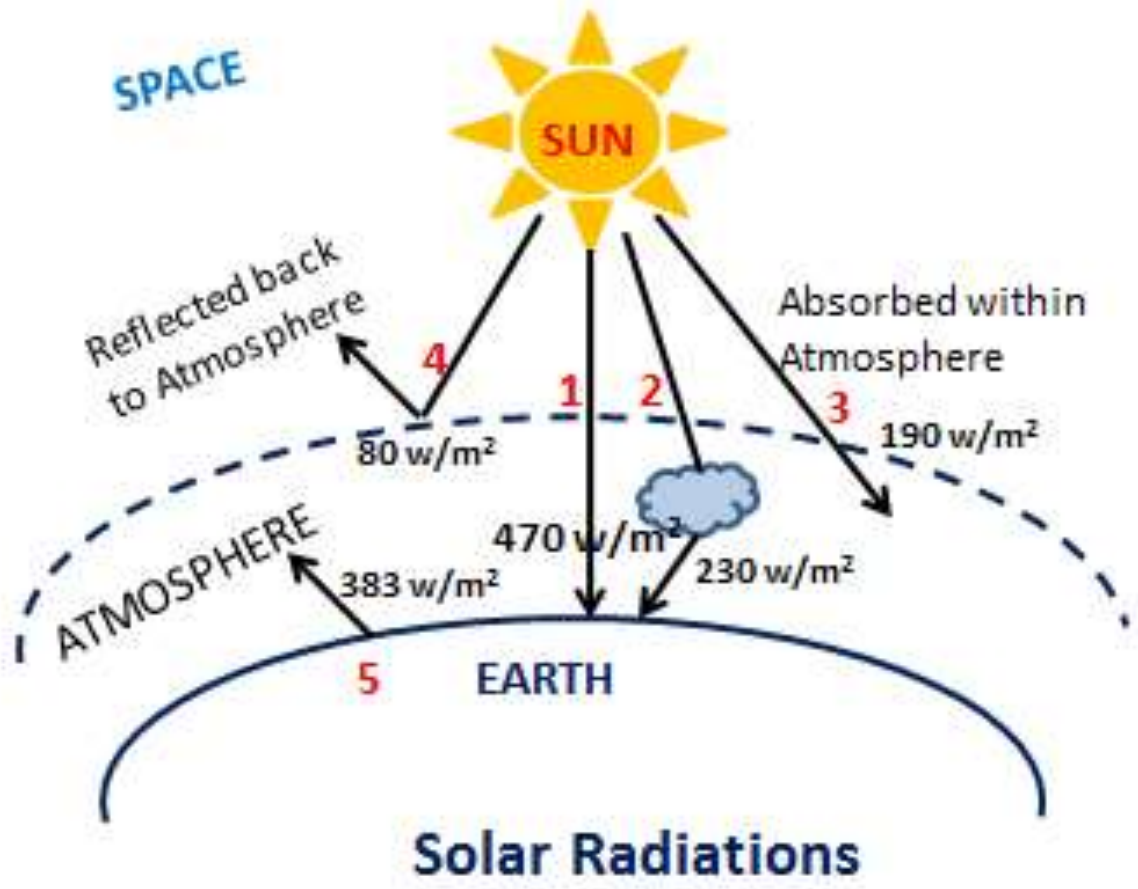
CB

Source: http://www.crossing-technologies.com/wp-content/uploads/2015/04/Big_data_image.jpg

