iGEE web tool user manual

1. Introduction

iGEE is a web tool- SaaS application that provides free and open earth observation datasets on Australian land surface temperature and landcover changes. The idea supports SDG research, climate change actions and governments decision making, so that stakeholders can easily assess what is happening to Australian cities and communities, starting with data on urban heat islands effect as a priority environmental issue.

For this purpose, a dedicated interface was built called iGEE: Mapping and Deriving Land Surface Temperature (LST) and Landcover (NDVI & NDBI) in Australia (Figure 1). The web tool was jointly developed by RMIT GISail research group and Australian Urban Research Infrastructure Network (AURIN). Our iGEE web tool contributes to the goal of SDGs 3 (Good Health and Wellbeing), SDGs 10 (Reducing Inequality), SDGs 11 (Sustainable Cities & Communities), SDGs 13 (Climate Action), and SDGs 15 (Life on Land).
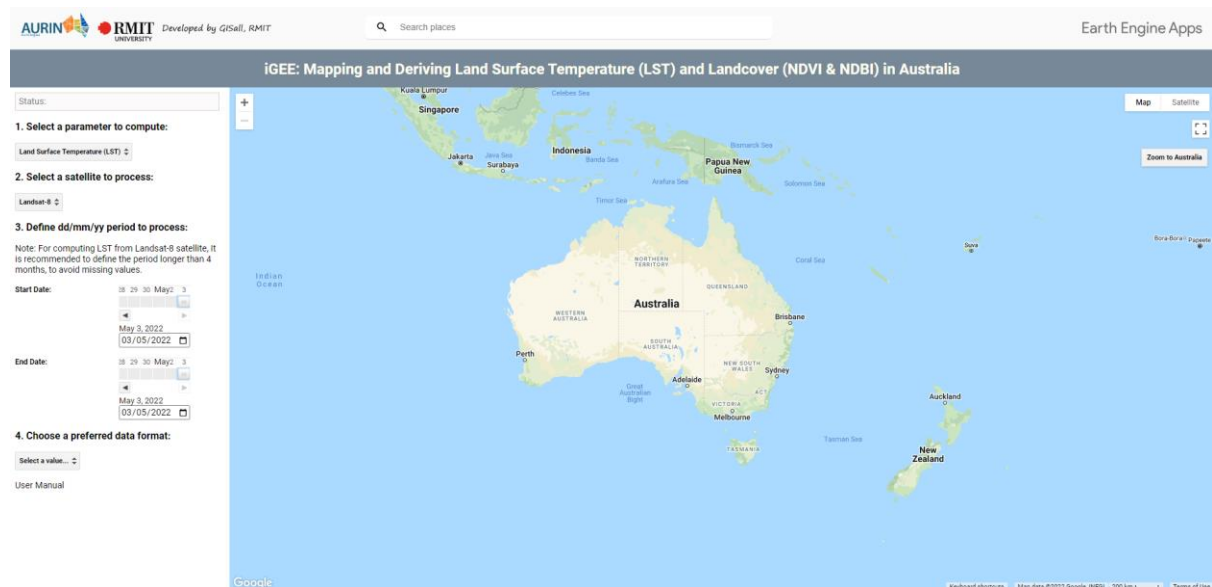

Figure 1. iGEE: Mapping and Deriving Land Surface Temperature (LST) and Landcover (NDVI & NDBI) in Australia interface.

 iGEE is operational on Google Earth Engine platform, directly accessing Earth Engine User Interface API to leverage Landsat, Sentinel and MODIS satellite data to retrieve and download Land Surface Temperature (LST) and Landcover (NDVI & NDBI) parameters in Australia. This user manual provides user instructions for operating iGEE application. The link to the tool is www.gisonmeta.com.

2. Description of iGEE

The iGEE tool operates using Landsat 8, Sentinel-2, and MODIS satellite data to derive LST and Landcover parameters. The description of showing in Table 1.

The tool provides two options for deriving the Land surface temperature (LST) of Australia. Firstly, using Landsat 8 Surface Reflectance, which is the atmospherically corrected surface reflectance from the Landsat 8 OLI/TIRS sensors containing 5 visible and near-infrared (VNIR) bands and 2 short-wave infrared (SWIR) bands with the spatial resolution of 30 m. Secondly, using MODIS Aqua Land Surface Temperature and Emissivity 8-Day Global 1km which has a spatial resolution of 1000m. The landcover parameters (NDVI and NDBI) is derived using Sentinel-2 which carries a multispectral imager with a swath of 290 km and a spatial resolution of 10 m.

