

Use of GIS flood tool, CREST outputs & observed flow levels for mapping flood inundated areas in African basins



Faith Mitheu^{a)}, Eric Kabuchanga^{a)}, Maungu Oware^{a)}, Dennis Macharia^{a)}, Ashutosh Limaye^{b)}, Africa Flores^{b)}, Robinson Mugo^{a)}, Anastasia Wahome^{a)}, Vincent Mtaroni^{a)}, Hussein Farah^{a)}.

a) Regional Centre for Mapping of Resources for Development, Nairobi, Kenya, b) The SERVIR Coordination Office, NASA Marshall Space Flight Centre, Huntsville, Alabama, USA.

1. Rationale

KDWR (Kenya Department of Water Resources) within the Ministry of Water and Irrigation uses SERVIR-Eastern and Southern Africa CREST (Coupled Routing and Excess Storage) modelling products in its analyses. KDWR and authorities responsible for disaster management indicated that, in addition to SERVIR's CREST Stream-flow data, it would be useful to have high-resolution maps of areas inundated as a result of flooding. That way, the response and evacuation agencies will have timely information about the mostly affected areas, and also roads to use for timely response.

The GIS flood tool is a desktop console tool developed by SERVIR-Eastern and Southern Africa in collaboration with USGS and it calculates the extent of flooding to simplify the outcomes of the CREST model for everyday users.

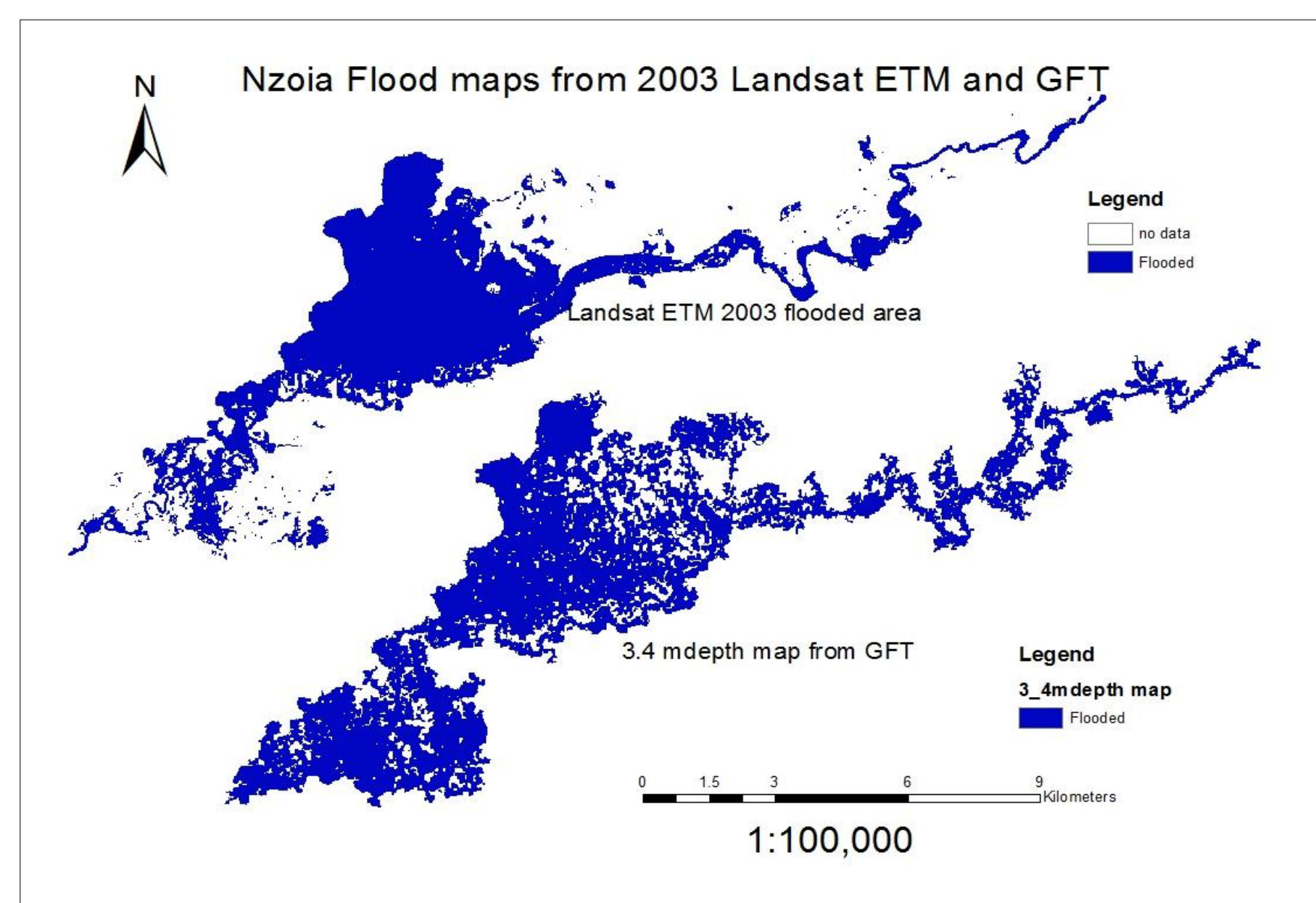
An online application has been developed to enable online generation and visualization of the flood maps and the CREST model outputs

