

# Development of Web-GIS Tool for estimating the rooftop solar power potential for Indian Solar Cities

## Background

As the demand for renewable energy (RE) has grown, and so has the need to quantify the potential for these resources. Understanding the potential for a particular energy source can help informed policy decisions, educate consumers, drive technological development, increase manufacturing capacity, and improve marketing methods. In response to the desire to better understand the potential of clean energy technologies; several approaches have been developed to help inform decisions. One technology-specific example is the use of solar photo-voltaic (SPV) maps. A solar PV mapping tool visually represents a specific site and calculates PV system size and projected electricity production. Visual, web-based solar PV mapping products are increasing in prevalence. These tools quantify the potential for solar PV at a specific location to educate the user about the benefits of solar PV and its associated costs and savings.

Most of these existing tools such as, In My Backyard (IMBY), Solar Boston Map, San Francisco Solar Map, Berkeley Solar Map, PVWatts developed by National Renewable Energy Laboratory (NREL), Cambridge Solar Map developed by Massachusetts Institute of Technology (MIT) etc. have been developed as a part of the U.S. Department of Energy's (DOE) Solar America Initiative (SAI). This initiative aims to make solar electricity from PV cost competitive with conventional forms of electricity from the utility grid by 2015 through R&D, and market transformation. Many of the 25 Solar America Cities, as part of the SAI, are pursuing solar mapping to educate their populaces. These maps empower a resident, business owner, or, decision maker to take the first step in analyzing the potential for solar PV at a particular location.

## Relevance at National Context in India

Ministry of New and Renewable Energy (MNRE), Government of India (GoI) has launched Jawaharlal Nehru National Solar Mission (JNNSM), which targets 20,000 MW grid connected solar power development by 2022, and also considers the deployment of off-grid solar systems of 2000 MW. The Phase II of JNNSM targets deployment of 1,000 MW of rooftop solar PV projects both at off-grid and grid connected levels. Various solar PV systems have been installed across the country to meet the energy demand and to generate the clean and green energy. Many small Solar PV systems have been deployed in India for electrification where grid connectivity is either not possible or, extending the grid connection to that point is not cost effective and feasible. But in urban or, semi urban area, a large rooftop potential is available which otherwise is not used for any purpose, can be used to install the kilo-watt (kW) scale PV plants to cater the energy need, and hence reduce the extra burden on the transmission and distribution line which otherwise have to be redesigned and reinforced to meet the increased load demand. There are several tools available to estimate the solar rooftop potential, although there is a need of developing more accurate, user-friendly,

intelligent and efficient tool which would be India specific and meet the requirements of end users and planners, which can help in preliminary assessment of site specific rooftop solar PV potential.

### Study Objective

To promote rooftop solar photovoltaic (SPV) systems, especially in Indian solar cities, there is a need for a tool to showcase solar resource potential in a user-friendly format so that users can investigate their locations of interest and perform pre-processed analysis. Geographic Information System (GIS) is the obvious tool to achieve this because it provides visual reference – a map of the entire city showing the buildings those have solar PV installation potential. An important part of every web-based GIS tool is its mapping or, visualization technology, which makes it possible to show data in the form of maps.

Hence, The Energy and Resources Institute (TERI) is currently developing first-of-kind cloud based open-source Web-GIS Tool for estimating Rooftop Solar Power potential for Indian Solar Cities. The main objective of this study is to develop a high performing and flexible Web-GIS tool to estimate the rooftop solar power potential for Chandigarh area. This initiative has been supported by Shakti Sustainable Energy Foundation (SSEF), and the strategic support is being provided by Chandigarh Renewable Energy Science and Technology Promotion Society (CREST), Ministry of New and Renewable Energy (MNRE), Solar Energy Corporation of India (SECI), and Confederation of Indian Industry (CII).

