Satellite Monitoring for Forest Management (SMFM) Project

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Main progress:

1 Project planning and analysis

Main activities during the month of February 2019 were the preparation of a training event on the use of SMFM tools 1 and 2 at the RCMRD in Nairobi, Kenya, and the continuing engagement and coordination with the F-TEP team on hosting of the tools on the F-TEP platform.

In addition, testing of the SMFM tools by designated partner country staff went underway and the SMFM project engaged in discussions with the GFOI plenary organisers on a possible side event at the GFOI plenary meeting in April 2019 in Maputo, Mozambique.

Technical update:

2.1 Design new or enhanced satellite EO methods to address requirements and gaps

SMFM Tool 1a/1b:
With the SMFM Tool 1 already operational and deployed onto F-TEP since December 2018, it has attracted further attention of users outside the SMFM project[1]. New users of the tool include (i) the Taras Shevcheko National University of Kyiv that is testing the tool to monitor agriculture in Ukraine with Sentinel 2 data and (ii) the National Data Centre in Finland that uses the tool to generate national-scale mosaics of Finland every 12 days for the use of citizens national agencies for multiple purposes. Feedback from these users has resulted in a range of alterations to sen2mosaic, including bug-fixes, updates to installation instructions, and new command line options. The scripts are continued to be updated as more use-cases are discovered.

SMFM Tool 2:
In early February, the team managed to get a development version of SMFM tool 2, dubbed “biota”, onto the F-TEP platform also in preparation of the upcoming training on tools 1 and 2.

[1] The scripts of sen1mosaic and sen2mosaic are published on bitbucket

Further improvements have been applied:

- The tool now has a new command line interface[2]. This means that it is no longer a requirement for the user to know Python to make use of this tool, lowering the barrier to use for many non-specialist users.
- Updates made to the required Python modules mean that SMFM tool 2 is now a Python 3 only library. This will require updates for existing users but over the long term will improve stability of the tool and will make the tool “future-proof” for quite a while.

Under a separate project, the University of Edinburgh introduced the modified tool to new users at a 1-week workshop held at the Zimbabwe Forestry Commission (25th February - 1st March). At this occasion the tool was used to prepare a first national scale deforestation map of Zimbabwe, which was turned into a poster for the Forestry Commission.