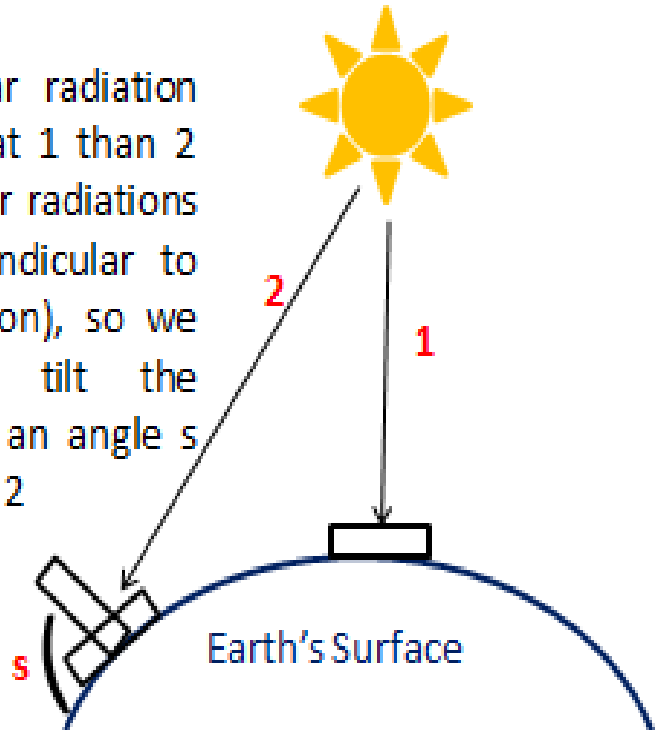


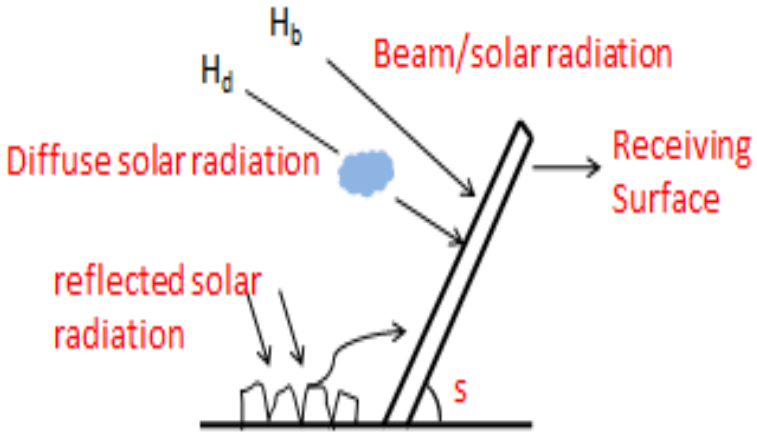
Source: https://www.gislounge.com/wp-content/uploads/2015/04/Cloud-GIS-1.png

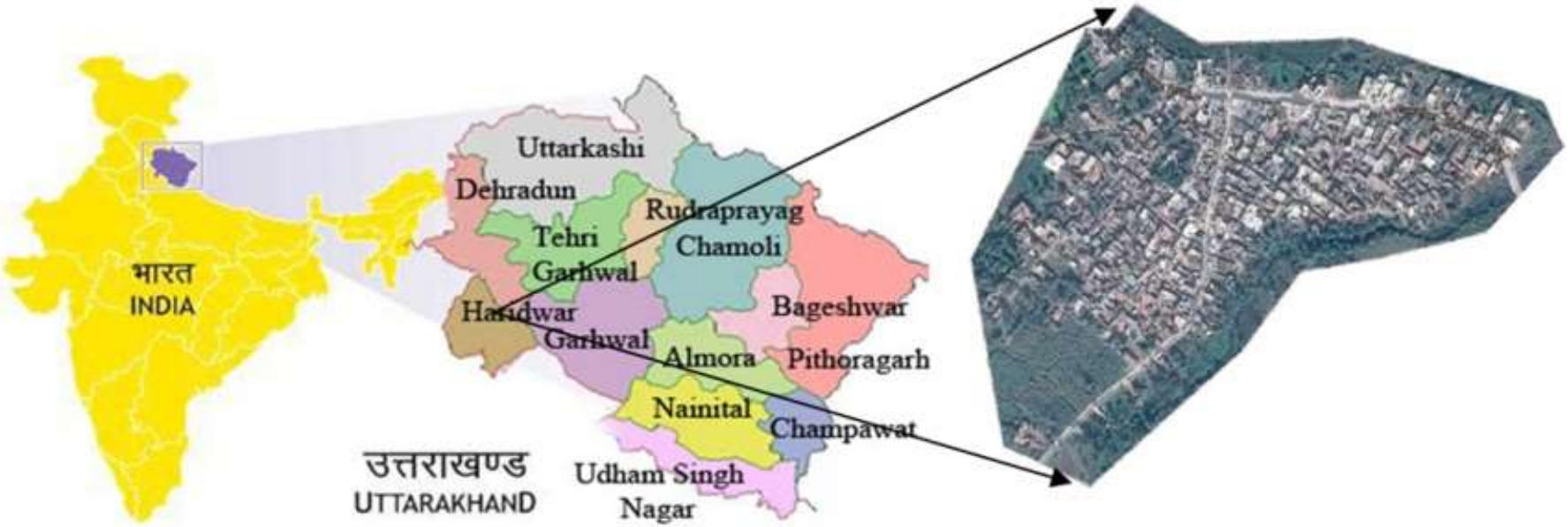

SUN
SPACE
Solar
Radiation
Unit area unit time
ATMOSPHERE
EARTH


SPACE
SUN
Reflected back
to Atmosphere
4
1
2
Absorbed within
Atmosphere
3
80 w/m²
190 w/m²
ATMOSPHERE
470 w/m²
383 w/m²
230 w/m²
5
EARTH
Solar Radiations

More solar radiation quantum at 1 than 2 (since solar radiations are perpendicular to that location), so we need to tilt the surface at an angle s at location 2




H_b
H_d
Beam/solar radiation
Diffuse solar radiation
Receiving
Surface
reflected solar
radiation
s


