TITLE (not too long if possible)

Automatic redevelopment sites monitoring using Sentinel data

STORY

(1000-3500 characters with spaces)

The Walloon Region is managing an inventory of abandoned sites, mainly former industrial areas, suitable for rehabilitation. While the presence of this type of site represents a deconstruction of the urban canvas, it also constitutes an opportunity for sustainable urban planning. Updating this inventory of more than 2,200 sites, located throughout the region, is costly and time-consuming, but it is essential in order to provide up-to-date information to various actors. However, less than 10% of these sites are estimated to be rehabilitated each year, in whole or in part.

The aim of the SARSAR project is to develop an operational tool to automatically monitor these sites using Sentinel imagery, from the European Copernicus programme, to (1) detect changes, (2) determine the type of change, (3) indicate the direction of the change and its amplitude, and finally (4) provide a confidence index per change. The project exploits the complementarity between Sentinel-1 data, which acquires C-band SAR images, and Sentinel-2, composed of a multispectral imaging system. On the one hand, Sentinel-1 is sensitive to variations in shape, height and water content. On the other hand, the Sentinel-2 optical data allow the identification and classification of changes in land cover. Moreover, their frequent revisit time (2 to 3 days over Wallonia) and their free access make them relevant for automatic change detection at the regional scale.

The general methodology includes the following stages:

- A framework based on a first filter to remove unusable data (e.g. cloudy optical images), features extraction and creation of temporal profiles;
- A change detection me methodology;
- A rule-based classifier to categorize changes into different types of land cover (vegetation, building and soil), also providing information on the direction of the change (increase, decrease), the amplitude and a confidence index.

The process is implemented in the TERRASCOPE platform, the Belgian contribution to the Sentinel Collaborative Ground Segment, as it provides pre-processed Sentinel data and computer capacity for the automatization.

ILLUSTRATION

(Add min3 high resolution high quality illustration (as high as possible, min 600 x 400 px))
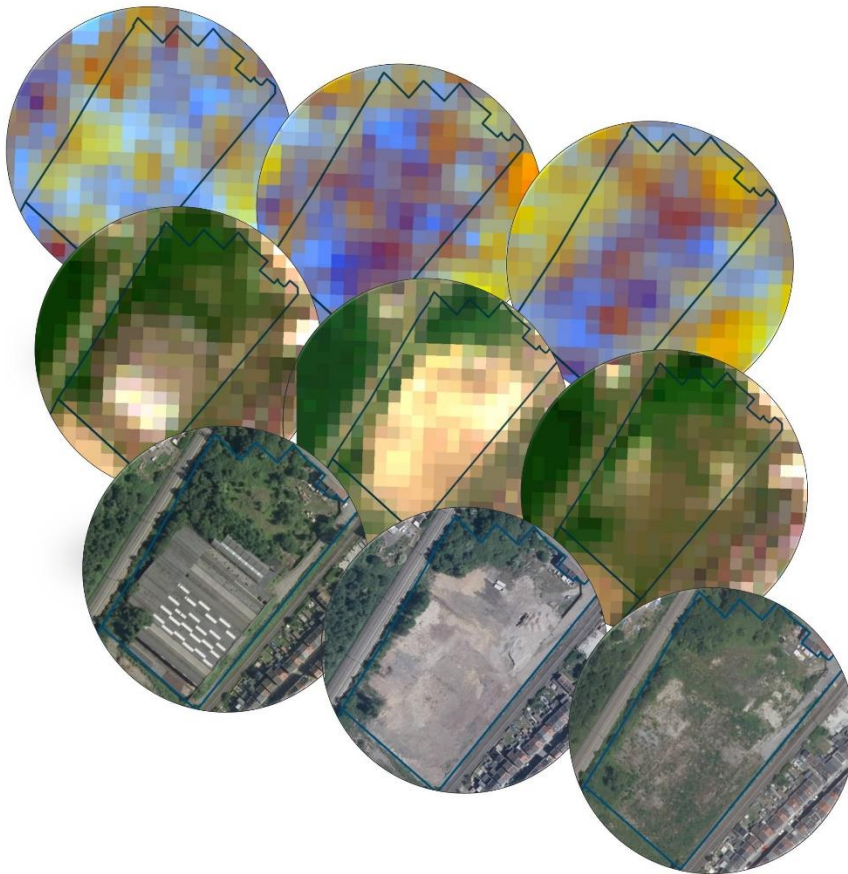