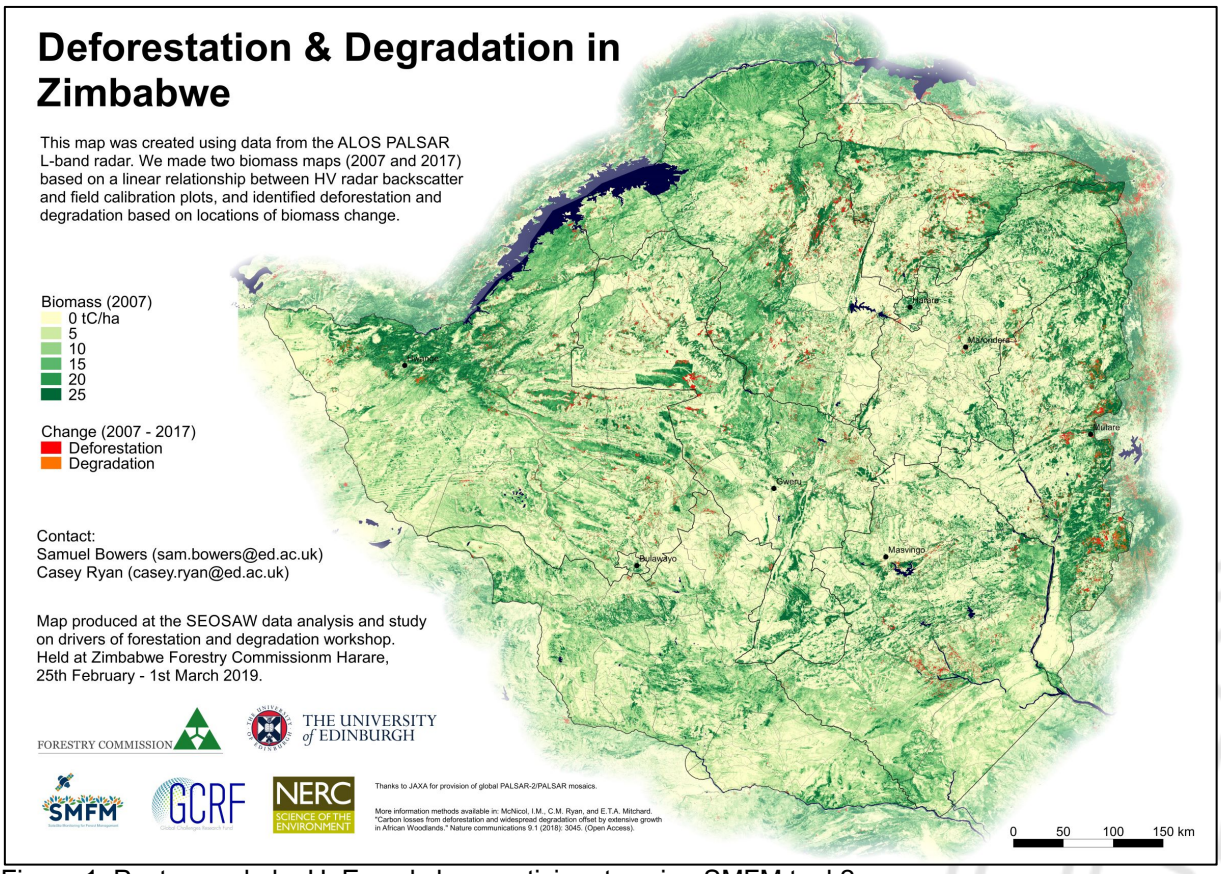

Figure 1: Poster made by UoE workshop participants using SMFM tool 2

Similar outputs are planned to be produced by partner country participants during the 1-week training on the use of the SMFM tools 1 and 2 at the RCMRD in Kenya in March 2019.

SMFM Tool 3:
Requirements of the SMFM Tool 3 when processing dense time-series of Sentinel-2 data on the F-TEP platform still represent barriers to its effective use. As described in previous progress reports, the pre-processing and atmospheric correction from level-1 to level-2 products proves challenging. Until all Sentinel-2 scenes are prep-processed to level-2, as earlier announced by ESA, this will remain to be a bottleneck.

To temporarily mitigate this effect, the SMFM development team decided to update the sen2mosaic tool, which handles data loading and pre-processing requirements, to take level-1 (L1C) files as input, reducing the pre-processing load at the expense of reduced quality cloud masks and no atmospheric correction. The impact of this change will now be evaluated.

In addition, the SMFM development team liaised with the F-TEP team on the retrospective pre-processing of four Sentinel tiles[3] for each partner country covering areas where calibration and validation data are available[4]. While implementing this it turned out that during the recent migration of F-TEP to the CREODIAS infrastructure inconsistencies between the Sentinel data repositories occurred, making part of the existing imagery over Africa and in particular Mozambique inaccessible to the search functions.

These kind of temporary set-backs will continue to affect the testing and development of the tools on the chosen platform. However, the F-TEP team has so far been very responsive and quick to correct such issues.

SMFM Tool 4:
A prototype of the SMFM Tool 4 has been used to produce test data over a range of southern African cities (Lusaka, Maputo, Dar Es Salaam, Harare, Lilongwe, Harare, Luanda). This data will be used at the upcoming training in Nairobi to test the capacity of the tool to identify the activities resulting in woody cover change. Change activities will be identified using high-resolution imagery from Google Earth, and resulting datasets used to calibrate and validate tool performance in the future.

A pilot of this method at the Harare workshop produced the following estimates of the contribution of various activities to woodland change in Zimbabwe (see figure 2 below).

2 described at: https://biota.readthedocs.io/en/latest/command_line.html
3 In squares of 2 x 2 tiles
4 Mozambique: tiles 36KWD, 36KWE, 36KVE, 36KVD
Zambia: tiles 35LQD, 35LRD, 35LRC, 35LQC