भारत
INDIA
Uttarkashi
Dehradun
Rudraprayag
Tehri
Garhwal
Chamoli
Haridwar
Bageshwar
Garhwal
Almora
Pithoragarh
Nainital
Champawat
उत्तराखण्ड
UTTARAKHAND
Udham Singh
Nagar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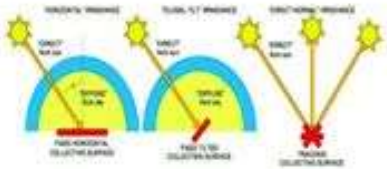
Google

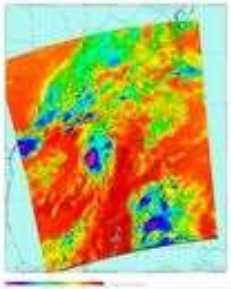
Energy Requirements

Consumption Fan, Tubelight, Electric Pump

Identify the Electricity demand of a House/Village



Global Horizontal Irradiance



Satellite Imagery

Extraction of features [State, City, district]

IMD [Rainfall Data]

Cloudy Days

Rainy Days

GIS Maps/ Geo-Database creation

App Engine

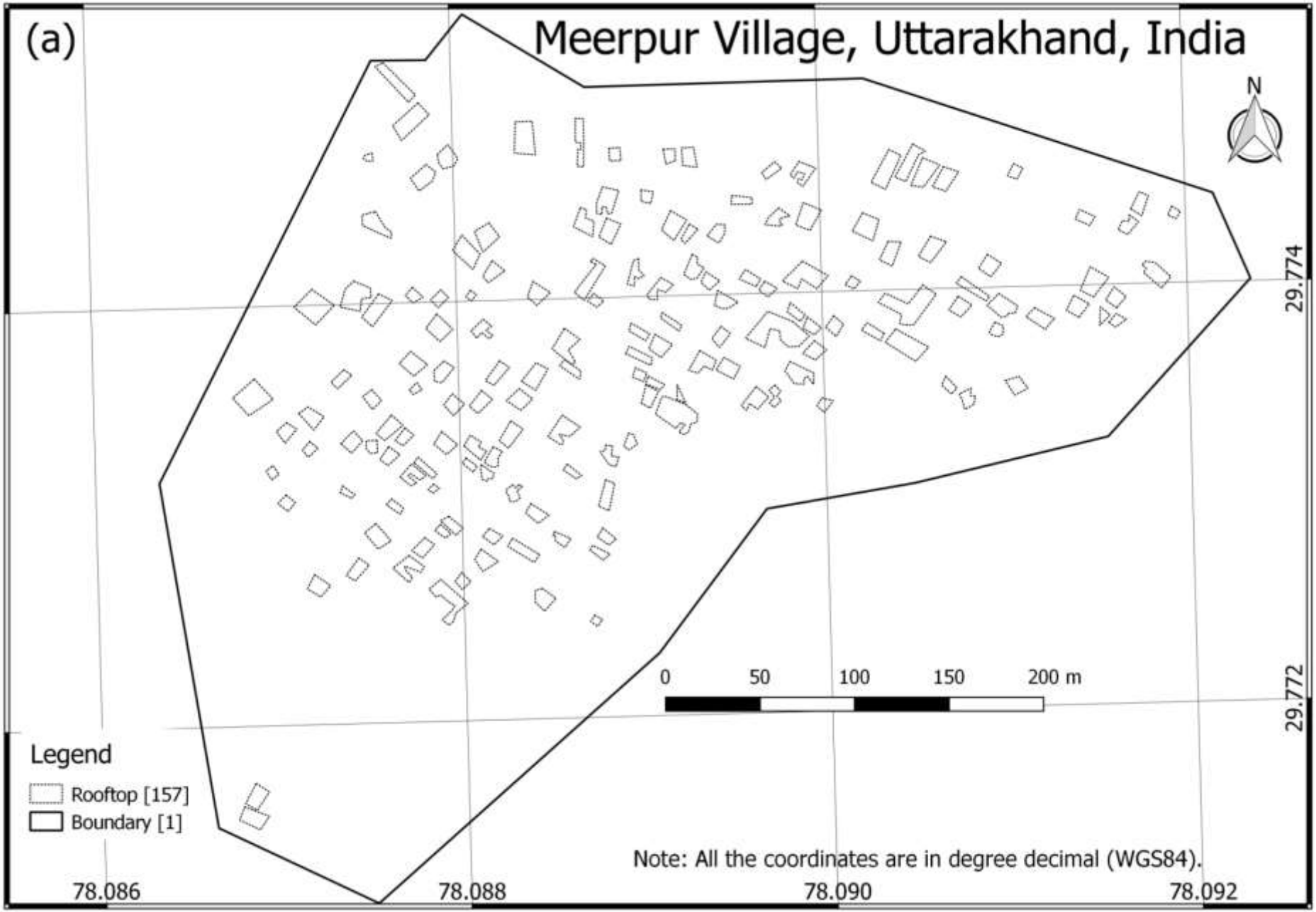
PERL script

Software Development

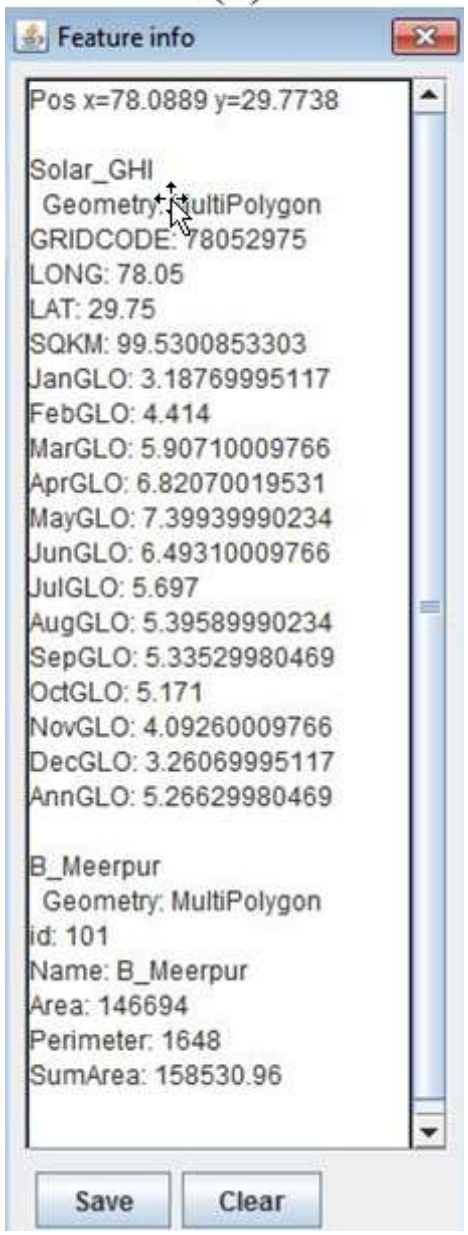
Cloud Computing

Software Module

- Load of a House
- Probabilistic solar potential forecasting


(a)
Meerpur Village, Uttarakhand, India
N
29.774
29.772
0
50
100
150
200 m
Legend
Rooftop [157]
Boundary [1]
Note: All the coordinates are in degree decimal (WGS84).
78.086
78.088
78.090
78.092

(b)


Feature info
Pos x=78.0889 y=29.7738
Solar_GHI
Geometry: MultiPolygon
GRIDCODE: 78052975
LONG: 78.05
LAT: 29.75
SQKM: 99.5300853303
JanGLO: 3.18769995117
FebGLO: 4.414
MarGLO: 5.90710009766
AprGLO: 6.82070019531
MayGLO: 7.39939990234
JunGLO: 6.49310009766
JulGLO: 5.697
AugGLO: 5.39589990234
SepGLO: 5.33529980469
OctGLO: 5.171
