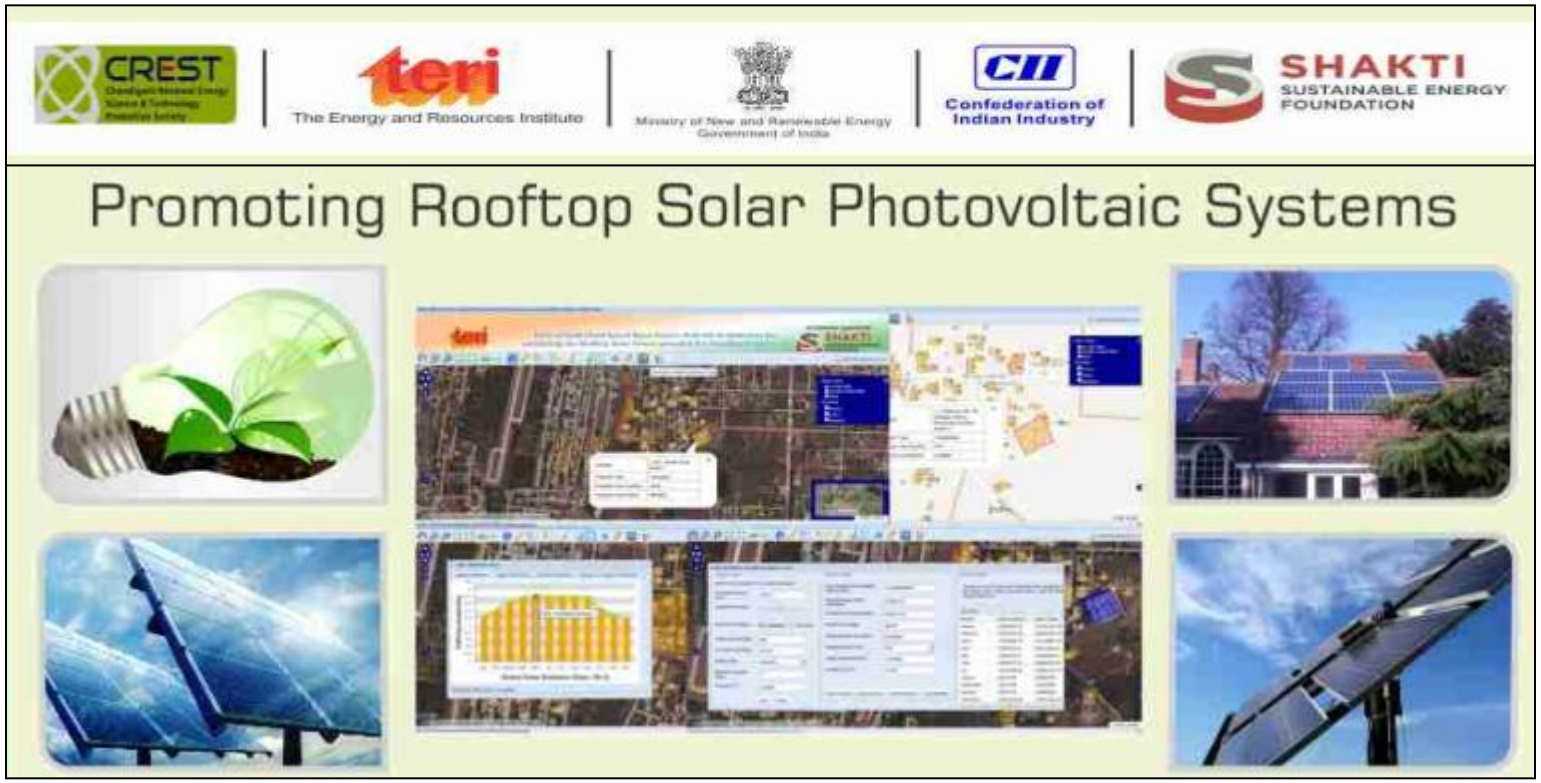
Creating Innovative Solutions for a Sustainable Future

