

Colombia Use Case of EO Use for SDG 11.3.1 Indicator	
SDG Indicator/Sub-indicator	SDG Indicator 11.3.1 Ratio of land consumption rate to population growth rate
Country or region	Colombia
Status (please check)	<input type="checkbox"/> being used in official SDG Indicator reporting <input checked="" type="checkbox"/> being verified or tested by country <input type="checkbox"/> studying feasibility
Earth Observation Data Used and its links	Landsat images, available in Google Earth Engine https://developers.google.com/earth-engine/datasets/catalog/landsat
Additional/ Other Data Used and its links	Census 2018 population or growth projections data https://www.dane.gov.co/index.php/en/estadisticas-por-tema/demografia-y-poblacion/censo-nacional-de-poblacion-y-vivenda-2018
Description of data access, processing, and analysis, including methodology that was developed, associated tools or applications, and how these are applied to compute SDG Indicator	<p>Firstly, to get the set of ideal Landsat images a Google Earth Engine script was developed, this to filter the collections having certain characteristics such as:</p> <ul style="list-style-type: none"> • Geographic area (coverage). • Time, in this study case between the years 2003 and 2015. • Low cloud and cloud shadow percentage presence. <p>As a result of this process, the number of pixels free of clouds and cloud shadows is given (specifically for urban areas), the additional band <i>Fmask</i> available in Google Earth Engine was used in this task.</p> <p>Then, it is necessary to apply topographic correction method to the selected image (SRTM Digital Elevation Model 30 M of the USGS was used in this case), after that, supervised classification algorithm was used, hence, the sample training and assessing method was generated, to classify the image the random forest algorithm was implemented, next, the confusion matrix was computed, the standard accepted for this process is up to 80%. Finally, the classification results were generalized by softening borders and review atypical areas in ArcGIS and ERDAS software.</p> <p>In the end, the indicator was computed as follow:</p> <p>Land Consumption Rate (LCR)</p> $LCR = \frac{LN(Urb_{(t+n)}/Urb_t)}{(y)}$ <p>Where:</p> <p><i>Urb_t</i> = Value of the constructed area intersecting the CM area in the initial year <i>Urb_(t+n)</i> = Value of the constructed area intersecting the CM area in the final year <i>y</i> = Number of years between the years of study</p>

Population Growth Rate (PGR)

$$PGR = \frac{LN(Pop_{(t+n)}/Pop_t)}{(y)}$$

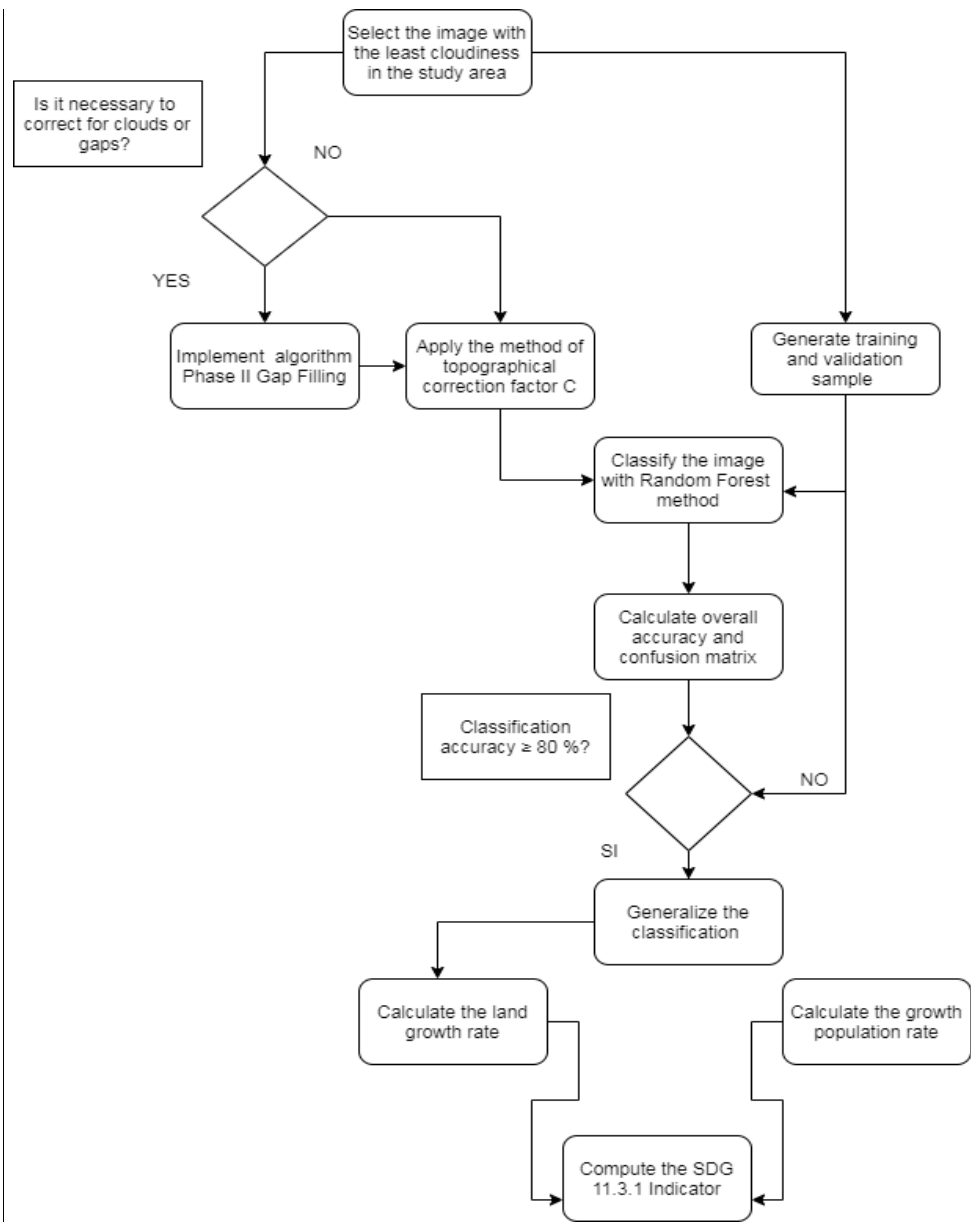
Where:

Pop_t = Projection of the total population of the CM in the initial year
 $Pop_{(t+n)}$ = Projection of the total population of the CM in the final year
 y = Number of years between the years of study

SDG Indicator 11.3.1 Ratio of land consumption rate to population growth rate

$$Indicator\ 11.3.1 = \frac{LCR}{PGR}$$

Work flow



<p>Lessons learned, any gaps, key issues and recommendations</p>	<p>The methodology is feasible to replicate given that it includes free use of Landsat images and free access of the Google Earth Engine platform. The use of this platform allows reducing processing time and of classification of the images because the parameterizable scripts are available that make it easier to process, so the uses of Google Earth Engine is broadly recommended. The continuous updating of population data and projection was found as a key issue, to compute the indicator in different periods. DANE is making efforts to compute the indicator again with data of the last census.</p>
<p>Supporting material about this use case. Include links, publications, etc.</p>	<p>Please find attached the results 2018 publication (in Spanish) coming soon will be available in English.</p>
<p>Name(s) and email address of individual(s) involved in this effort. Please note the principal point(s) of contact (POCs).</p>	<p>Sandra Liliana Moreno Mayorga Geostatistical Direction Manager slmorenom@dane.gov.co</p> <p>Raul Emilio Ospina Villalobos Research and development task group leader reospinav@dane.gov.co</p>