The tool offers date range selection in form of dd/mm/yyyy along with study area selection at a National scale (whole Australia) or Greater Capital City Statistical Area Name (GCC Name). The GCC covers 7 capital cities along with their regional areas, namely, Greater Sydney and Rest of NSW, Greater Melbourne and Rest of VIC, Greater Adelaide and Rest of South Australia, Greater Brisbane and Rest of Queensland, Greater Perth and Rest of Western Australia, Greater Darwin and Rest of Northern Territory , and Greater Hobart and Rest of Tasmania. The user can also select their preferred data download format, i.e., Vector-based CSV or Raster-based GeoTIFF to process the download.

Table 1. LST and Landcover datasets description and formats

Datasets	Spatial resolution (m)	Time period	Spatial Coverage	Satellite image
LST/ UHI - Landsat	30	2013-04-11- present	National scale	**USGS Landsat 8 Surface Reflectance Tier 1**
LST/UHI – MODIS	1000	2002-07-04- present	National scale	**MYD11A2.006 Aqua Land Surface Temperature and Emissivity 8-Day Global 1km**
NDBI	10	2015-06-23 - present	National scale	**Sentinel-2MSI: Multispectral Instrument, Level-1C**
NDVI	10	2015-06-23 - present	National scale	**Sentinel-2MSI: Multispectral Instrument, Level-1C**

3. Operational steps

i. Start application: In a web browser (preferred Google Chrome), paste the link to direct to iGEE platform www.gisonmeta.com. The platform with display 'the layer to be selected' on the operational panel (left) and a map panel centred to Australia (right).
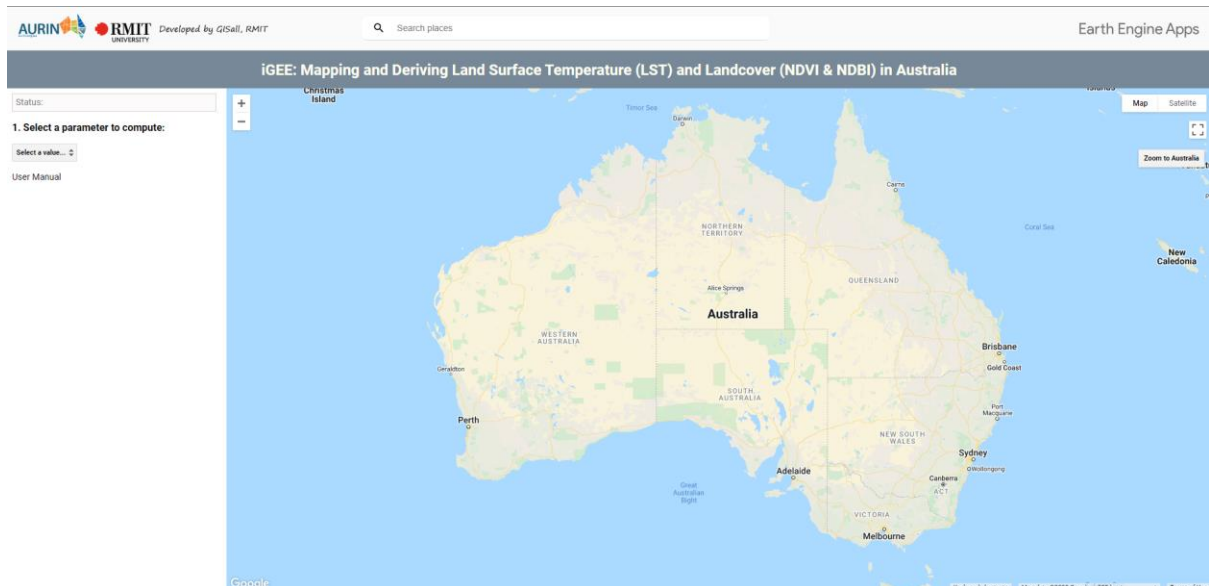
ii. Operational panel : User needs to select different layers to retrieve LST or Landcover parameters. The following steps/layers are explained which the user needs to select to retrieve LST or Landcover data from iGEE webtool. An example of retrieving LST from MODIS satellite at nationwide Australia is also illustrated in the steps.

1. Select a parameter to compute

Select a value**:** It gives the option to select three parameters to be computed.

For example: User chooses Land Surface Temperature (LST).