# *"Development of Web-GIS Tool for estimating the Rooftop Solar Power potential for Indian Solar Cities"*



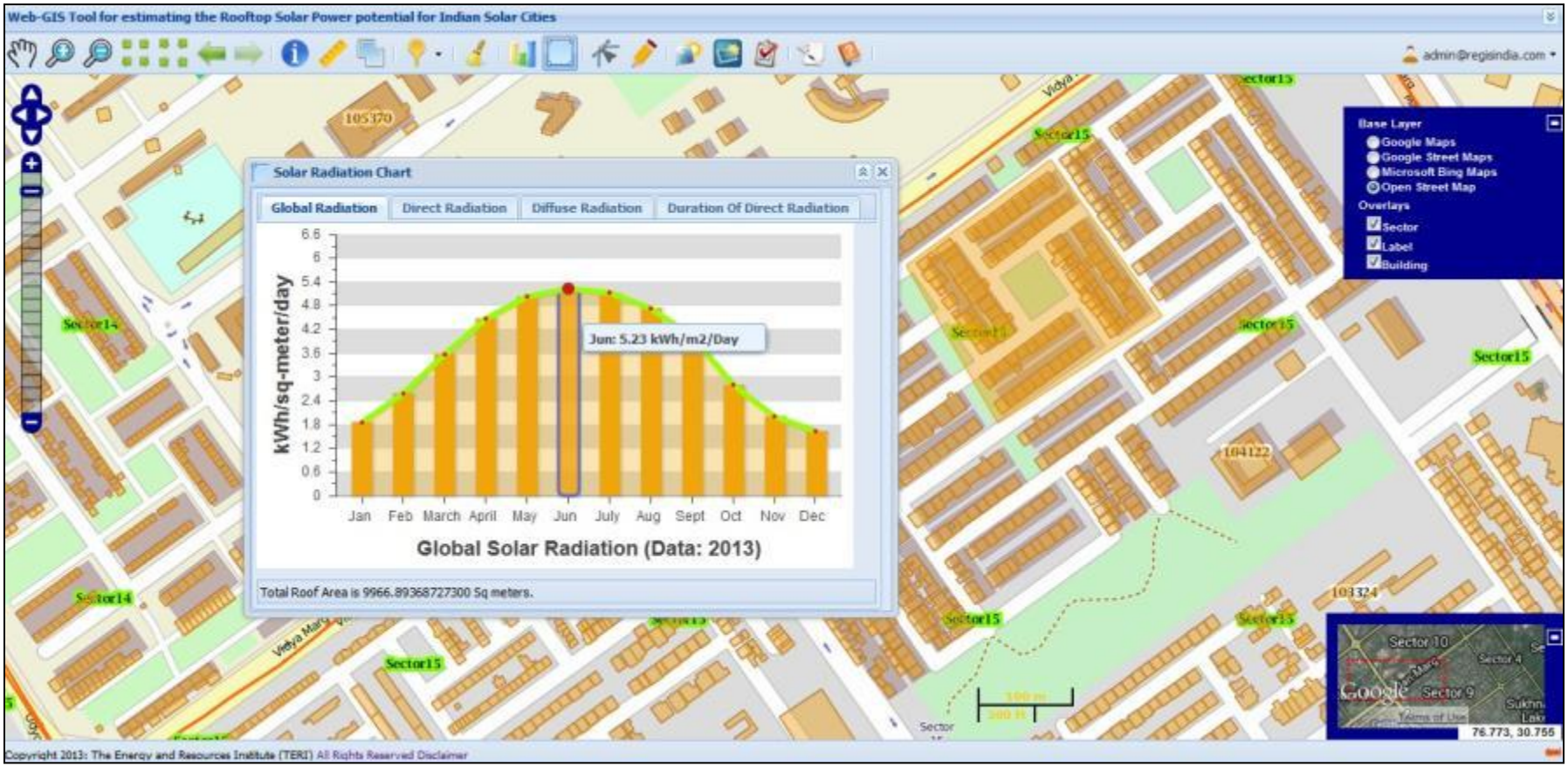

**December 23, 2013**
**Chandigarh, IND**

# Study Objective

Creating Innovative Solutions for a Sustainable Future

**To develop a high performing and flexible Web-GIS tool to estimate the rooftop solar power potential for a city.**

## Phase I: Chandigarh Area

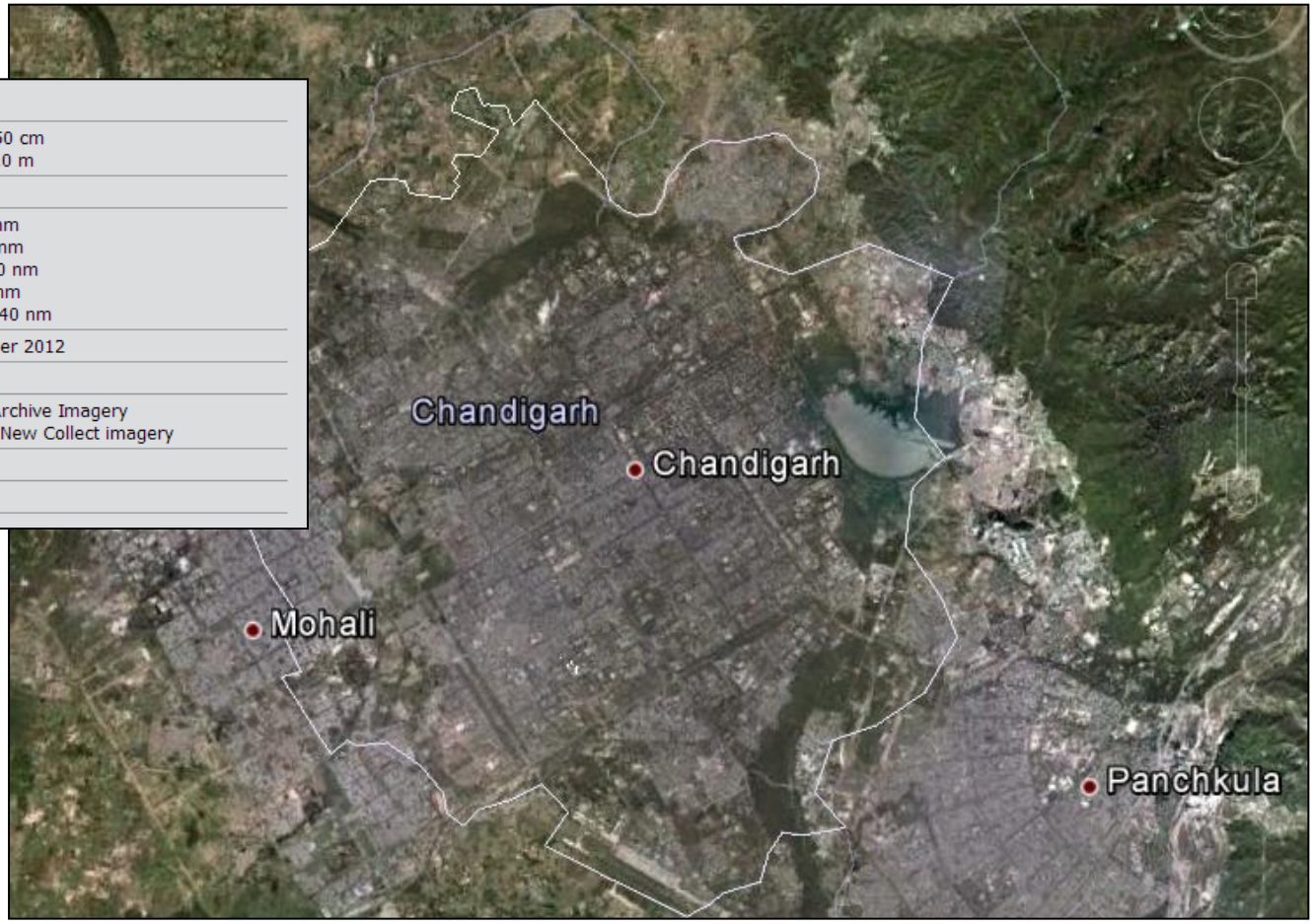


# Study Area

Creating Innovative Solutions for a Sustainable Future

## Pleiades-1A

| Specifications | |
|---|---|
| RESOLUTION | Panchromatic 50 cm<br>Multispectral 2.0 m |
| NOMINAL SWATH WIDTH | 20km at Nadir |
| BANDS | Pan: 450-830 nm<br>Blue: 430-550 nm<br>Green: 500-620 nm<br>Red: 590-710 nm<br>Near IR: 740-940 nm |
| ARCHIVE AVAILABILITY | From September 2012 |
| PROGRAMMABLITY | YES |
| MINIMUM AREA OF PURCHASE | 25 sqkms for Archive Imagery<br>100 sqkms for New Collect imagery |
| STEREO AVAILABLE? | YES |
| BEST SCALE | 1 : 2000 |