Figure 1 - Illustration of a change on a RDS with, from top to bottom, Sentinel-1, Sentinel-2 images and orthophotos
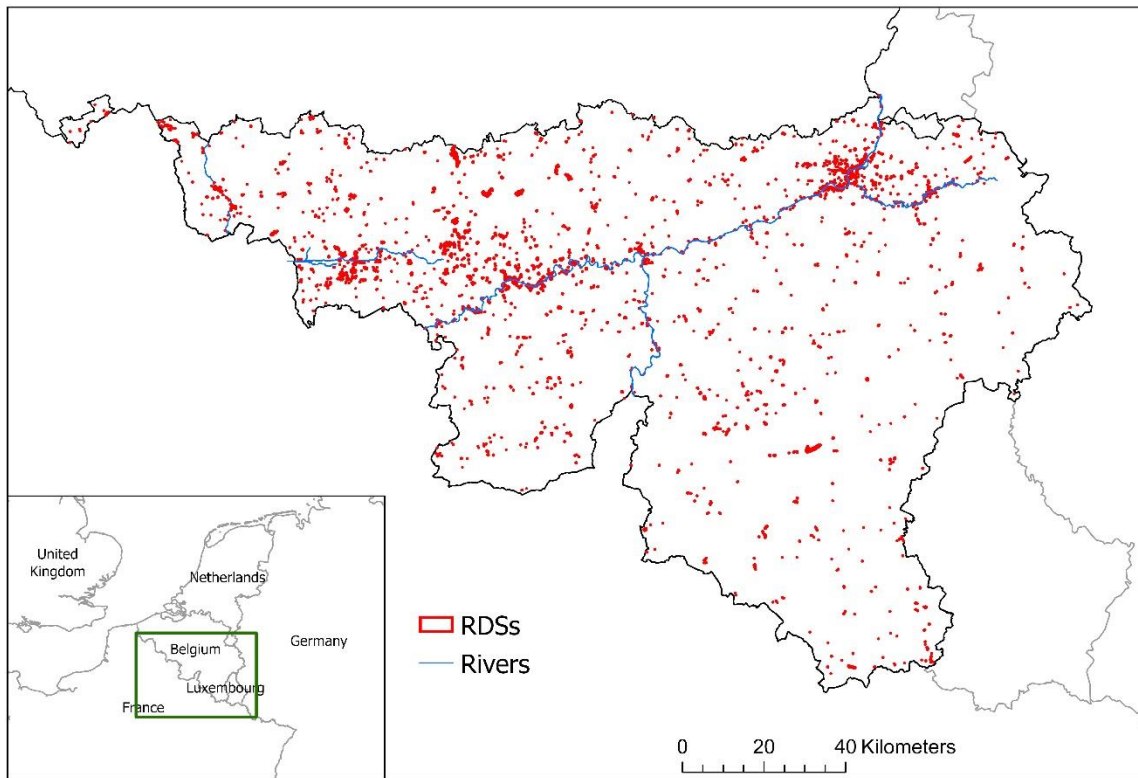
Figure 2 - Study area (green mark), with the spatial distribution of the RDSs in Wallonia (red marks).
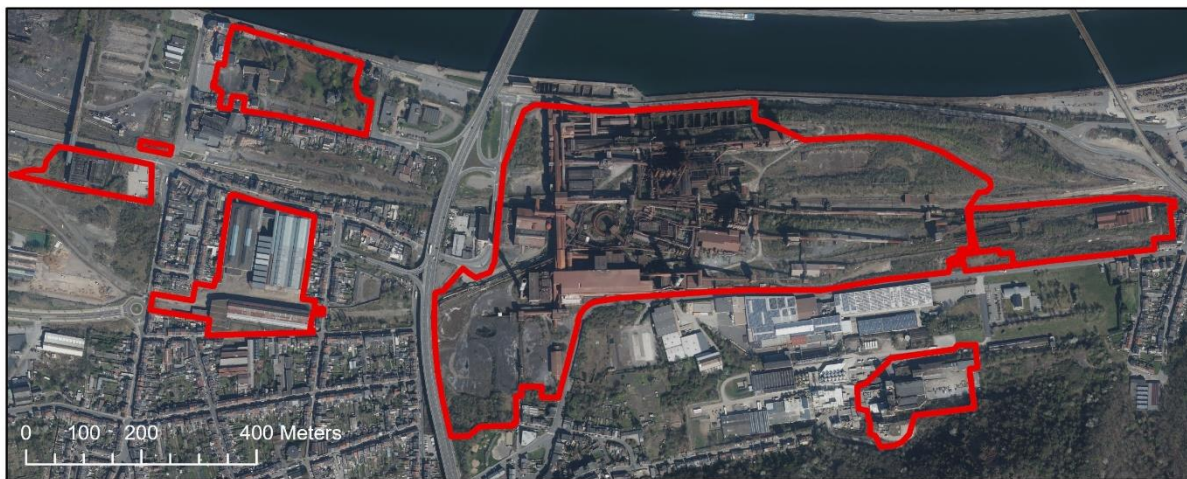