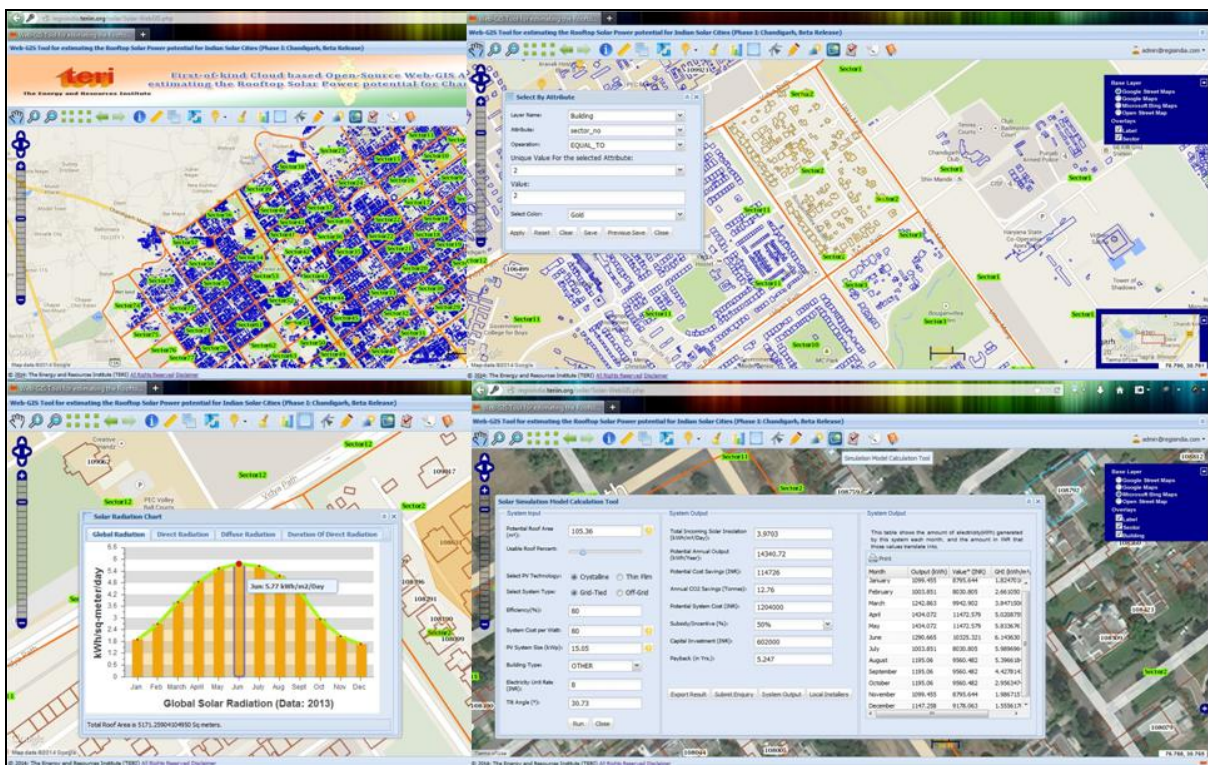


Figure: GIS Interface (Beta Release) of Rooftop Solar Web-GIS Tool for India

### **Principal Outcome(s) resulting from the Project**

The proposed Rooftop Web-GIS Tool for India will be an ideal medium to showcase investors the logistics of rooftop solar energy investment. This tool will have the 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 such as, crystalline, thin-film etc.
- 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 green-house gas (GHG) mitigation through solar rooftop route for a given location/building;
- Assess the viability of any rooftop projects based on possible business models and financial schemes available.

### **Beneficial at National Level**

After successful demonstration of this proposed Rooftop Solar Web-GIS tool on a pilot-basis, the quantifiable and tangible benefits can be showcased for other cities too. This tool can work as a base platform, which can be replicated for other cities by creating the GIS data layers for the target city and integrating those with the existing tool, without having any additional development efforts. Upon development of the GIS database(s), and successful demonstration of the tool for few major cities in the country, the possibility of inclusion of this database into world resources such as, Global RE-Atlas etc. can be explored.

### **Indicators for estimating success of the Project**

The final product of this project will be a GIS based application for rooftop potential assessment. The success of this tool would be measured by analyzing the number of users getting access to the application/tool, policy changes/formulations based on the information and most importantly the acceleration in the deployment of rooftop solar installations.

### **Additional Outcome(s)**

- The entire software development life-cycle and GIS data creation process will be through as per the specified international standards such as, IEEE Standards Association (SA) Software Document Definitions (International Standards for Software Development), International Geospatial Interoperability Standards i.e., ISO Technical Committee 211 (ISO/TC 211) and Open Geospatial Consortium, Inc. (OGC)
- Develop a standardized software development framework which can be replicated further at later stage to demonstrate this similar concept universally for other cities.

The Beta release of this tool is available at: <http://regisindia.teriin.org/solar/Solar-WebGIS.php>. For more information about this ongoing project, and accessing the Renewable Energy Geo-Spatial Gateway of India (RE-GIS India), kindly visit at: [www.regisindia.com](http://www.regisindia.com)

### **Disclaimer**

The views expressed and analysis put-forth in the RE-GIS India Website/ Rooftop Solar Web-GIS Tool does not necessarily reflect views of the concerned authority(s). Rooftop Solar Web-GIS Tool is not substitute to an on-site assessment performed by a certified professional. Rooftop Solar Web-GIS Tool is a remote evaluation tool, based on topographical surveys, information models, and simulation methodologies, and results may be unavailable or, inaccurate due to issues including, but not limited to, partial sample obsolescence, excess of vegetation or, non-modeled obstructions, incomplete or, corrupted databases, incomplete or, corrupted GIS layers, undetectable partial obstructions based on survey resolution, and force majeure. Hence, the concerned agency(s) does not guarantee the accuracy of any data included in this publication and product nor, does it accept any responsibility for the consequences of its use. RE-GIS India Website/Rooftop Solar Web-GIS Tool can be best viewed at (1280 x 1024) resolution with Chrome 14.0/Internet Explorer 9.0/Mozilla Firefox 4.0, and higher.

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