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Cloud on the horizon: rebooting flood mapping in Congo-Brazzaville

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In November 2017, the remote Congolese town of Impfondo experienced unrelenting rains that flooded vast areas of land and forced thousands of people to evacuate. An on-the-ground assessment showed extensive damage to food crops, homes, buildings, and roads. The World Food Programme (WFP), along with other UN agencies, supported the government's response by providing food to the most affected people. Yet responding was a challenge, and determining needs took some guesswork: the government did not get official reports about the damage until well after the event, and UN offices did not learn of the flood for an entire month.

In order to enable more rapid response to this type of disaster in the future, WFP teamed up with Cloud to Street, and access to WFP's innovation accelerator supported the adaptation of Cloud to Streets' tools for humanitarian response. A continued close collaboration with relevant government agencies, combined with an on-site training week, has led to the development of a near real-time Congo flood monitoring dashboard that scans the country every day for flooding and high precipitation events, alerting the government and other users in near real-time with the location, size and impact of floods detected. During an emergency, the dashboard estimates the number of people and certain types of assets (e.g., schools, health centers, airports) at risk each day throughout the event.

The flood maps in this dashboard are derived from NASA's MODIS (Aqua and Terra), Landsat 7 and 8, and ESA's Sentinel 2 sensors. For specific flood events, commercial satellite imagery from Planet sensors and DigitalGlobe are used when available. These datasets are augmented with past and future 10 days daily precipitation rates retrieved from, respectively, JAXA's satellite-based GSMaP product and NCEP's Global Forecasting System (GFS). High precipitation alerts are issued when daily precipitation sums exceed historical 2, 5 and 10 year precipitation return periods. A WhatsApp group was launched to connect all actors (e.g., Meteorology Office, Hydro Office, Ministry of Social Affairs) and to have a bi-directional mode of communication to alert about a flood risk situation. Recently, these tools are also used to inform the UN Refugee Agency and WFP about the flood risk of asylum seeker sites that currently host some 16,000 recently arrived refugees from the Democratic Republic of the Congo.

Yet challenges remain in order to provide meaningful and high-quality information for tangible decision-making. Congo-Brazzaville is located in the tropics, where extensive cloud cover corrupt the freely available optical satellite datasets. In addition, the GFS forecasting system often fails to capture the timing, location and intensity of the convective precipitation cells, leading to false precipitation alerts. Finally, a lack of detailed, fine-scale information on settlements (people, assets, etc.) jeopardizes the flood risk assessment that should lead to rapid emergency response.