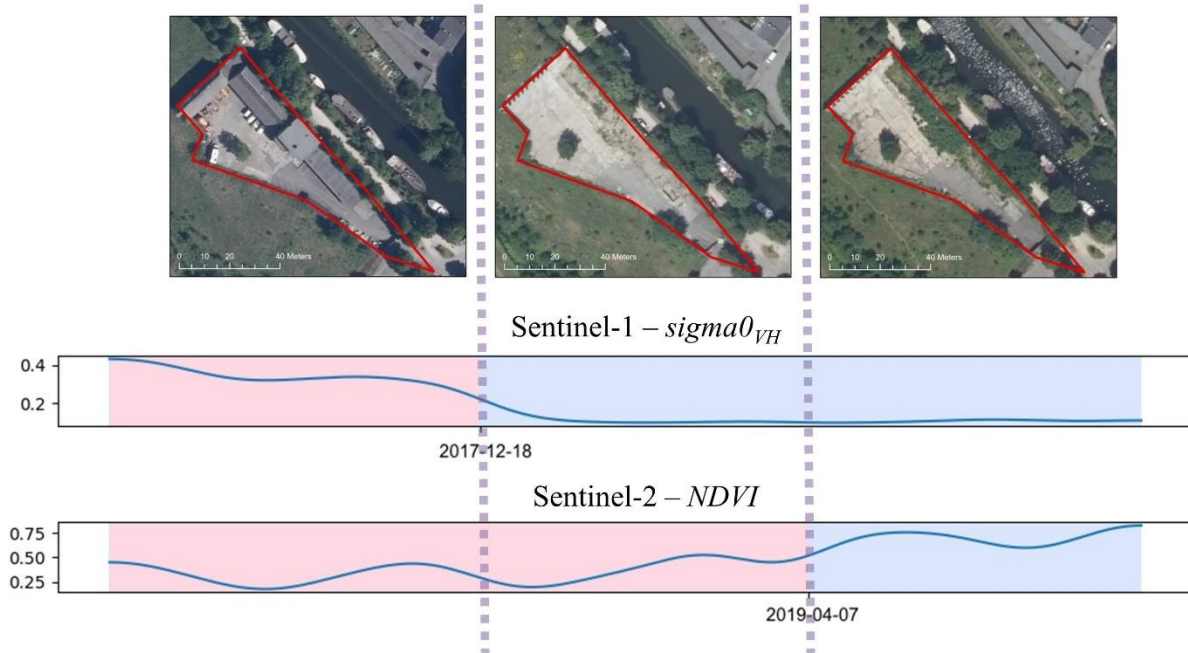Figure 3 - Close up of a former industrial area presenting several RDSs of different sizes