3. Approach/Project Activities

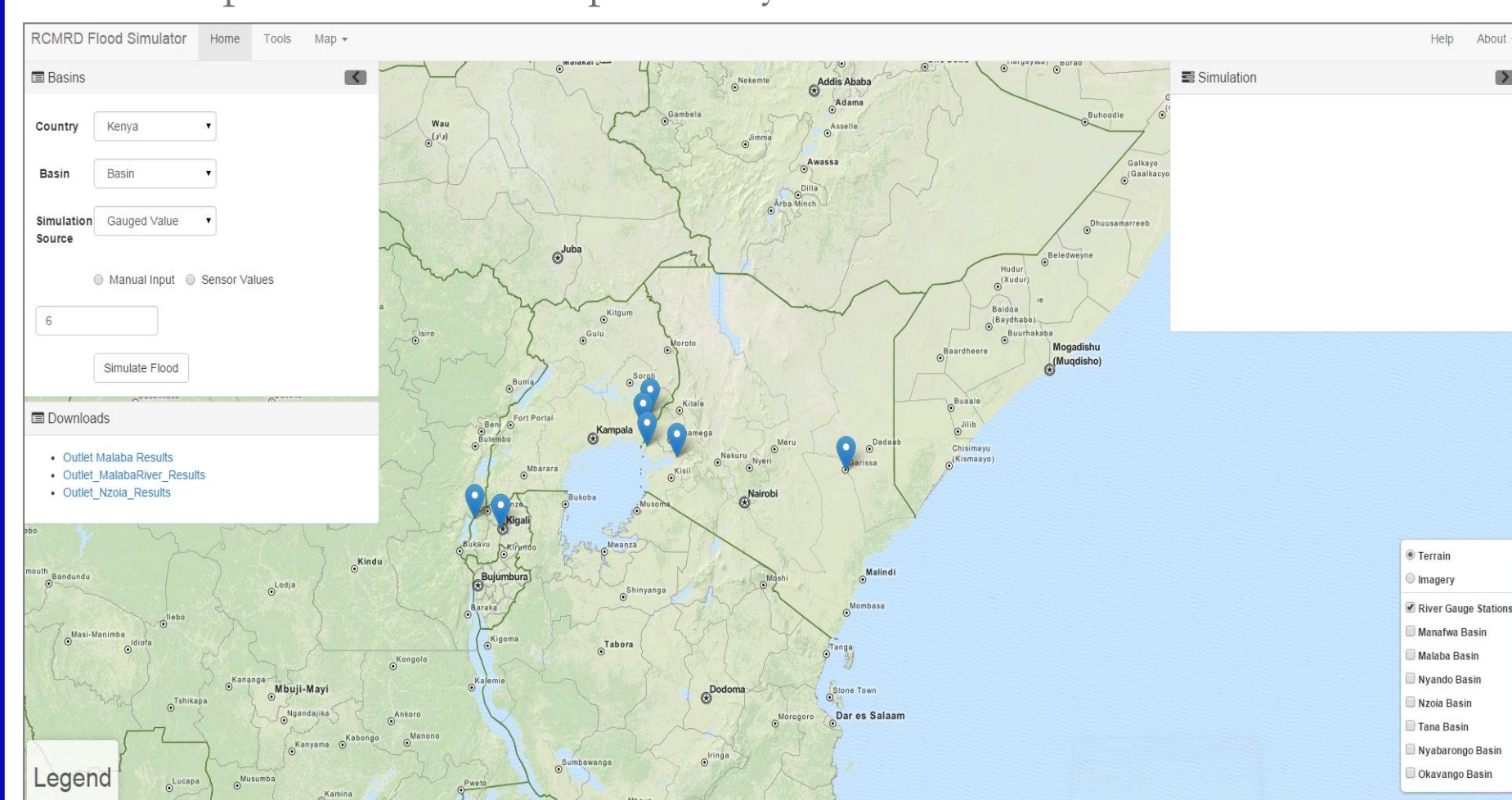
- ▶ The GIS flood tool integrates KDWR flood-rating curves and CREST-modeled stream flow with a higher-resolution digital elevation model dataset to generate flood inundation maps.
- ▶ The stand-alone version of this capability that enables users to incorporate stream-flow inputs from sources other than CREST
- ▶ The online application is linked to the CREST outputs for flood inundation mapping
- ▶ Water agencies in Kenya and Uganda have been trained on the use of the tool with the goal of non-technical users to gaining practical insight into flooding in specific basins.