NovGLO: 4.09260009766
DecGLO: 3.26069995117
AnnGLO: 5.26629980469
B_Meerpur
Geometry: MultiPolygon
id: 101
Name: B_Meerpur
Area: 146694
Perimeter: 1648
SumArea: 158530.96
Save
Clear

ESolPot_v_1.0

Cloud Computing Application for Energy Requirements and Solar Potential Assessment

Energy Requirements

Tubelight Quantity 30 | AC Watts 40 | Hours On per day 8 | Submit | Fans Quantity 35 | AC Watts 70 | Hours On per day 15 | Submit | 1/2HP Well Pump 45 | AC Watts 2500 | Hours On per day 7 | Submit | Calculate Total Load

Load Calculated

Load 833.85 kWh/day , 25015.5 kWh/month , 300186.0kWh/year

Solar Potential Available at the specified location

Globan Tilted Irradiance (KWh/m2/day) Annual 7.04 Submit | Latitude/Longitude in deg 29.65 N 78.05 E Submit | Rainy Days 44 Submit

Cloudy Days 30 Submit | Roof Top Area(m2) 11837 Submit | Geospatial Analysis (ShapeFiles) ShapeFiles | Calculate Solar Potential

Calculated Solar Potential based on the values provided

You are elligible for installing Solar Panels. Solar Potential calculated is 17574.82 kWh/day 5114272.5 kWh/ann

Limitations ! | Help ? | Credits | Exit Software

 Software developed at Geomatics Engineering, IIT Roorkee, India

Acknowledgements

NREL
National Renewable
Energy Laboratory

GOVERNMENT OF INDIA
MINISTRY OF
NEW &
RENEWABLE
ENERGY


Thank you for your kind attention