DSC-128 SDG 6.6.1. Surface water

2018-12-06

The aim of this project is to research and develop techniques for rapid monitoring and assessment of changing extents of freshwater bodies in relation to operationalising SDG indicator 6.6.1: "Change in the extent of water-related ecosystems over time" in different country contexts. The work will complement UNEP's Global Surface Water App by monitoring within year change against the trends identified in that dataset using timely and higher resolution earth observation datasets.

Team members

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Project outline

SDG indicator 6.6.1 supports the management and protection of water-related ecosystems and the services those provide to societies. As part of work on this indicator, a consortium on UN Environment Programme (UNEP), Google, and the EU Joint Research Centre developed a powerful data product, the Global Surface Water Explorer (GSWE), and web-based application, the SDG 6.6.1 app. The platform provides both geospatial data (as geotiffs) and aggregated national, sub-national and basin level statistics (as csv) on permanent, seasonal and monthly (monthly data to be added in mid-2019) water extents for the years between 1984 and 2018. The data is derived from Landsat imagery, with Sentinel being added by end 2019, based on the indicator methodology. Note that the number of viable images globally before 2000 is low for some locations and thus the SDG indicator 6.6.1 uses 2000-2004 as a baseline.

SDG indicator 6.6.1 includes the data which is available globally through the SDG 6.6.1 app along with data which is reported nationally. A planned expansion of

the SDG 6.6.1 app to include wetlands, mangroves and chlorophyll-A deviations is planned during 2019-2020. Nationally reported data is primarily focused on SDG 6.6.1 sub-indicators related to wetlands, water flow and water quality (which links to SDG 6.3.2 on water quality). Currently for the UK, indicator 6.6.1 is based only on the globally available data while national data sources are being explored. The GSWE platform should therefore be of direct practical use in the production of statistics for the UK that are disaggregate and reported in a standard and globally consistent way.

Whilst the GSWE provides high accuracy and global coverage, for some applications it's temporal and spatial resolution is a limitation. These include: early identification of emerging issues in the distribution and quantity of available water caused, for example, by climate change, drought, flooding, or human activities (e.g. damming or extraction), and; monitoring changes to strategically important water bodies that fall below the resolution of imagery (20-30m depending on source). In particular, due to the intensity of computations involved in running the global algorithm, the data product is only produced on an annual basis which is planned for February each year (e.g. the monthly data for January would only be available in February 2019). This constrains the use of GSWE in operational settings as a source of data to drive early policy interventions and assess the effectiveness of those.

High resolution imagery and data science techniques may offer ways to complement the GSWE and mitigate against limitations by providing ways to rapidly detect emerging issues and support localised assessments. This project would look at the feasibility of using such datasets for these purposes, trading-off the accuracy and completeness provided by the GSWE with simpler but higher resolution assessments that could be reported quickly as part of an detection system. The proposed research will focus on three areas:

- UK SDG reporting: To investigate datasets and support reporting against the indicator nationally, we would undertake some initial feasibility work in the UK where we currently have access to high resolution imagery (SPOT and Pleaides) and a range of geospatial datasets on the extents of water-related ecosystems.
- Early warning: Following initial scoping work, we would focus research on one or more sites in Kenya to assess methods to rapidly monitor changes in water body extents to a required level of accuracy. This work would be to support the identification of areas where a user would want drill-down and assess local impacts using high resolution data from Planet.
- Targeted analysis of significant water bodies: To consider the feasibility of applying high resolution imagery for making such assessments and supporting further analysis, we will also look at the strategically important site of Wadi El Ku in Sudan. Two research areas of interest at this location are integrating remotely sensed flood water levels to within simple environmental models to assess the impact of the weirs, being constructed, on water management regimes and for early warning, and; to monitor how

fast areas of the wadi dries up after the rainy season, using for example NDVI, to show the effect of the weirs.

Impact

The Public Good

The project supports a programme of work around the Sustainable Development Goals and the principle of those to leave no one behind.

The project is closely engaged with the SDG and Natural Capital reporting teams at ONS to ensure the outputs of the work are aligned with strategic objectives both nationally and in relation to international partnerships. Work within the UK will also feed into national reporting of the indicator.

The project will work directly with the UN Environment Programme to ensure that it is aligned with their requirements for 'real-time' information in support of operational activity and complements the GSWE. UNEP will share the project objectives and project findings with national and local level stakeholders in Kenya and Sudan to ensure country engagement and use. This will include through linking to existing UNEP planned data collection and fieldwork next year in a variety of the locations. UNEP will also work with countries to bring the data under this project together with other relevant data streams. The aim is for outputs from this project to be available for that activity to demonstrate to countries what information is available and to support countries in bringing together multiple sources of information to inform policy.

UNEP and ONS will also consider this pilot work as an opportunity to build awareness of the potential of using the Global Platform for similar initiatives.

Data science

The work is innovative for a variety of reasons: * It will assess the potential of high resolution satellite imagery to support applying SDG indicators to drive policy. * It will look to apply data science techniques to detect surface water and assess changes over time. * It will use cloud infrastructure from the UN Global Platform to develop robust and open methods.

Stakeholders

UNEP – Jillian Campbell and Stuart Crane (overall on SDG 6.6.1) and David Jensen (on Wadi El Ku) ONS – SDG and Natural Capital teams, International Development Team UN Global Platform

Dissemination and outputs

Events

- UN Big Data for Official Statistics, 29/04-03/05/2019

- World Water Week, Stockholm, 25/08-30/08/2019

Related and existing work

- SDG 6.6.1 methodology
- SDG 6.6.1 metadata
- Global Surface Water Explorer (paper), and blog post
- SDG 6.6.1 / GSWE homepage and app
- BlueDot Water Observatory Medium blog and AWS blog
- BlueDot methodology
- UN Global Platform

Delivery

TBD - [ ] **May 2019** Project started - [ ] **August 2019** A milestone - [ ] **Dec 2019** Another milestone - [ ] **Future** Estimated delivery

Further information

Please contact datasciencecampus@ons.gov.uk for more information.

Updates

- No updates yet.