2. Select a satellite to process

Select a value**:** Once the parameter is selected, user need to select a satellite. For calculating LST, user can choose either of the two satellites: Landsat 8 and MODIS. For calculating NDVI or NDBI, user needs to choose Sentinel-2 satellite.

For example: User chooses Landsat 8.

3. Define dd/mm/yy period to process:

User needs to click the calendar icon to select the time range. The scroll bar is set to change the 'dd' (days). User needs to set a 'Start date' and 'End date' to define the time period. Once selected the time period will be displayed in form of dd/mm/yyyy.

For example: User chooses 01/11/2020 as start date and 31/03/2021 as end date. (Note: This time range indicated the summer months in Australia for 2020).

4. Choose a preferred data format

Select a value**:** The date format allows the user to download the retrieved parameter either in vector or raster format. In this tool, user can download vector data in form of CSV and raster data in form of GeoTIFF.

*For example: User chooses Vector-based CSV.*

5. Choose a pre-defined study area for CSV

Select a value**:** User needs to define a study area. A drop-down menu lists the name of the Greater Capital City and their regional areas in Australia. For example, Greater Melbourne is a Greater Capital City and Rest of Vic is its regional area. Similarly, Greater Sydney and Rest of NSW, Greater Brisbane and Rest of Qld, Greater Adelaide and Rest of SA, Greater Perth and Rest of WA, Greater Hobart and Rest of Tas, Greater Darwin and Rest of NT and Australia Capital Territory. User can select 'Entire Australia' to download nationwide data. The tool will directly navigate to the area selected.

For example: User chooses Greater Melbourne.

6. Submit request and download result

Once all the parameters are selected, user needs to click process request to direct the tool for computation. Once the computation starts, the tool will display the layers on the map panel.
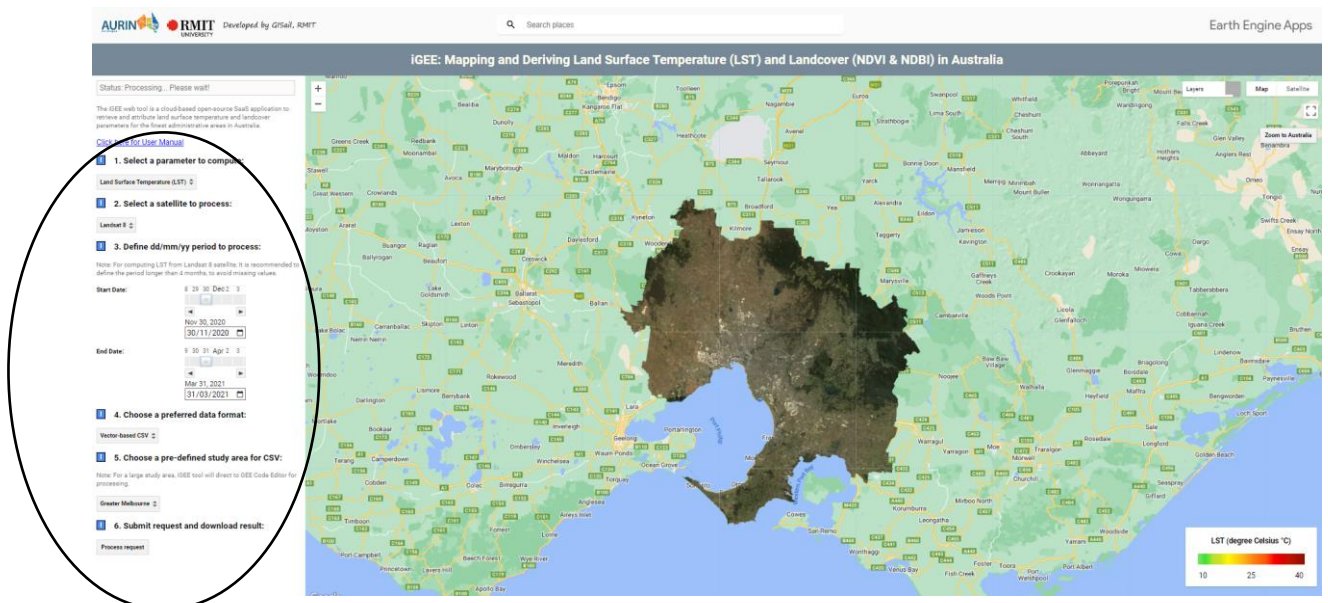
Once the computation finishes, the option of ' Download result' will appear on the operation panel. User needs to click on it to download the result to local disk.