Sentinel-1 − $sigma0_{VH}$

Sentinel-2 − $NDVI$

Figure 4 – Example of a changepoint analysis for a showing the Orthophotos ground truth (left: summer 2017, center: summer 2018, right: summer 2019) and Bi-dimensional time series sigma0VH and NDVI.
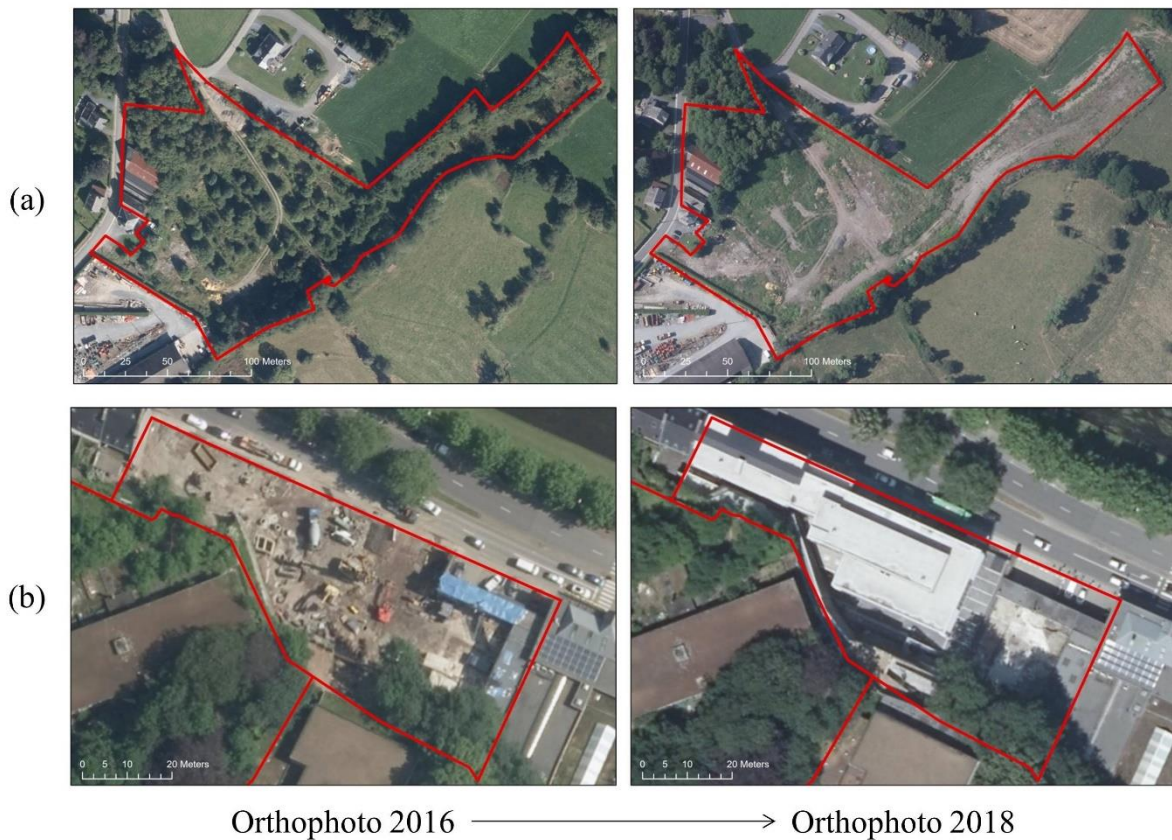

(a)

(b)

Orthophoto 2016 $\longrightarrow$ Orthophoto 2018

Figure 5 - Close-ups of two RDSs showing (a) vegetation decrease and soil change; (b) building increase and soil change.

SARSAR - Automatic redevelopment sites monitoring using SAR and OPTICAL images

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