COMPLEMENTARY USE OF CITIZEN SCIENCE AND EO DATA FOR ADDRESSING SDG DATA GAPS

Linda See, Dilek Fraisl and many others

25 May 2022
Citizen science and the United Nations Sustainable Development Goals

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Original Article | Open Access | Published: 02 July 2020


Abstract

The UN Sustainable Development Goals (SDGs) are a vision for achieving a sustainable future. Reliable, timely, comprehensive, and consistent data are critical for measuring progress towards, and ultimately achieving, the SDGs. Data from citizen science represent one new source of data that could be used for SDG reporting and monitoring. However, information is still lacking regarding the current and potential contributions of citizen science to the SDG indicator framework. Through a systematic review of the metadata and work plans of the 244 SDG indicators, as well as the identification of past and ongoing citizen science initiatives that could directly or indirectly provide data for these indicators, this paper presents an overview of where citizen science is already contributing and could contribute data to the SDG indicator framework. The results demonstrate that citizen science is “already contributing” to the monitoring of 5 SDG indicators, and that citizen science “could contribute” to 76 indicators.
Synergies between Citizen Science and EO for the SDGs

- **Green** = where citizen science is already contributing
- **Yellow** = where citizen science has the potential to contribute
- **Black boxes indicate both citizen science and EO can contribute together**
Picture Pile as a tool for SDG monitoring

- Rapid image classification
- Single or pairs of images (for change detection)
- Wilderness, deforestation, building damage assessment
- Yes/no/maybe mechanic

- Yes/No/Maybe mechanic modified for categorical and continuous variable data collection
<table>
<thead>
<tr>
<th>Campaign</th>
<th>Location</th>
<th># of participants</th>
<th># of validations</th>
<th># of images</th>
<th>Campaign start date</th>
<th>Campaign available for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wild landscapes</td>
<td>Global</td>
<td>32</td>
<td>11,937</td>
<td>86,176</td>
<td>2014-12-15</td>
<td>6 months</td>
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<tr>
<td>Deforestation</td>
<td>Tanzania, Indonesia</td>
<td>1360</td>
<td>5,127,697</td>
<td>362,544</td>
<td>2015-07-25</td>
<td>Left open until 2018-09-04</td>
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<tr>
<td>Hurricane Matthew campaign 1</td>
<td>Haiti</td>
<td>344</td>
<td>224,214</td>
<td>37,582</td>
<td>2017-04-28</td>
<td>6 days</td>
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<tr>
<td>Hurricane Matthew campaign 2</td>
<td>Haiti</td>
<td>421</td>
<td>298,323</td>
<td>37,582</td>
<td>2017-05-03</td>
<td>12 days</td>
</tr>
<tr>
<td>Cloud detection</td>
<td>Global</td>
<td>149</td>
<td>276,068</td>
<td>27,021</td>
<td>2019-02-28</td>
<td>2 months</td>
</tr>
<tr>
<td>Nighttime lights</td>
<td>Global</td>
<td>217</td>
<td>160,338</td>
<td>13,966</td>
<td>2019-03-04</td>
<td>6 months</td>
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<tr>
<td>Urundata land cover campaigns</td>
<td>Indonesia</td>
<td>395</td>
<td>1,373,840</td>
<td>14,221</td>
<td>2019-04-01</td>
<td>4 months</td>
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<tr>
<td>Oil palm plantations</td>
<td>Global</td>
<td>78</td>
<td>56,212</td>
<td>1,649</td>
<td>2019-07-31</td>
<td>1 month</td>
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<tr>
<td>Oil palm plantations Asia</td>
<td>Asia</td>
<td>78</td>
<td>99,618</td>
<td>13,653</td>
<td>2019-08-20</td>
<td>2 months</td>
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<tr>
<td>Poverty (degree of wealth)</td>
<td>Dhaka, Bangladesh</td>
<td>176</td>
<td>60,382</td>
<td>11,300</td>
<td>2019-08-26</td>
<td>6 months</td>
</tr>
<tr>
<td>Slums</td>
<td>Dhaka, Bangladesh</td>
<td>74</td>
<td>13,636</td>
<td>30,028</td>
<td>2019-08-27</td>
<td>6 months</td>
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<tr>
<td>Urundata Change Campaigns</td>
<td>Indonesia</td>
<td>195</td>
<td>3,553,315</td>
<td>153,115</td>
<td>2019-08-27</td>
<td>3 months</td>
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<tr>
<td>Marine litter</td>
<td>One beach</td>
<td>105</td>
<td>14,374</td>
<td>1,215</td>
<td>2019-12-13</td>
<td>3 months</td>
</tr>
<tr>
<td>Poverty (degree of wealth)</td>
<td>Africa</td>
<td>63</td>
<td>7,888</td>
<td>1,398</td>
<td>2019-12-18</td>
<td>6 months</td>
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<tr>
<td>Poverty (building height)</td>
<td>Dhaka, Bangladesh</td>
<td>181</td>
<td>36,430</td>
<td>12,300</td>
<td>2020-02-06</td>
<td>6 months</td>
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<tr>
<td>Earth Challenge Food Insecurity (crop types)</td>
<td>France, Latvia, USA</td>
<td>1292</td>
<td>289,553</td>
<td>45377 out of 70,520</td>
<td>2020-07-28</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
Picture Pile and the SDGs