**Source**: Google Earth (http://www.google.com/earth/index.html)

**Source**: http://www.astrium-geo.com/pleiades

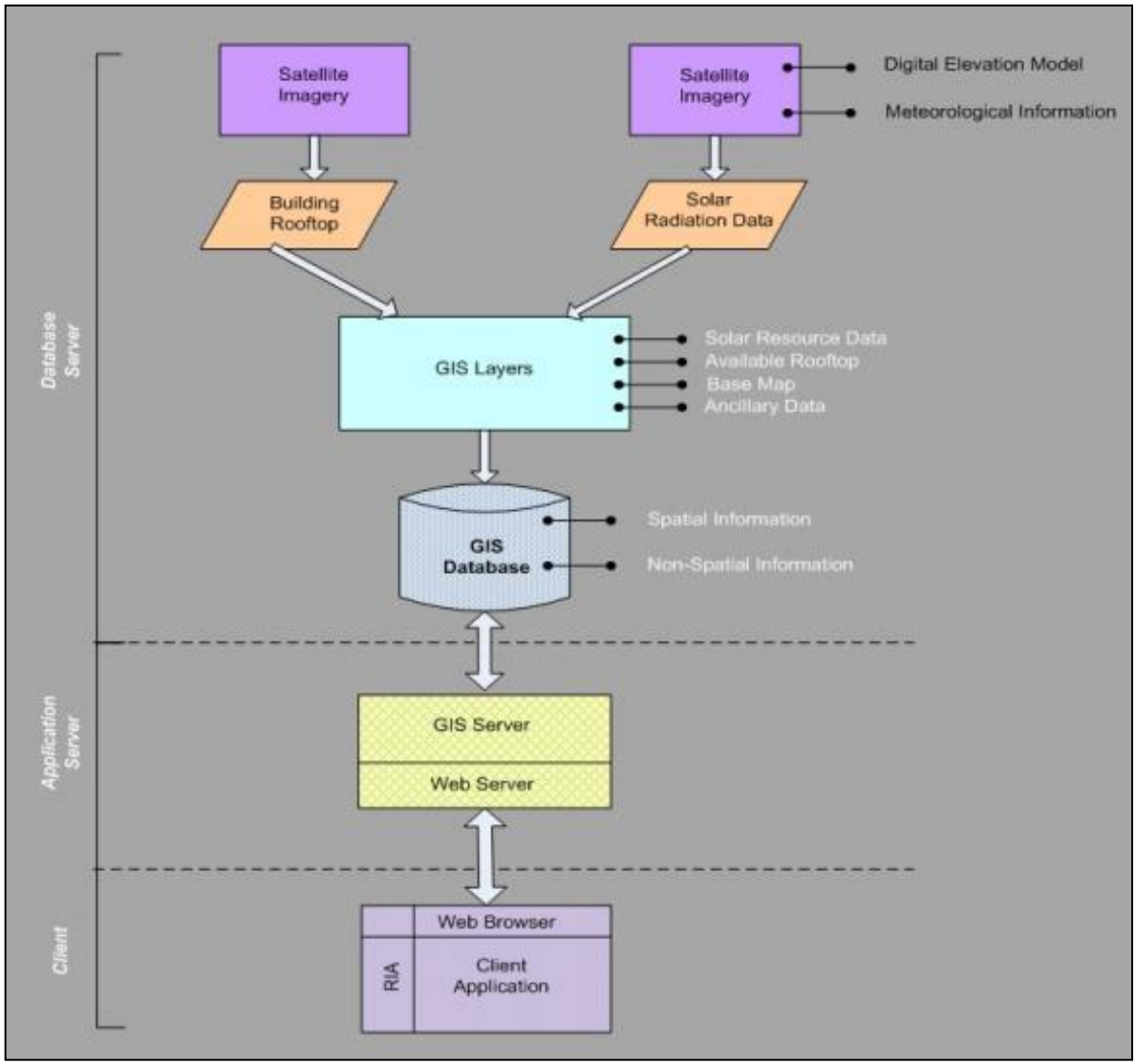
# Pleiades Satellite Imagery



**Pleiades Satellite Imagery Coverage: Chandigarh Area**

# Methodology



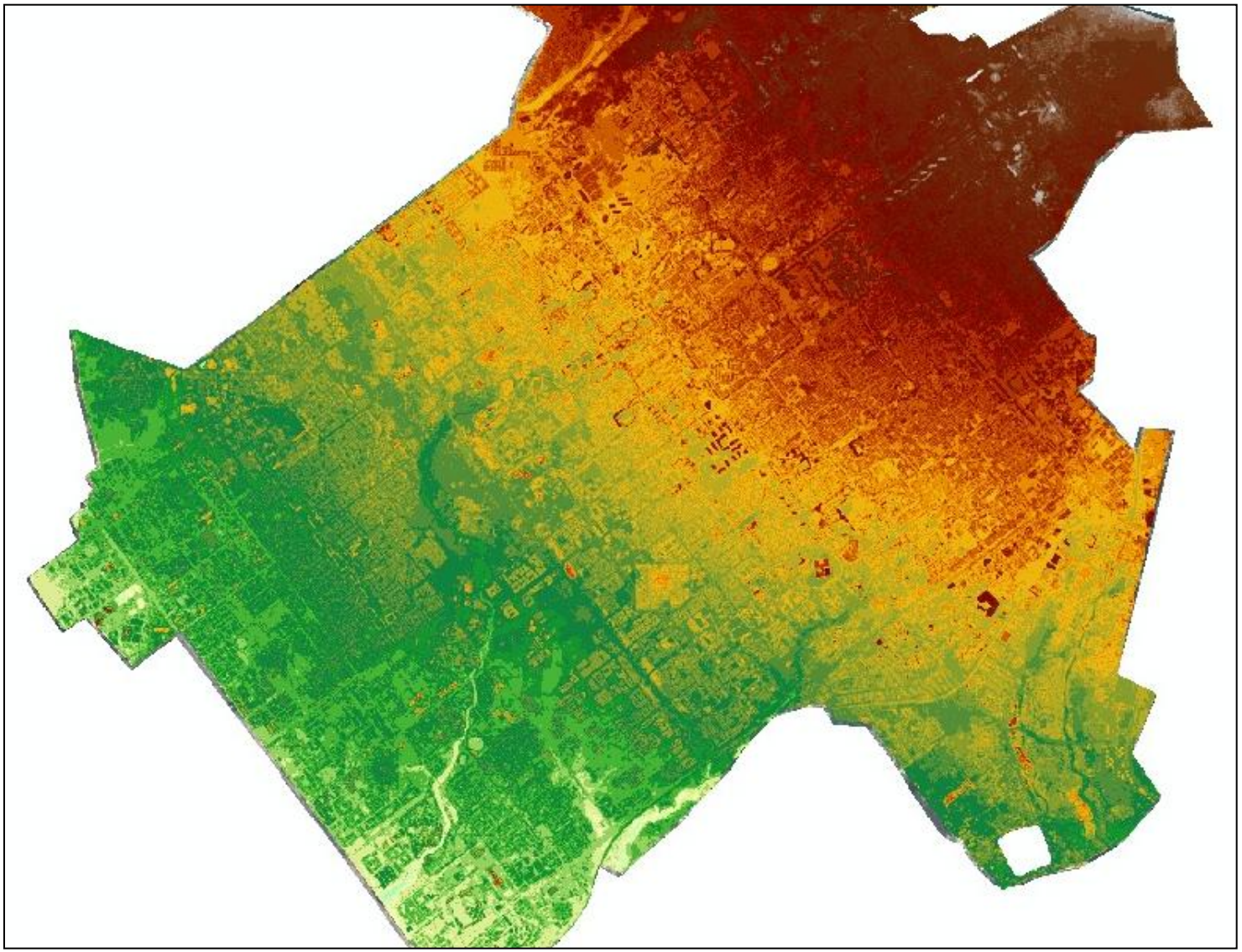


# GIS Data-sets for Chandigarh Area (Building Rooftop)



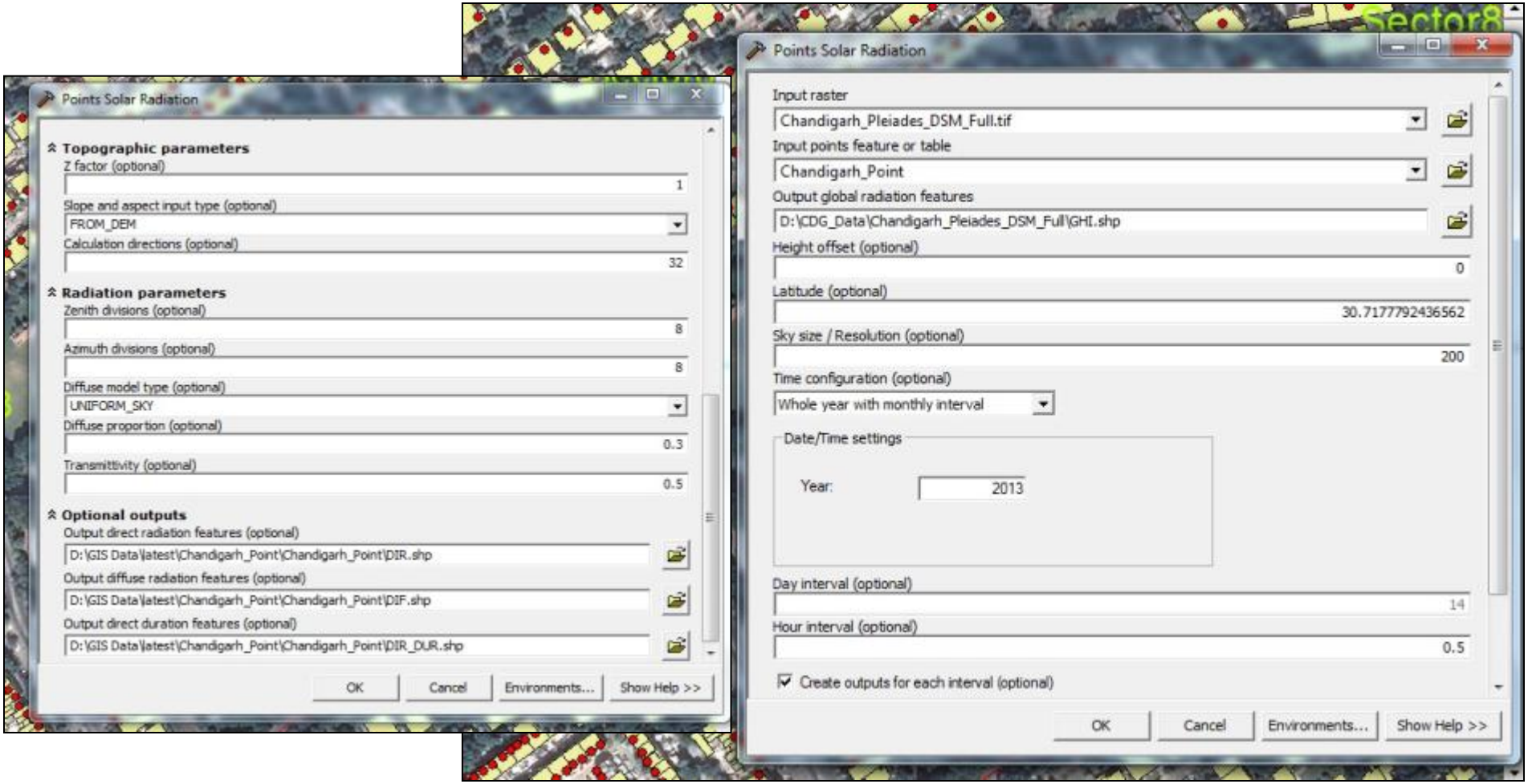
# Digital Surface Model (DSM) for Chandigarh





# Solar Radiation Analyst

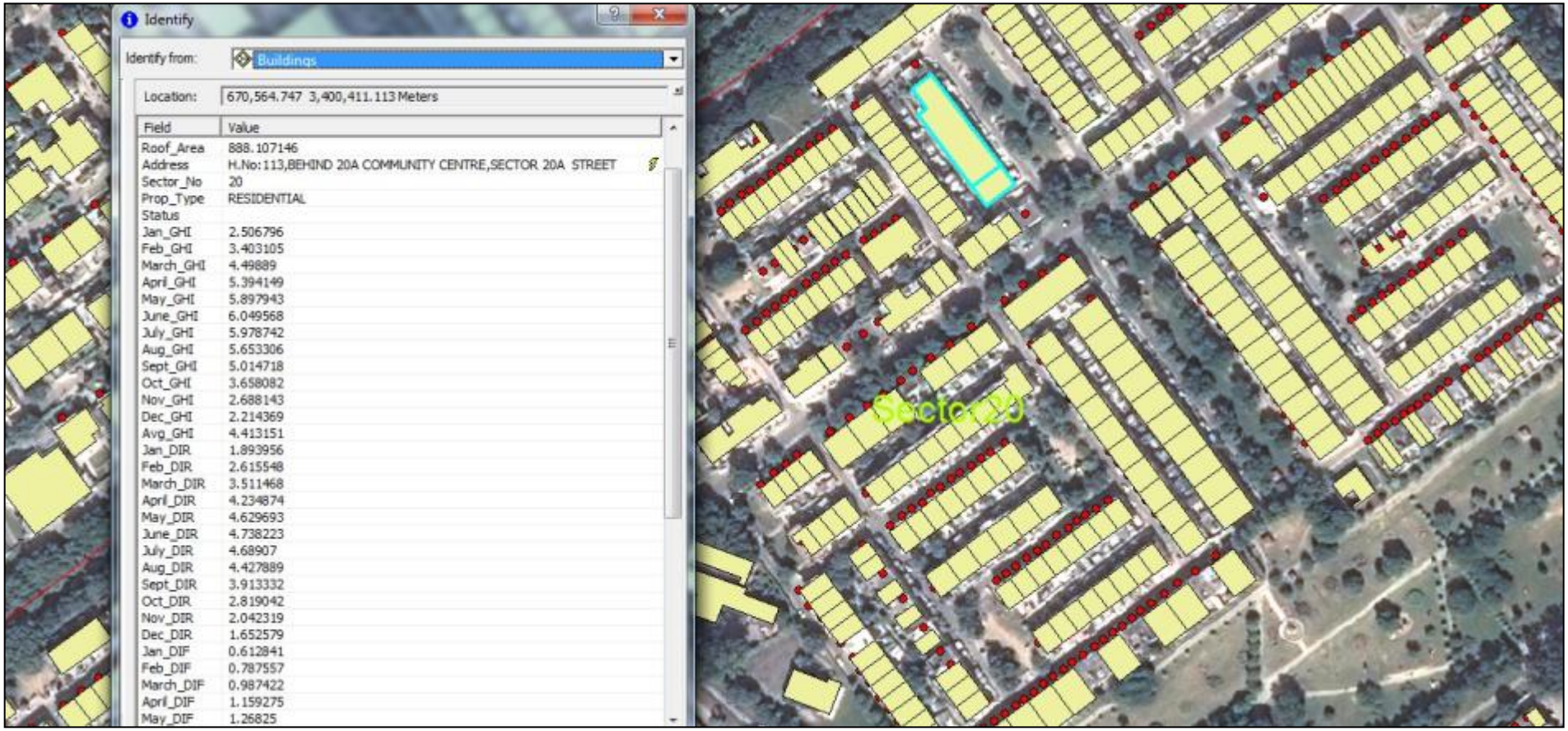





**ESRI ArcGIS Solar Radiation Tools**:
http://resources.arcgis.com/en/help/main/10.1/index.html#/An_overview_of_the_Solar_Radiation_tools/009z000000t4000000/

# Rooftop Area and Solar Radiation



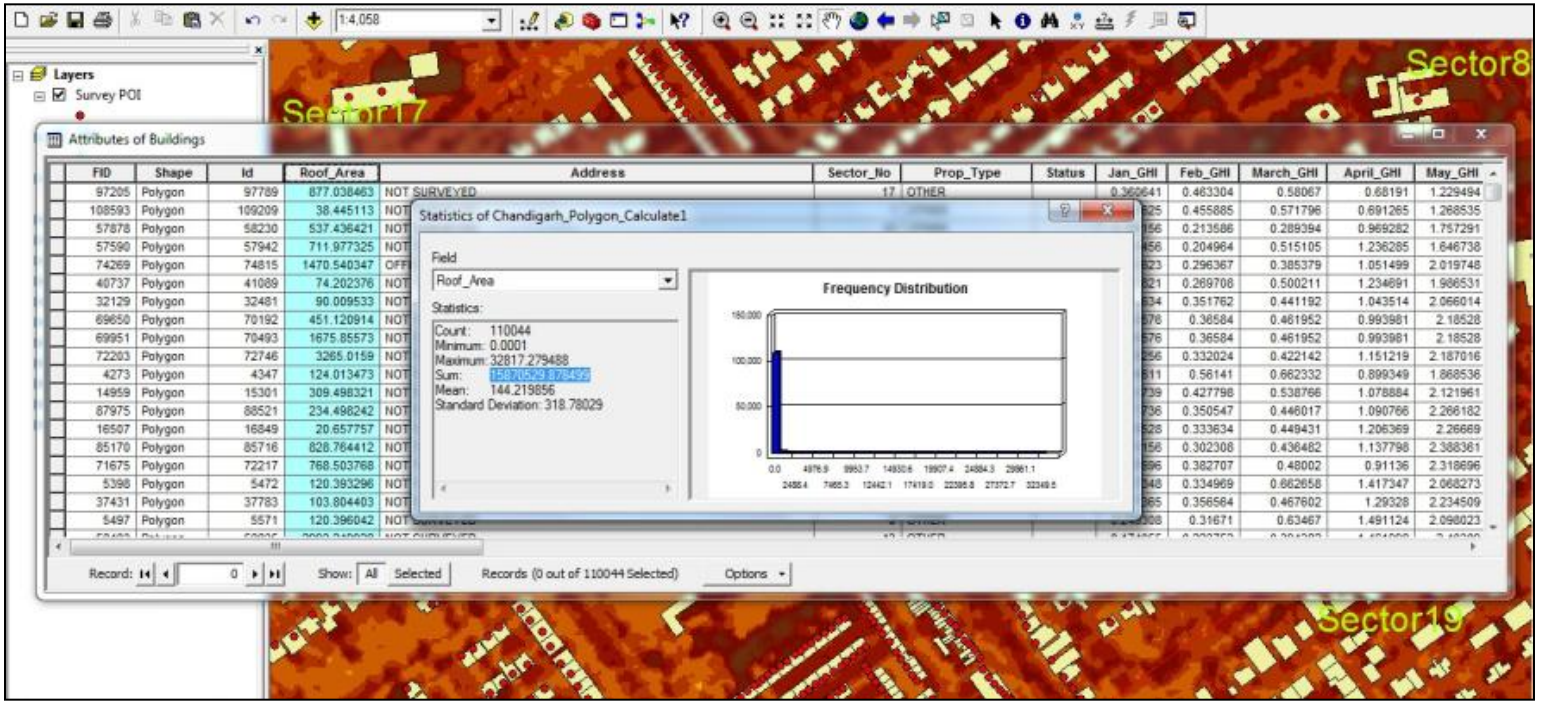


# Analysis Results: Chandigarh Area

Creating Innovative Solutions for a Sustainable Future

- ✓ **Total Buildings Surveyed (Nos.): 14,000 (approx.) ##**
- ✓ **Total Rooftop Digitized (Nos.): 1,10,500 (approx.) ##**
- ✓ **Potential Roof Area (70%) for Solar PV (Area > 10 Sq-M && GHI > 4kWh/m2/Day): 4 Sq-Kms. (approx.) ##**
- ✓ **Ground Validation for actual Roof Area, and Solar Radiation: 50-60 Samples (approx.)**
- ✓ **Validation using Solar PV Generation Data: 5-10 Samples (approx.), TBD.**

