UN SDGs and EO satellite imagery

AquaWatch

CSIRO Earth Observation Future Science Platform

8th June 2016
Earth Observation & Geo-spatial information resources for SDG monitoring (GEO matrix)

Source: GEO “Supporting Official Statistics in Monitoring the SDGs”, March 2016
<table>
<thead>
<tr>
<th>Sustainable Development Goals</th>
<th>Population distribution</th>
<th>Cities and Infrastructure mapping</th>
<th>Elevation and topography</th>
<th>Land cover and use mapping</th>
<th>Oceanographic observations</th>
<th>Hydrological and water quality observations</th>
<th>Atmospheric and air quality monitoring</th>
<th>Biodiversity and ecosystem observations</th>
<th>Agricultural Monitoring</th>
<th>Hazards, disasters and related impacts</th>
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</thead>
<tbody>
<tr>
<td>1   No poverty</td>
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<td>2   Zero hunger</td>
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<td>3   Good health and well-being</td>
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<td>4   Quality education</td>
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<td>5   Gender equality</td>
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<td>6   Clean water and sanitation</td>
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<td>7   Affordable and clean energy</td>
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<td>8   Decent work and economic growth</td>
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How many goals to be monitored with EO satellite data use?

Australia identifies at least 9 goals where EARTH OBSERVATIONS could be directly used and relevant either to monitor the indicators to help measuring the goals’ progress, or to help achieving the goals.
Australian Bureau of Statistics is Co-Chair of the UN Global Working Group on Big Data for Official Statistics and Chair of the sub group on the Use of Satellite Imagery, Remote Sensing and Geospatial Data for Official Statistics

• CSIRO writing chapter for report to the UN Statistics Commission on the use of satellite earth observation for use in official statistics.
GOAL 6
“Ensure availability and sustainable management of water and sanitation for all”

TARGET 6.6
“By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.”

INDICATOR 6.6.1
Percentage of change in the extent of water-related ecosystems over time

% of change in wetlands extent over time can be measured globally by earth observation based monitoring of wetlands looking at land-use, land-cover, vegetation cover, inundation frequency, biodiversity.
Multi-temporal Wetland Identification and Delineation products (Landsat 1975, 1990, and 2002) for exemplary sites between Izmir and Bodrum (upper part: region around Tahtali Dam; lower part: Bodrum airport area).

http://www.earthzine.org/wp-content/uploads/2011/12/Figure-3.jpg
GOAL 15
“Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.”

TARGET 15.2
“By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally”

INDICATOR 15.2.2
Net permanent forest lost

Land cover (time series) to be monitored, such as the global initiative GFOI (to foster the sustained availability of observations for national forest monitoring systems)
Land cover map for Colombia using 2011 ± 2 years of MODIS NDVI and surface reflectance MOD13A1 data, filtered for low-quality observations and adding elevation (TS-F-C2-E)

http://www.mdpi.com/2072-4292/7/12/15833/htm
How to determine minimum EO data requirements?

Guiding questions to decide whether or not EO satellite data can help monitor issues/SDGs indicators:

<table>
<thead>
<tr>
<th>Justification</th>
<th>Do you need to use EO?</th>
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</thead>
<tbody>
<tr>
<td>Suitability</td>
<td>Can EO provide the required data products?</td>
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<tr>
<td>Spatial resolution</td>
<td>What is the appropriate size of pixel?</td>
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<tr>
<td>Temporal frequency</td>
<td>How frequent do these EO need to be done?</td>
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<tr>
<td>Record length</td>
<td>How far back in time does your data record to go?</td>
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<tr>
<td>Reliability</td>
<td>Do you need guaranteed continuation of data supply into the future?</td>
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<tr>
<td>Accuracy:</td>
<td>What degree of accuracy is needed in the data product?</td>
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<tr>
<td>Maturity</td>
<td>Do you want to use only data products that common in use?</td>
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<tr>
<td>Complexity</td>
<td>What data management and analysis capacity is available?</td>
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</table>
DETECTION TREE

Define the problem: context of the topic (or indicator) to be measured/monitored

Define the status of existing EO data/networks

Do you NEED to use satellite EO data?

YES

Can satellite EO potentially provide the required data?

YES

Determine minimum required data characteristics

QUESTIONS - Rationale

Which issues to be addressed?
- Policy and or regulatory drivers
- Who are the stakeholders and beneficiaries?

Metrics available?
- Condition of the data networks?
- Impediments of sharing, collating, archiving the data?
- Any papers/case-studies already written?
- Any monitoring/modelling?

Justification
- Will complement ground-based monitoring networks or serve as the sole information source?
- Will it be used in conjunction with modelling?
- Are the EO data streams suitable for long-term official statistics?
- Would EO complement/replace traditional official statistics, or would it be a new methodology?

Suitability
- What variables can EO provide?
- Are data products readily available? Or will they be in future?

Spatial resolution: What is the appropriate pixel size?
Temporal frequency: How frequent do these observations need to be?
Record length: How far back in times does your data record need to go?
In-situ data requirements: How much in situ data are used in data product?
Reliability: What's the certainty of supply of that product across space and through time?
Accuracy: What's the uncertainty associated with the data estimates?
Maturity: How established the data product is?
Complexity: What is the level of complication involved in the process of converting the EO processed data into the data product?
Updates on SDGs
(from IAEG-SDG: Informal briefing to the General Assembly on the global SDG indicator framework - 28th Jan 2016)

• **Statistical Capacity building** plan in discussion
  - Will become essential for national statistical systems
  - *Should we be part of the process regarding “Big data” and satellite data?*

• Indicators:
  - GLOBAL indicators are still in discussions (will be further formalized post March 2106)... However, **member states will also develop indicators to complement global ones**, to take into account national priorities/environment

*From CEOS discussions: Should we start promoting EO satellite data / DataCube=Analysis Ready data projects to some countries (national statistics agencies willing to use EO satellite data to monitor specific and relevant indicators)? CEOS and GEO: yes!!*