- Found that Picture Pile could contribute to the monitoring of 15 SDG indicators (SDGs 1, 2, 11, 13, 14, 15)
- Direct = data from Picture Pile could contribute to the calculation of the SDG indicators
- Supplementary = data that are useful to contextualize an SDG indicator or target

<table>
<thead>
<tr>
<th>Campaign</th>
<th>Direct</th>
<th>Supplementary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wild landscapes</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Deforestation</td>
<td>15.2.1</td>
<td>-</td>
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<tr>
<td>Hurricane Matthew campaign 1</td>
<td>1.5.2, 11.5.2</td>
<td>1.5.1, 11.5.1, 13.1.1</td>
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<tr>
<td>Hurricane Matthew campaign 2</td>
<td>1.5.2, 11.5.2</td>
<td>1.5.1, 11.5.1, 13.1.1</td>
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<td>Cloud detection</td>
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<td>-</td>
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<td>Nighttime lights</td>
<td>11.3.1</td>
<td>1.1.1, 1.2.1, 1.2.2</td>
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<tr>
<td>Urundata land cover campaigns</td>
<td>15.1.1, 15.2.1, 15.4.2</td>
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<tr>
<td>Oil palm plantations</td>
<td>15.1.1, 15.2.1, 15.4.2</td>
<td>-</td>
</tr>
<tr>
<td>Oil palm plantations Asia</td>
<td>15.1.1, 15.2.1, 15.4.2</td>
<td>-</td>
</tr>
<tr>
<td>Poverty (degree of wealth)</td>
<td>11.1.1</td>
<td>1.1.1, 1.2.1, 1.2.2</td>
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<td>Slums</td>
<td>11.1.1</td>
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<tr>
<td>Marine litter</td>
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<td>14.1.1b</td>
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<td>Poverty (degree of wealth)</td>
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<td>Poverty (building height)</td>
<td>11.1.1</td>
<td>1.1.1, 1.2.1, 1.2.2</td>
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<tr>
<td>Earth Challenge Food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insecurity (crop types) from 31 Mar 2021</td>
<td>2.4.1</td>
<td>-</td>
</tr>
</tbody>
</table>
An example of Picture Pile + EO for SDG 11

- SDG 11, indicators 11.1.1: Proportion of urban population living in slums, informal settlements or inadequate housing
- Slums have multiple dimensions, but one is about housing durability
- Picture Pile was used to classify images in Dhaka for presence/absence of slums, number of floors in buildings and degree of wealth (although clearly subjective)
- Inputs were used (along with many other features including those from remote sensing) to produce a wall-to-wall map for the city with slum locations