**##To be crossed-checked.**



# Using Open-Source GIS and What's new in this study?

Creating Innovative Solutions for a Sustainable Future

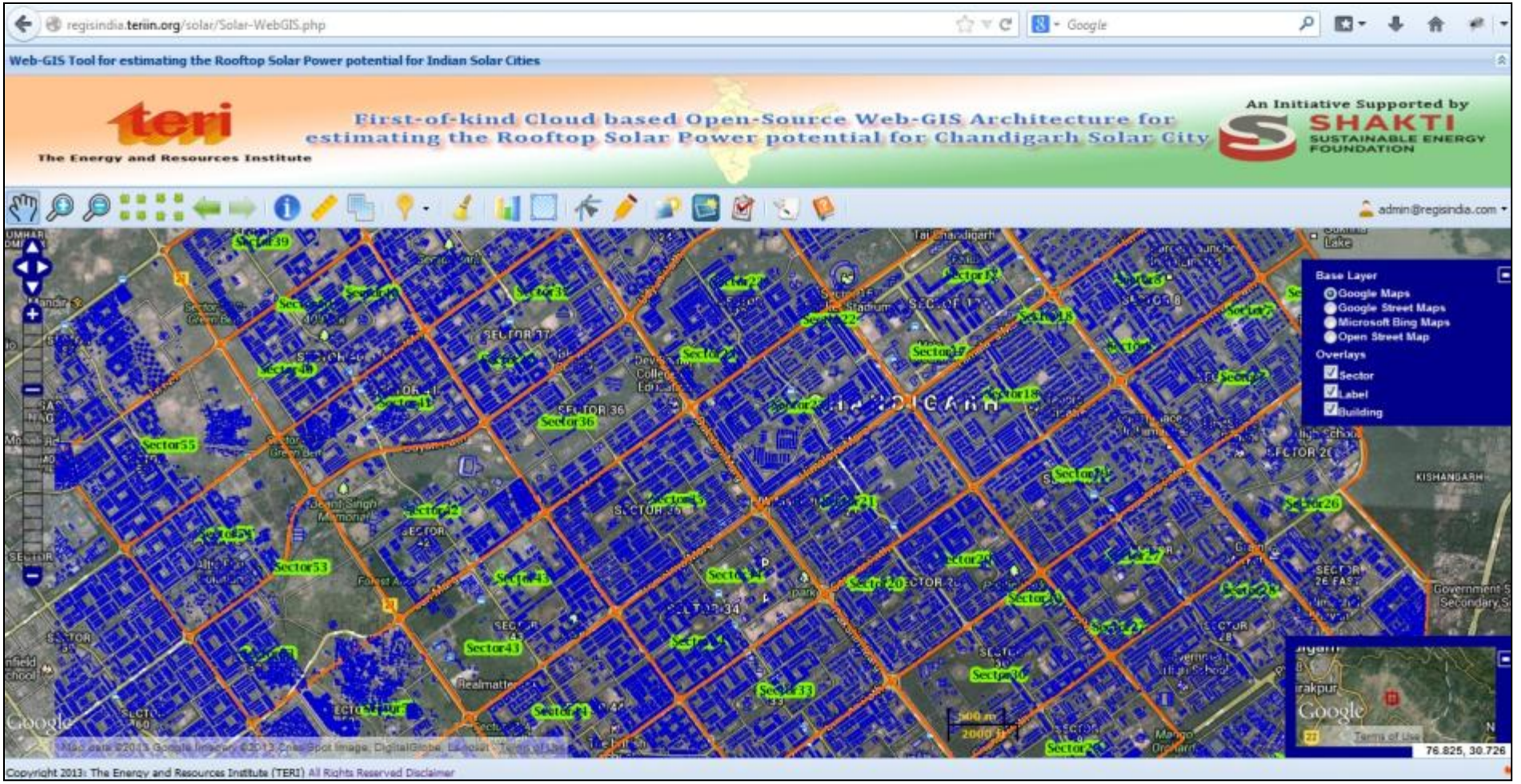
OSGeo
Your Open Source Compass

OGC®
Making location count.
www.opengeospatial.org

- ✓ **Web Application: Open Layers, Ext-JS, Geo-Ext, PHP, and Ajax;**
- ✓ **Open-Source GIS Server: Geo-Server, and Map-Server;**
- ✓ **Open Geo-Database: PostgreSQL with PostGIS;**
- ✓ **Tile-Server Caching, Cloud based, and Publicly Accessible.**