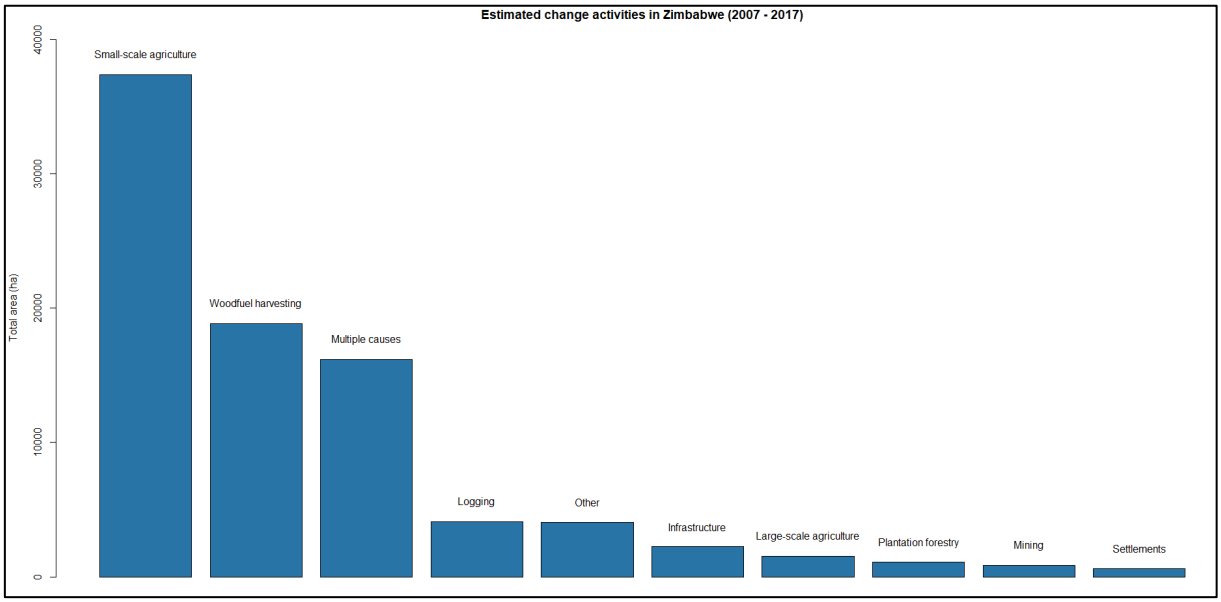

Figure 2: Results from Tool 4 testing; estimated area of dry forest change by cause

Co-development and testing of EO tools:
Testing of tools began with setting up all users on F-TEP in a dedicated SMFM user / developer group. All participants and co-developers were asked to allow tracking of usage to asses their level of engagement with and utilisation of the SMFM tools during testing.

During February an additional person from the Zambian NRSC (Mr. Michael Phiri) has been added to the testing and co-development team.

The Mozambique testing team successfully tested tools 1 and 2 and shared initial outputs with the group.

In a separate development and following discussions at the joint VC in January, Hatfield Consultants, advisers to the World Bank, also tested the tools on F-TEP and provided a detailed report, which serves as a basis for further improvements. Some of the issues encountered are, however, related to the operation of the underlying F-TEP platform and are not directly tool-related. The SMFM development team has started looking into the comments and is preparing a response.

Testing of EO cloud platforms

<u>Forestry-TEP:</u>

With the first two tools deployed onto F-TEP a number of issues arose that were directly discussed with the F-TEP team. These included the absence of any possibility to store temporary outputs between two runs of the same tools or of different tools, such as the pre-processing with tool1 and the time-series processing with tool 3.

The same is relevant for running of tool 2 on F-TEP, as the ALOS mosaic data are not stored on the CREODIAS data repository and need to be downloaded for each run.

The LTS / UoE development team has also benefitted from an online training session with the F-TEP team on specific issues around deployment and operation of the SMFM tools on the platform. Although brief, the training was helpful in particular in addressing the following topics:

- how to build functional Docker files and compatible workflow files for tailored scripts development
- updates on the L2A data processing for the selected tiles
- multi-tile processing (Area of Interest) for SMFM tool 2 Biota
- updates on costing structure

Following this training, the team agreed with the F-TEP team to make a similar session available to participants from the SMFM partner countries at the upcoming training at RCMRD Kenya in March 2019.

4.3 Implement at least two training events; including SSKE

Preparations for the training event to be hosted at RCMRD Kenya continued with budgeting, requests for quotations, invitation of participates, including staff from RCMRD Kenya, and travel arrangements. A training programme and materials were prepared by University of Edinburgh and shared with the participants. Each partner country selected three participants to attend the training.

In January 2019, a decision had been taken to present the project and the tools at the upcoming GFOI plenary meeting in Maputo, Mozambique in April 2019. Initiated by the World Bank, communication with the GFOI event organisers has continued throughout February to provide the SMFM project with a slot for a side event during the open forum. Such a side event could become an important occasion to promote the SMFM tools among dry-forest countries and the global community of practice.

Issues and potential bottlenecks:

As previously reported, the risk of service disruptions at the F-TEP due to platform development remains a continuous issue for the successful testing and running of the SMFM tools. Some of the issues raised and suggestions made by tool testers depend on F-TEP functionalities and can therefore not directly be addressed by the SMFM development team.