5. Results

- ▶ Flood extent maps for various basins- Nzoia, Shire, Nyando
- ▶ Online application linked to the CREST outputs for flood inundation mapping. <http://apps.rcmrd.org/floodmaps/>
- ▶ 64 water managers from Kenya and Rwanda trained on the use of the tool.
- ▶ 15 institutions trained on the use of the products



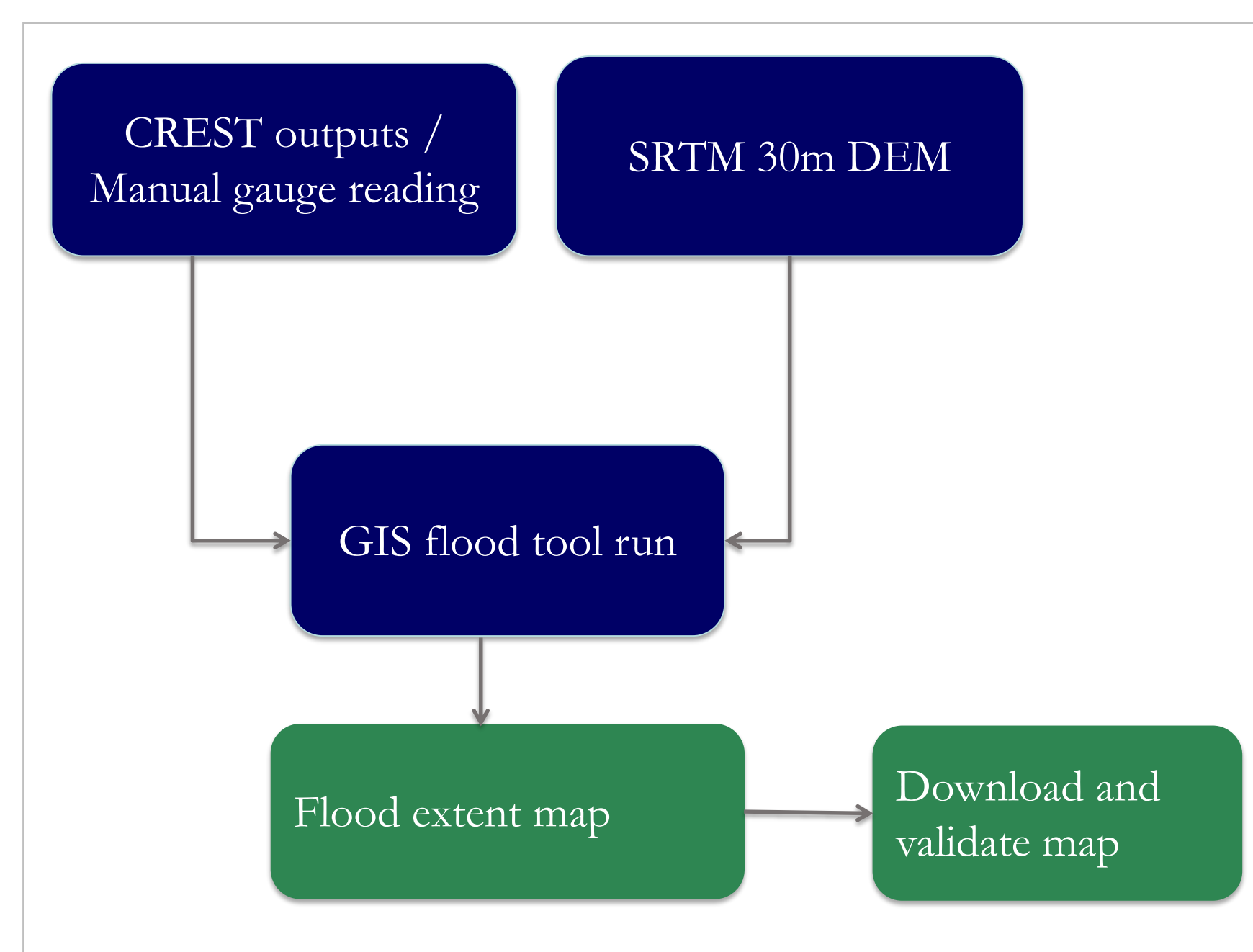
Flood maps for Nzoia as captured by Landsat and GFT