# Rooftop Solar Web-GIS Tool (Beta)

Creating Innovative Solutions for a Sustainable Future



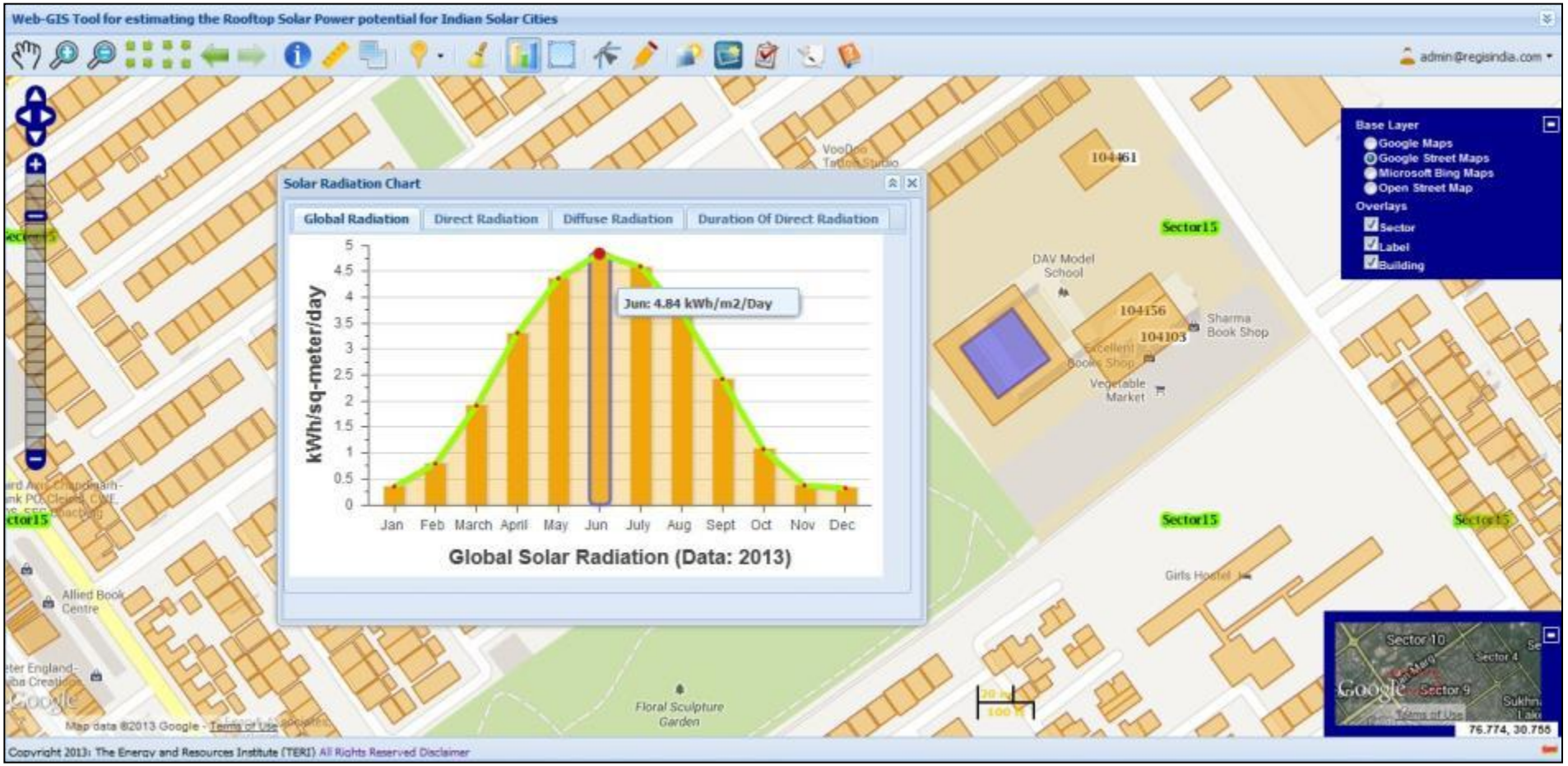

**Source**: http://regisindia.teriin.org/solar/Solar-WebGIS.php

# Rooftop Solar Web-GIS Tool (Home Page)

Creating Innovative Solutions for a Sustainable Future

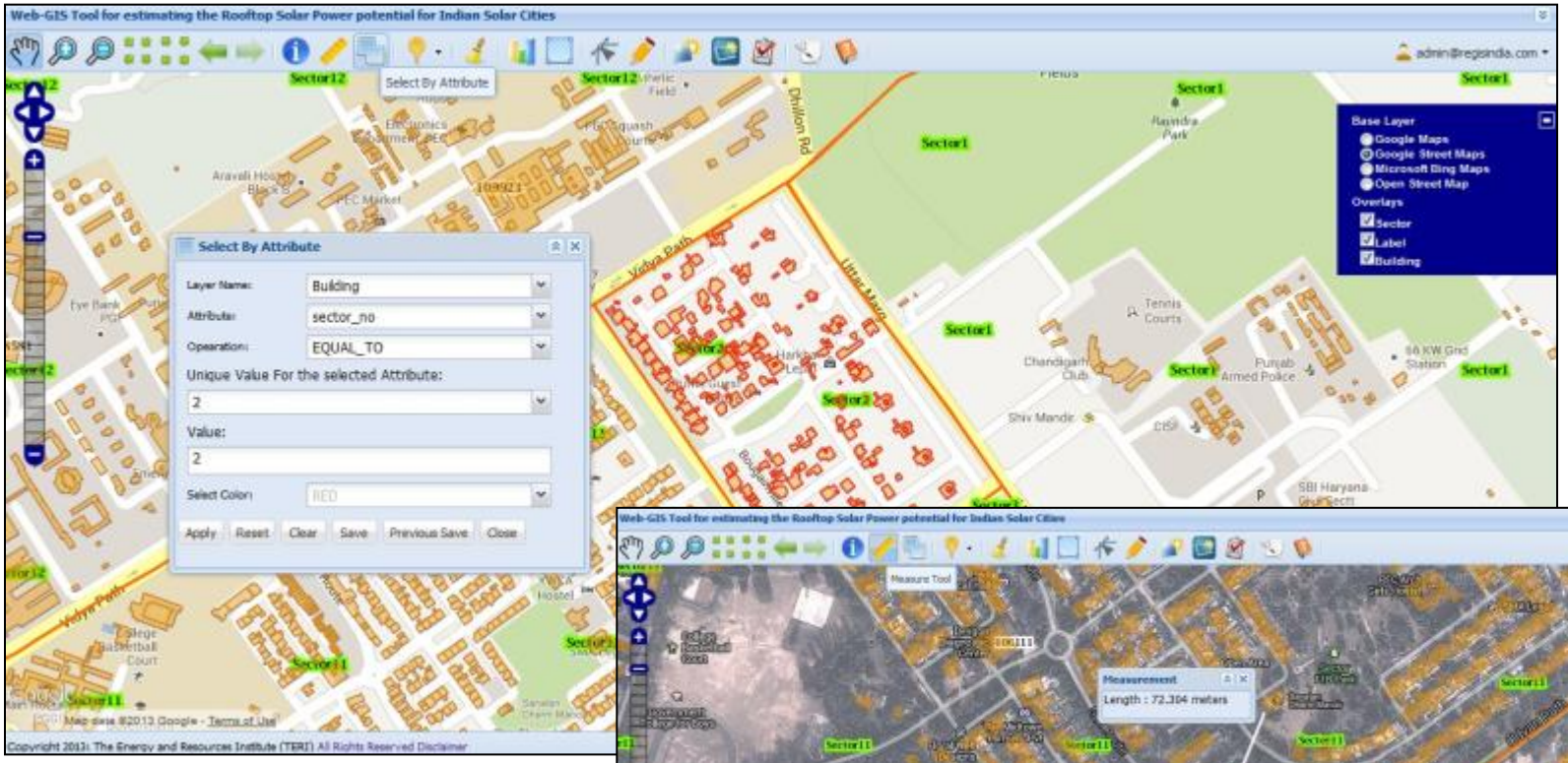
# Rooftop Solar Web-GIS Tool (Base Maps)

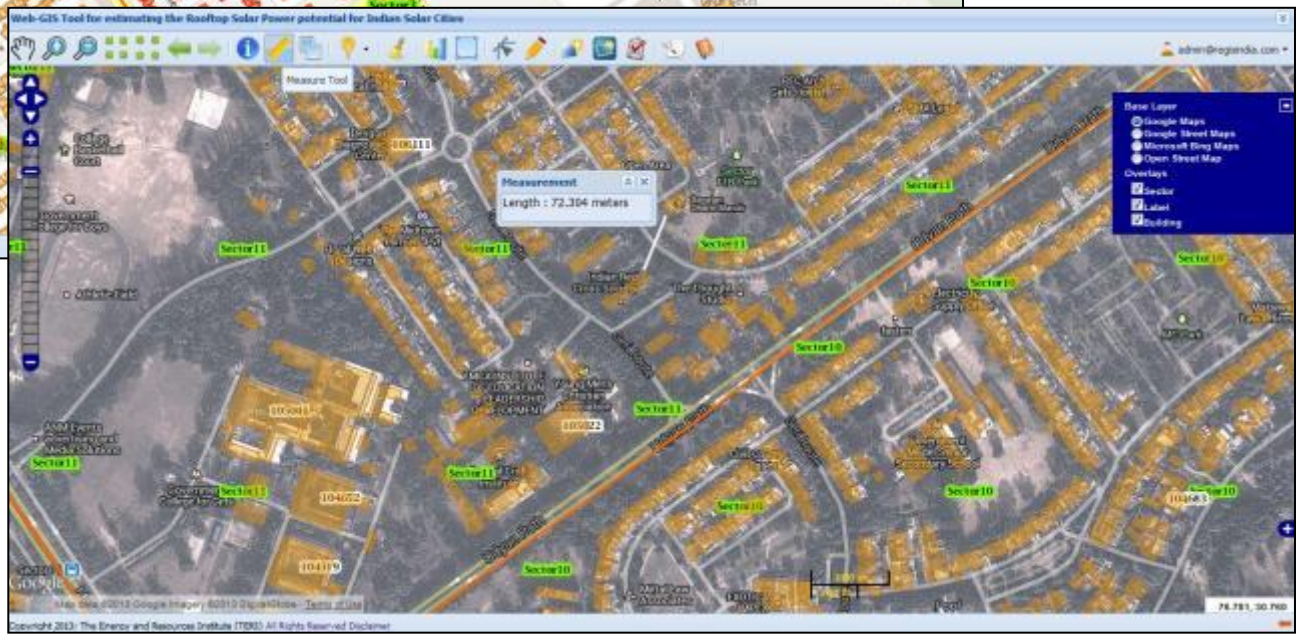
Creating Innovative Solutions for a Sustainable Future