Data from Picture Pile

Slum locations from Gruebner et al. (2014)
An example from SDG 14.1.1b

- Index of plastic debris density
- Citizen science already part of the methodology for this indicator (GESAMP, 2019; UNEP, 2021)
- Many citizen science initiatives established in cleaning up beaches (counting, identifying and weighing items)
- Picture Pile was used in a campaign to gather observations of marine litter from imagery
- Could be used to complement field-based approaches
- Was used to train an AI algorithm to automatically recognize marine plastics using remote sensing to produce a density map as a demonstrator (in collaboration with U of the Aegean)
Picture Pile as a tool for SDG monitoring

Environmental Science & Policy
Volume 128, February 2022, Pages 81-93

Demonstrating the potential of Picture Pile as a citizen science tool for SDG monitoring


Show more

More examples can be found in the paper

Highlights

- Citizen science can contribute to the monitoring of the Sustainable Development Goals.
- Picture Pile is a citizen science tool for rapid image classification.
- Picture Pile could contribute to the monitoring of 15 SDG indicators.
- To realize this potential, use cases for PP and the SDGs need to be developed.
Picture Pile Platform

- Picture Pile Platform, new project funded by ERC PoC
- Commercially self-sustaining platform
- Anyone can setup a pile and run their own campaigns via the Picture Pile Campaigner for free

**Campaigner**
Setup your own pile of images to get classifications

**Picture Pile App**
Crowd classifies the images using the picture pile mobile app in an intuitive, efficient and engaging way

**Data Portal**
The image classifications are made publicly available on Data portal

**Quality Assurance**
Many quality control mechanism guarantee the quality of data collected.

**Free To Use**
It is completely free to setup your own pictures. You can pay the crowd if you don’t want to make the collected data public on Data Portal or provide additional incentives for the crowd to do classifications.

- Users can earn money
- Data freely available on the Picture Pile Data Portal
- Launch at end of 2022
- Looking for people interested in creating first piles
Monitoring SDG 14.4.1b with Citizen Science

Strengthening Measurement of Marine Litter in Ghana

How Citizen Science is Helping to Measure Progress on SDG 14.1.1b

SDSN TReNDS  |  9 April 2021

Integrating citizen science data on marine litter for SDG indicator 14.1.1.1b reporting in Ghana

Understanding the global methodology
- Global
- National
- Supplementary indicators
- Beach litter count per km² of coastline

Finding and compiling the data
- TIDES ICC Platform
- Local citizen science groups: SNFYVF, Plastic Punch
- Compiling the data (GSS)
- Distributing the data: In-Country Custodian, Government Stakeholders

Validating, integrating and reporting the data
- Bringing together global and national stakeholders
- Organizing global and national workshops
- Calculating integrating and reporting

Align the ICC methodology with the global 14.1.1.1b indicator methodology
Facilitate support to the local citizen science groups for future data collection activities
Ensure policy uptake and impact
Citizen Science data....

- that were used for monitoring beach litter have been integrated into the official SDG monitoring and reporting mechanisms of Ghana
  - Ghana is the first country to report on SDG indicator 14.1.1b and the first country to use citizen science data for that purpose
- will serve as inputs to Ghana’s Ocean Plan and other relevant policies to address the marine litter problem
- have helped to bridge local data collection efforts with global monitoring processes by leveraging the SDG framework
- will be integrated with EO in the next phase of the project using Picture Pile to classify drone imagery/classification of RS imagery
Lessons Learned

- Rather than the time- and resource-intensive process of designing a digital mobile app from scratch, used off-the-shelf solutions such as CleanSwell, requiring fewer resources to implement and enabling the reuse of historical data.

- By tapping into **Smart Nature Freaks Youth Volunteers** and **Plastic Punch**, who are already established and sustainable networks, data could be efficiently compiled as a by-product of existing activities.

- Importance of creating time and space for the government, international organizations and NGOs to meet, in order to **build trust**, common goals and **ownership** over the results.
Plug for our latest project: CAMALIOT

- Collection of raw GNSS data from mobile phones to improve weather forecasting
- > 11K participants; > 58 billion measurements
- [https://www.camaliot.org](https://www.camaliot.org)
- Poster at the session on Friday
Thank you!
Any questions?

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