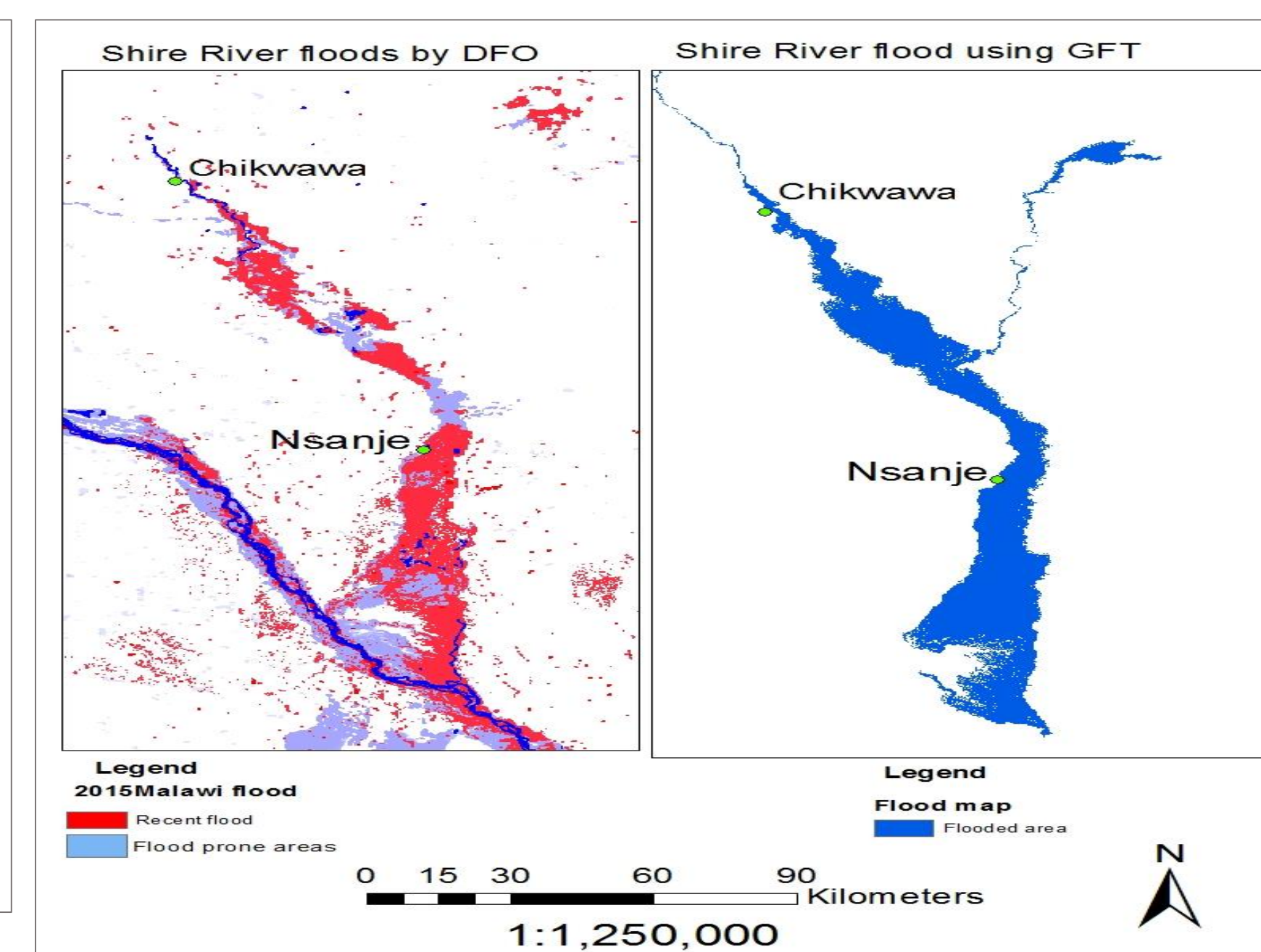
Snapshot of the flood simulator



Flooding situations in Budalangi



GFT** methodology flow chart



Shire river flood maps as captured by DFO* and GFT**



Training session on use of GIS flood tools

2. Objectives

- ▶ The desktop console tool developed by SERVIR-Eastern and Southern Africa in collaboration with USGS calculates the extent of flooding to simplify the outcomes of the CREST model for everyday users.
- ▶ An online application has been developed to enable online visualization of the tool outputs and the CREST model outputs

4. Earth Observations and Other Inputs

- ▶ SRTM (Shuttle Radar Topography Mission) 30m Digital Elevation Model
- ▶ Landsat satellite images
- ▶ Earth observation 1 images
- ▶ CREST stream flow output
- ▶ Historical Stream flow observations data from water agencies in Uganda, Kenya, Rwanda, Namibia
- ▶ Rating curves for each used river gauging station

6. Outcomes/Anticipated Impacts

- ▶ An online tool for flood maps generation developed
- ▶ Reduction of loss of life and property within the target areas.
- ▶ The disaster reduction agencies in Kenya- National Disaster Operations Centre and Red cross will get to use the products on their work
- ▶ Improved capacity of the disaster reduction agencies in Kenya, Uganda, Malawi on the use of the online tool for flood mapping.

7. Project Partners

- ▶ Water Resources Management Authority, Kenya
- ▶ Kenya Meteorological Department
- ▶ SERVIR-Eastern and Southern Africa
- ▶ NASA coordination office

8. Project End Users

- ▶ Kenya Department of water Resources
- ▶ Water resources Management Authority, Kenya
- ▶ Integrated Water Resource Management Department, Rwanda
- ▶ Ministry of Water and environment, Uganda
- ▶ Hydrology Services, Namibia