# Rooftop Solar Web-GIS Tool (Analysis Tools)

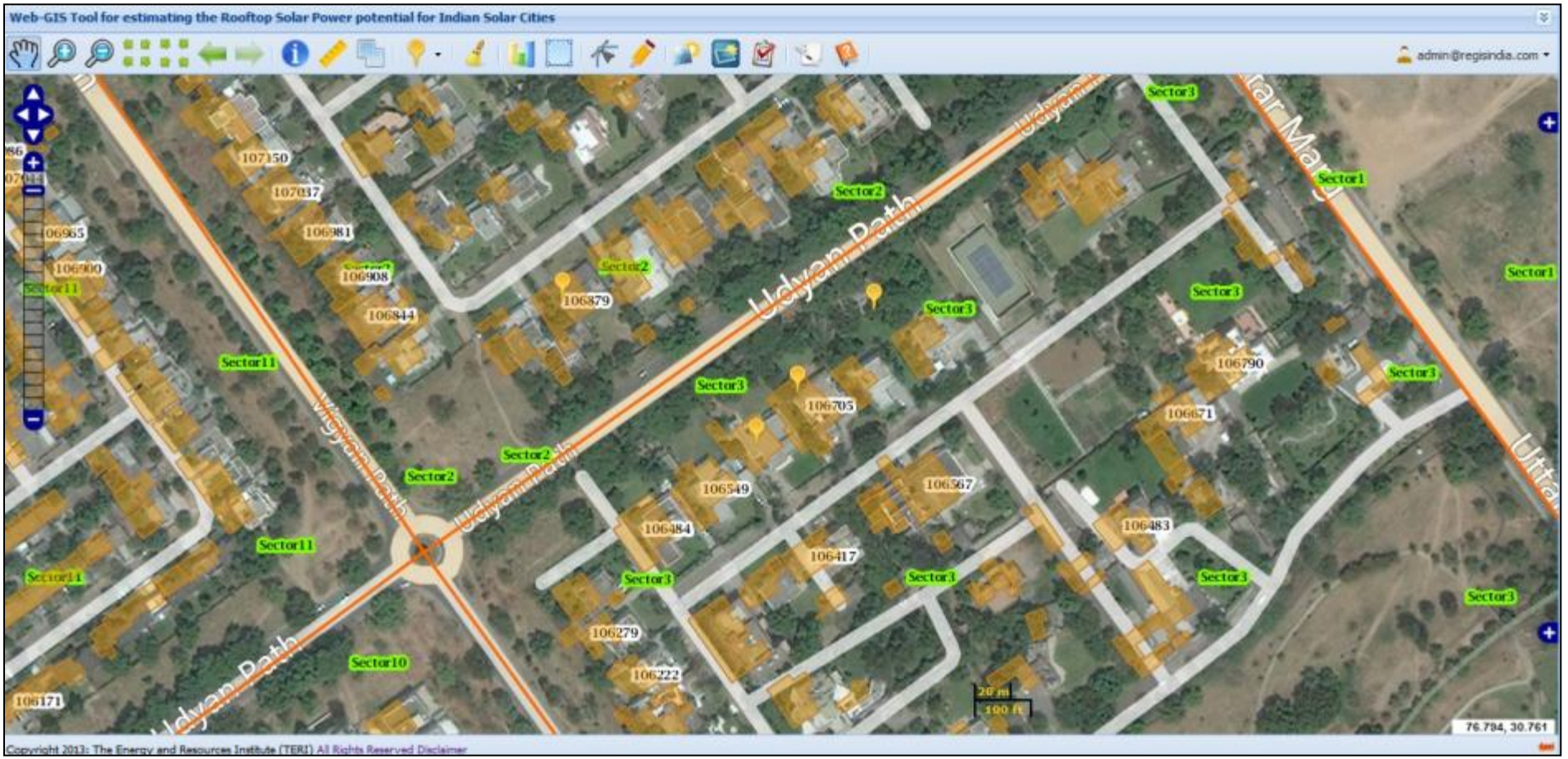




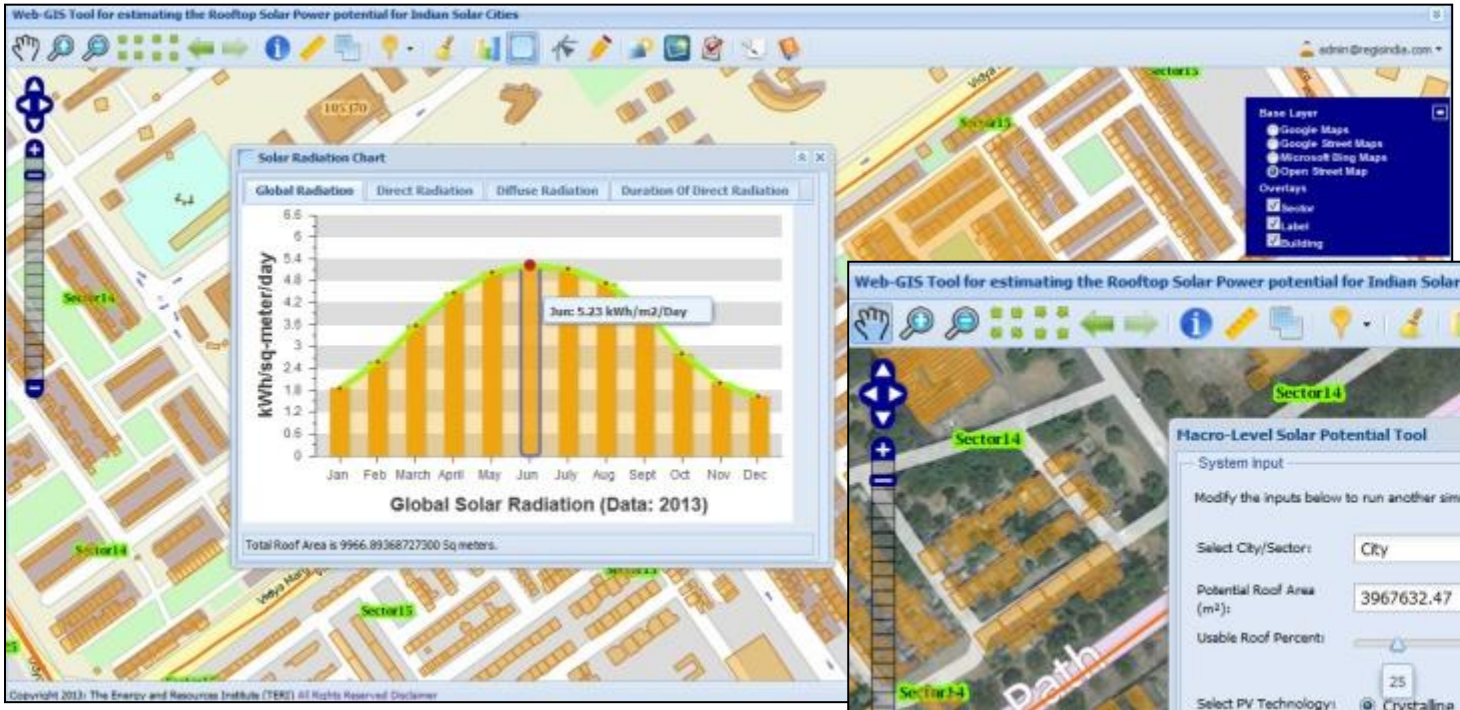
# Rooftop Solar Web-GIS Tool (Placeholder)

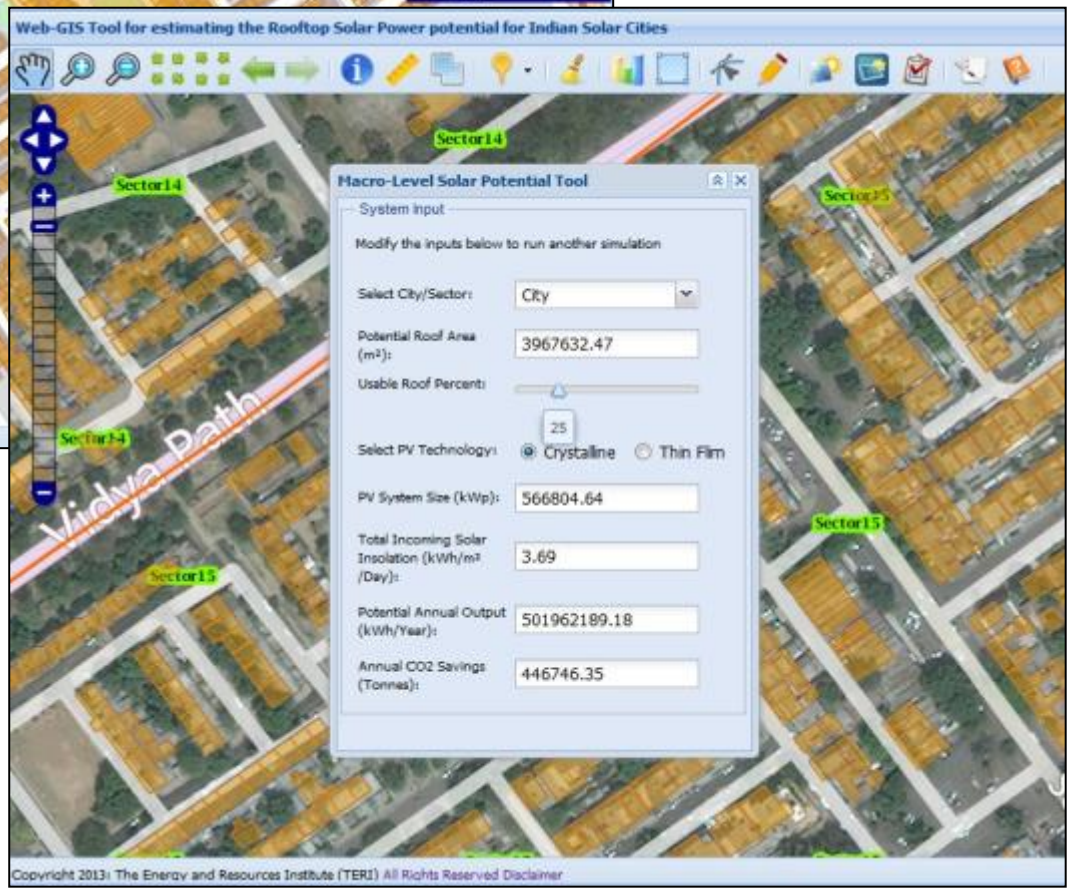
Creating Innovative Solutions for a Sustainable Future



# Rooftop Solar Web-GIS Tool (Core Tools)

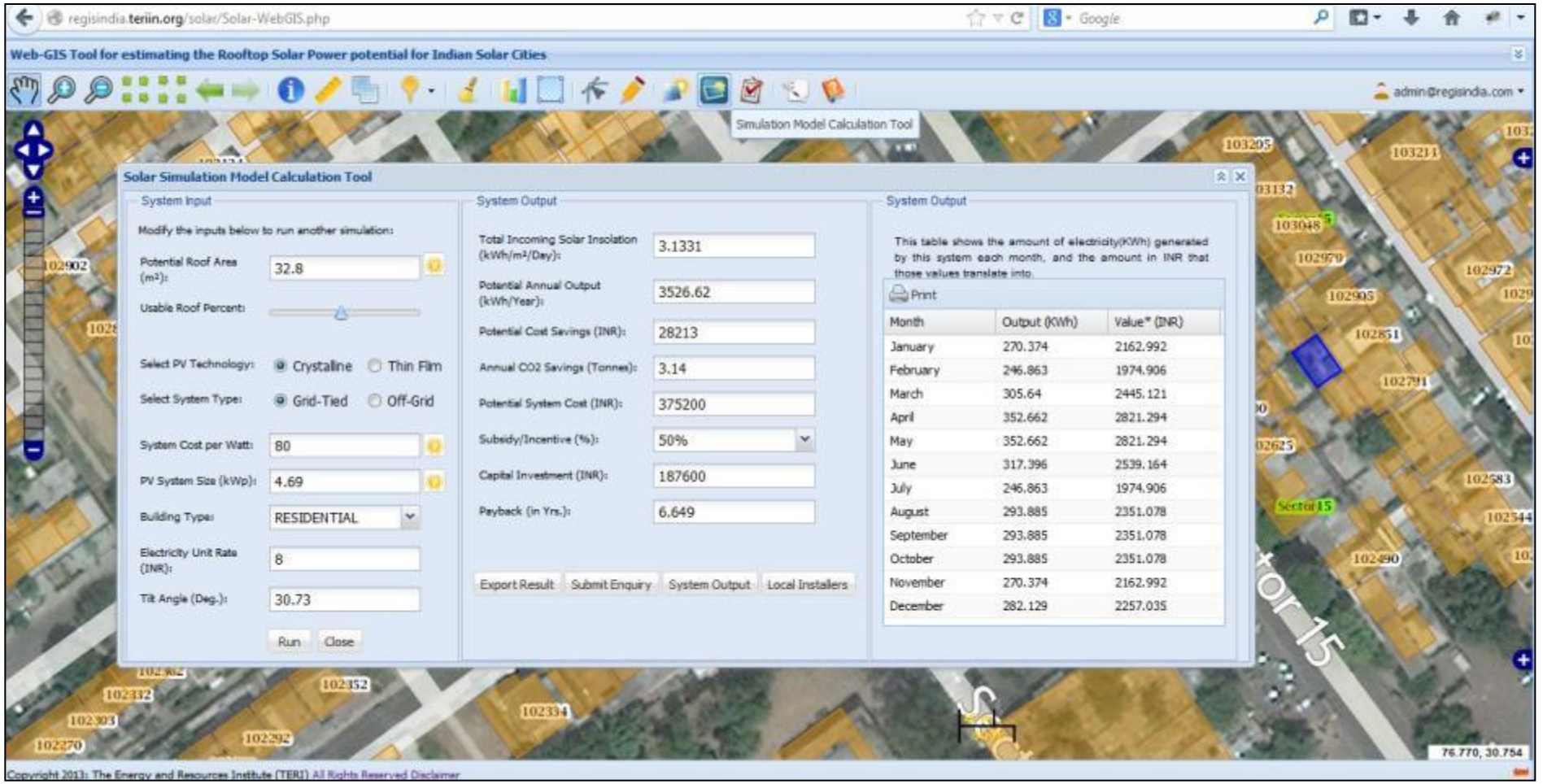
Creating Innovative Solutions for a Sustainable Future



# Solar Simulation Model Calculation Tool

Creating Innovative Solutions for a Sustainable Future



# Solar Simulation Model (Report)

Creating Innovative Solutions for a Sustainable Future

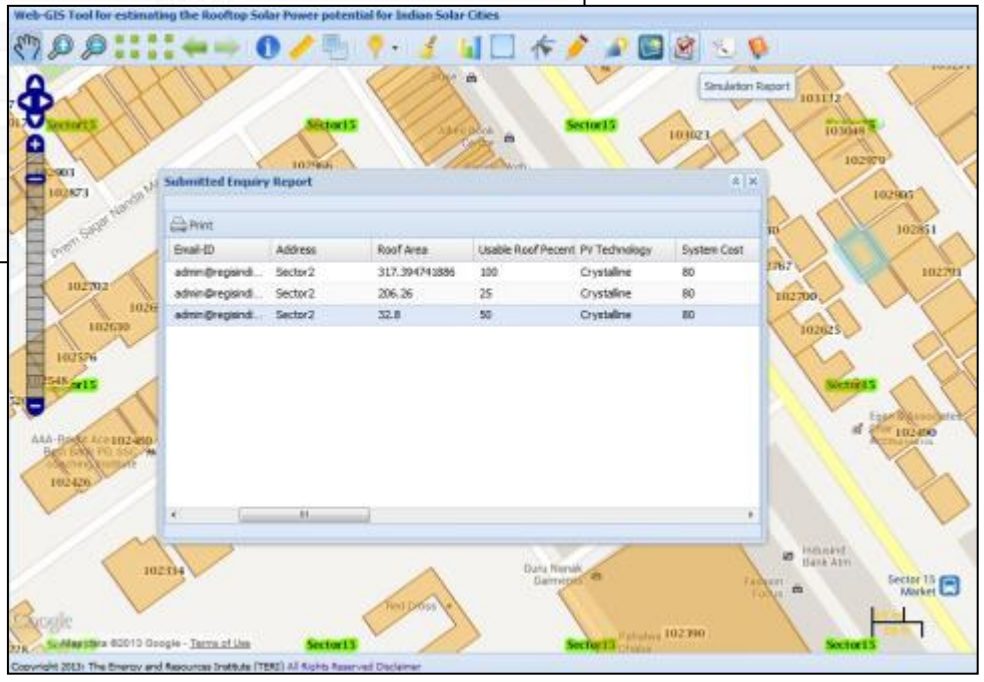
First-of-kind Cloud based Open-Source Web-GIS Architecture for estimating the Rooftop Solar Power potential for Chandigarh Solar City

The Energy and Resources Institute

An Initiative Supported by SHAKTI SUSTAINABLE ENERGY FOUNDATION

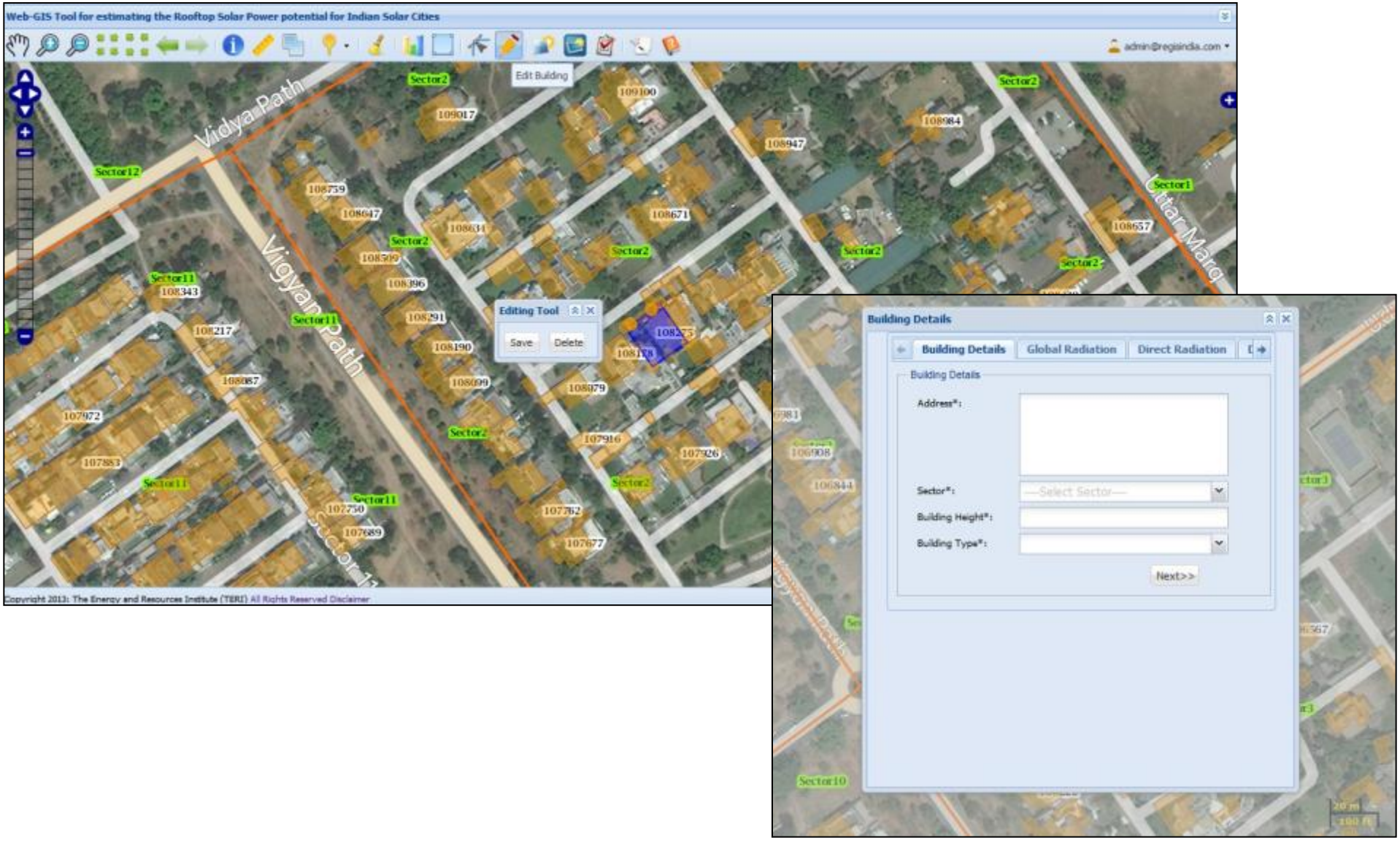
Print Close

| Description | Value |
|---|---|
| Address | NOT SURVEYED |
| Potential Roof Area (m²) | 32.8 |
| Usable Roof Percent | 50 |
| PV Technology | Crystalline |
| System Type | Grid-Tied |
| System Cost Per Watt | 80 |
| PV System Size (kWp) | 4.69 |
| Building Type | RESIDENTIAL |
| Electrict Unit Rate(INR) | |
| Tilt Angle (Deg.) | |
| Total Incoming Solar Insolation (kWh/m2/Day) | |
| Potential Annual Output (kWh/Year) | |
| Potential Cost Savings (INR) | |
| Annual CO2 Savings (Tonnes) | |
| Potential Annual System Cost (INR) | |
| Subsidy/Incentive (%) | |
| Capital Investment (INR) | |
| Payback (in Yrs.) | |



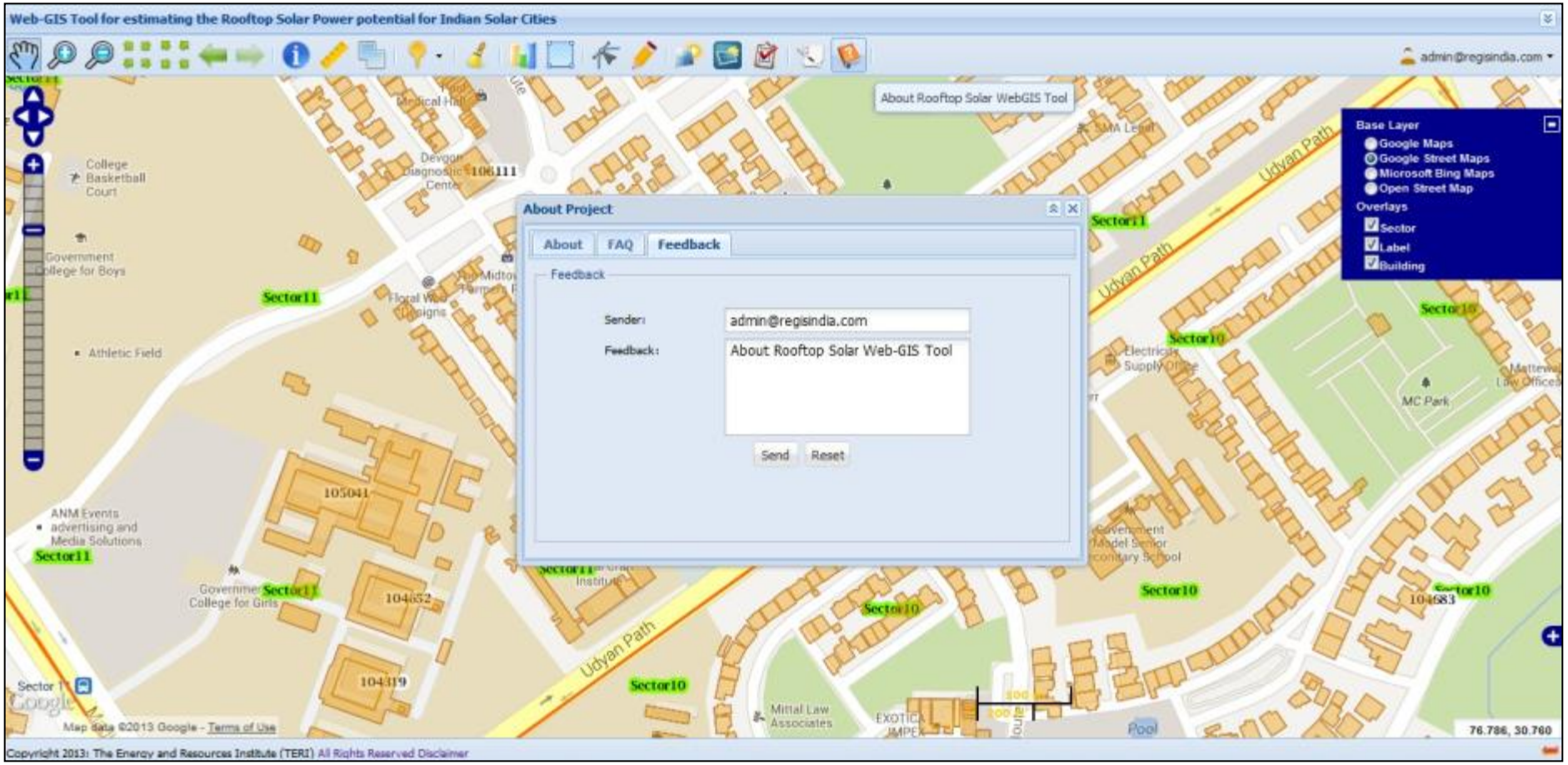
# Rooftop Solar Web-GIS Tool (Spatial Editing)

teri
Creating Innovative Solutions for a Sustainable Future



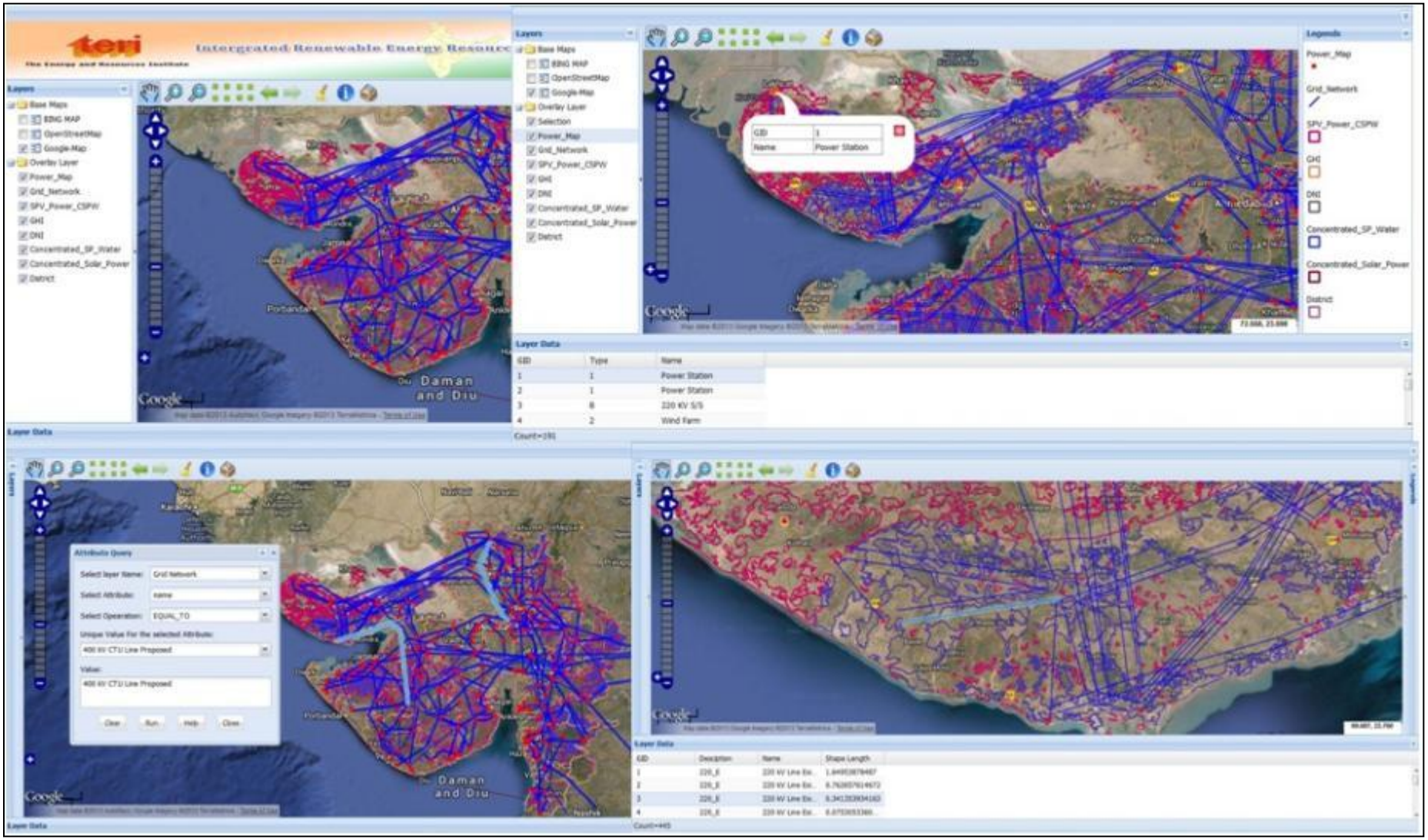
# Rooftop Solar Web-GIS Tool (User Feedback)





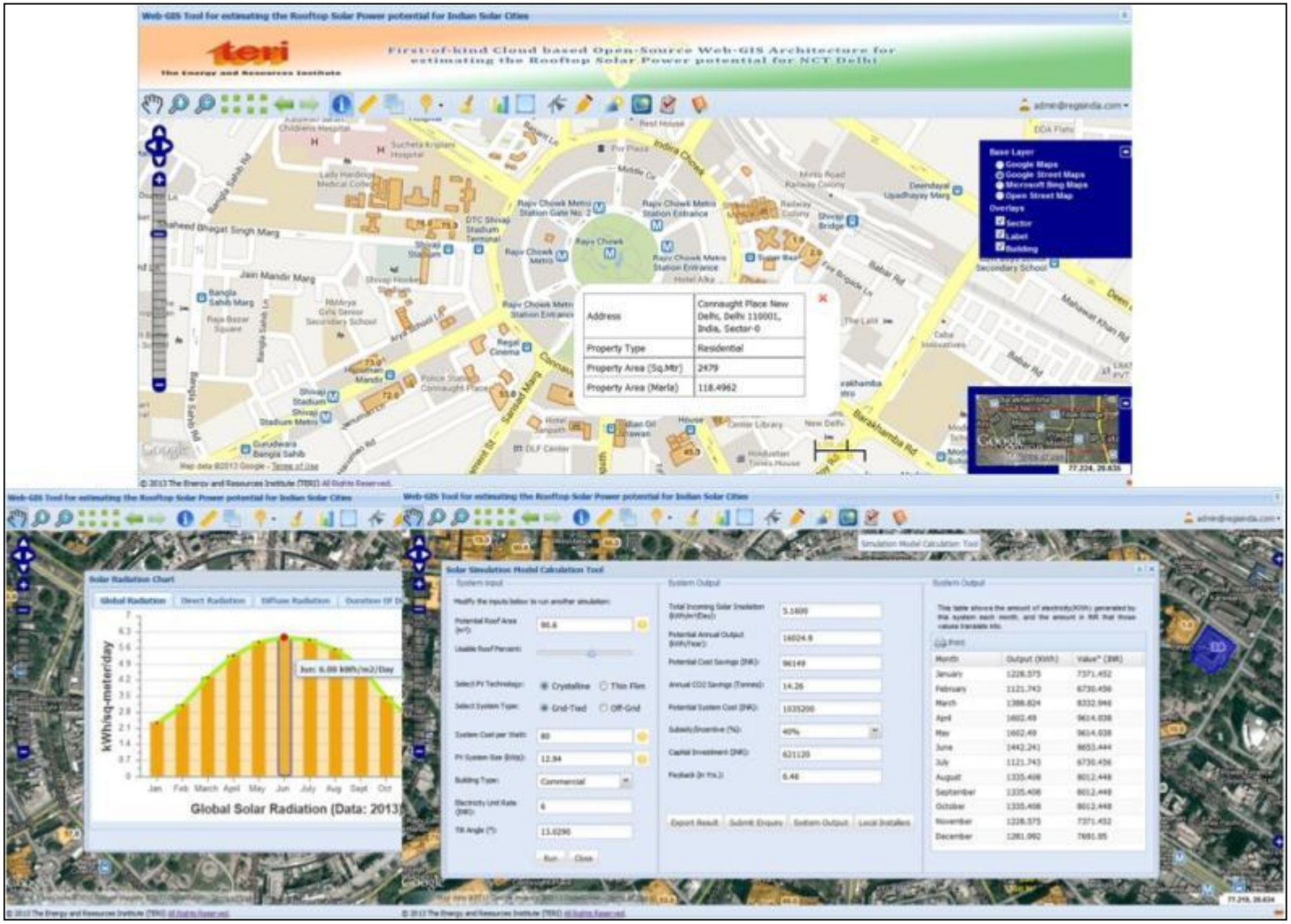
# Web-GIS based Renewable Energy Atlas for Gujarat (Ongoing Project)

Creating Innovative Solutions for a Sustainable Future



# Rooftop Solar Web-GIS Tool for NCT-Delhi (Proof of Concept)

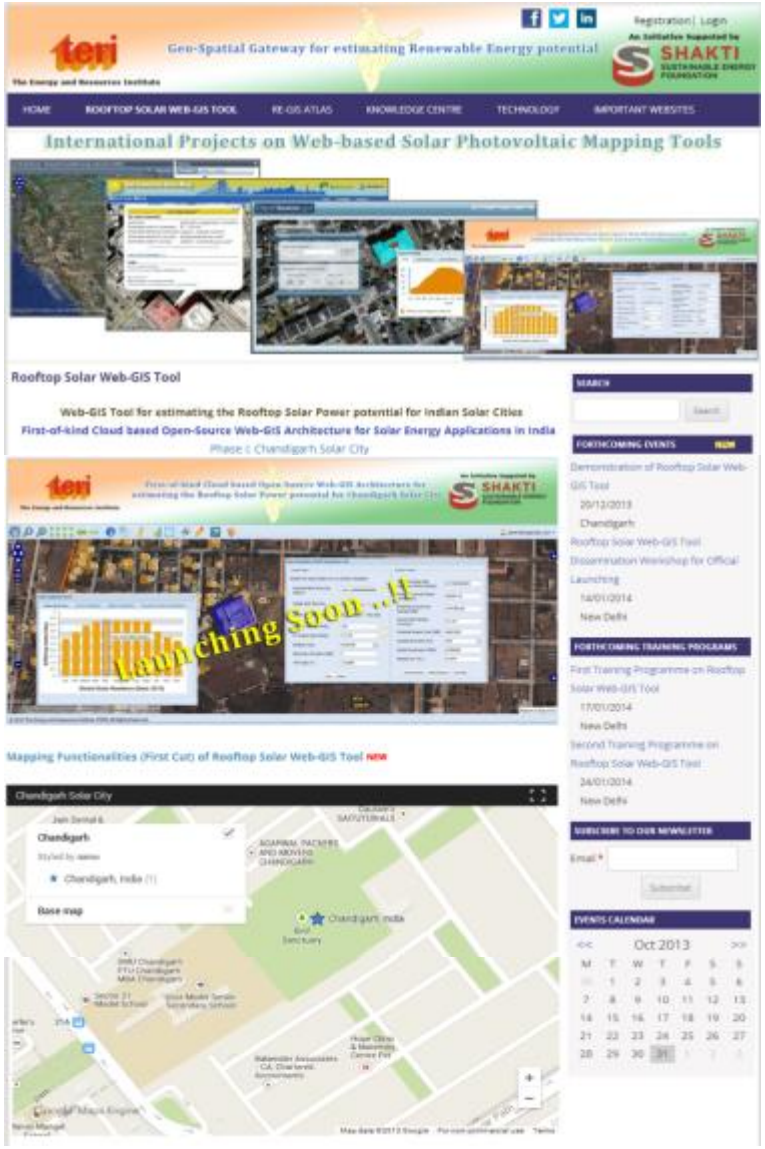
Creating Innovative Solutions for a Sustainable Future



# RE-GIS India (Website Highlights)

Creating Innovative Solutions for a Sustainable Future


RE-GIS India (www.regisindia.com)



# Outcomes from the Study



**This proposed Web-GIS tool will be an ideal medium to showcase investors the logistics of rooftop solar energy investment. The proposed tool will have following benefits:**

- ✓ **It will enable user to estimate the rooftop solar power potential of selected area or, buildings for a particular location w.r.t. various SPV technologies (crystalline/thin-film);**
- ✓ **Will act as a Decision Support System (DSS) to carry out the pre-feasibility assessment of putting rooftop PV system for a particular location;**
- ✓ **Will help users to estimate potential GHG mitigation through solar rooftop PV systems for a given locality;**
- ✓ **Assess the viability of any rooftop projects based on possible business models and financial schemes available.**

# Thank You

Creating Innovative Solutions for a Sustainable Future

alekhya.datta@teri.res.in

+91 11 4150 4900 (**Extn**: 2144)

www.teriin.org | www.regisindia.com

SMA SOLAR ACADEMY
Be a solar expert

The Energy and Resources Institute

NATIONAL INSTRUMENTS Certified

LabVIEW CERTIFIED ASSOCIATE DEVELOPER