

FACT SHEET

Flooding in Cuvelai of Namibia

March 2023

Due to heavy rainfalls in southeastern Angola and northeastern Namibia during the first week of January 2023, first flood waters were observed on the eastern extents of Namibia's iishanas, near the town Helao Nafidi, on 13 January 2023. By 07 February 2023, flooding had displaced 2 190 people and disrupted emergency services, access to clinics and schools.

The Cuvelai Basin is a catchment area shared between Angola and Namibia. Its ephemeral system of drainage channels are called iishana. The system originates in the Angolan planalto highlands, between the Rio Cunene and Rio Cubango, from where it flows in a southern, south-easterly direction, via the iishana and converging towards the Omadhiya lakes in Namibia. In some years, it flows even more southerly into Namibia's Etosha Pan (*Atlas of Namibia Team 2022*). The total wetland area covers almost 160 000 km² (*CUVECOM 2021*).

For 68 years between 1941 and 2021, the extent and severity of flooding in the system was recorded. It appears that only around 67 % of those years had flooding at varying severity, from low to high flooding (*Atlas of Namibia Team 2022*).

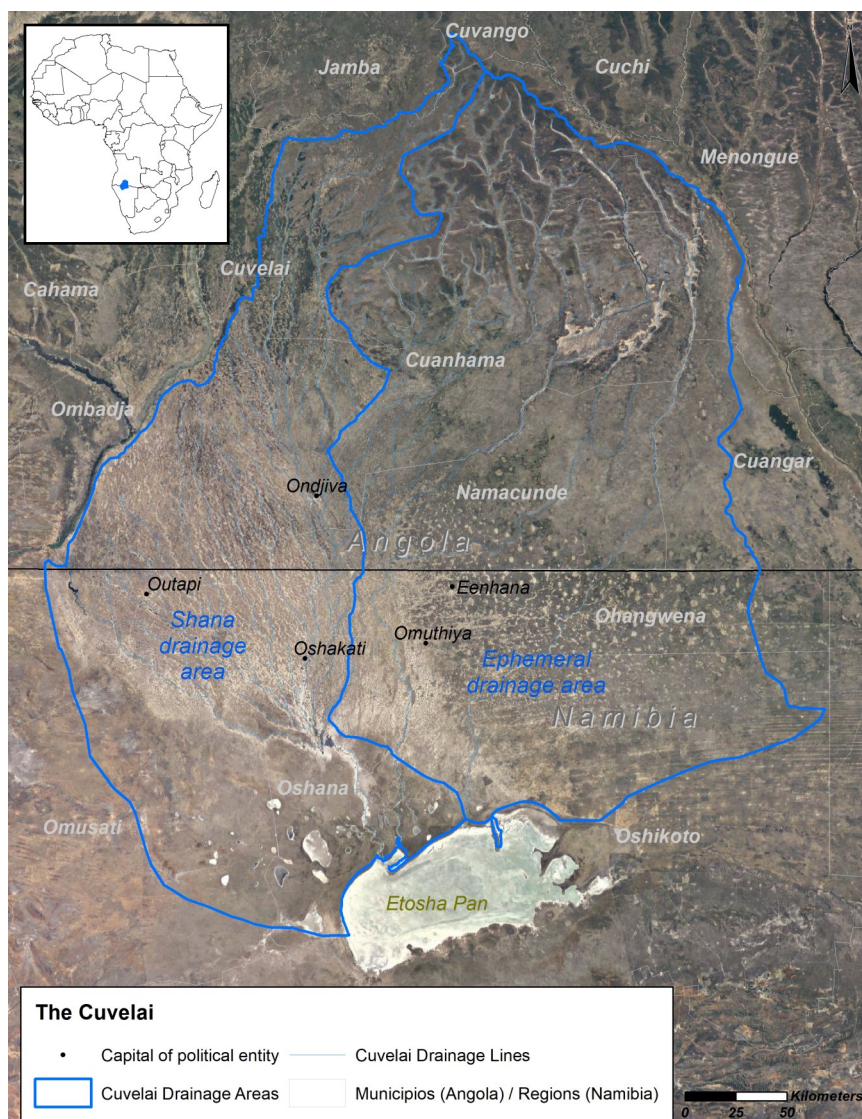
The population in the Cuvelai Basin in Namibia is particularly vulnerable to high flood events, as it's regions are of the country's most densely populated, partly due to decades of unrest in Angola and an influx of Angolan refugees, partly due to a prolonged drought in south-western Angola and due to good soil fertility. The communities consequently also rely extensively on subsistence farming.

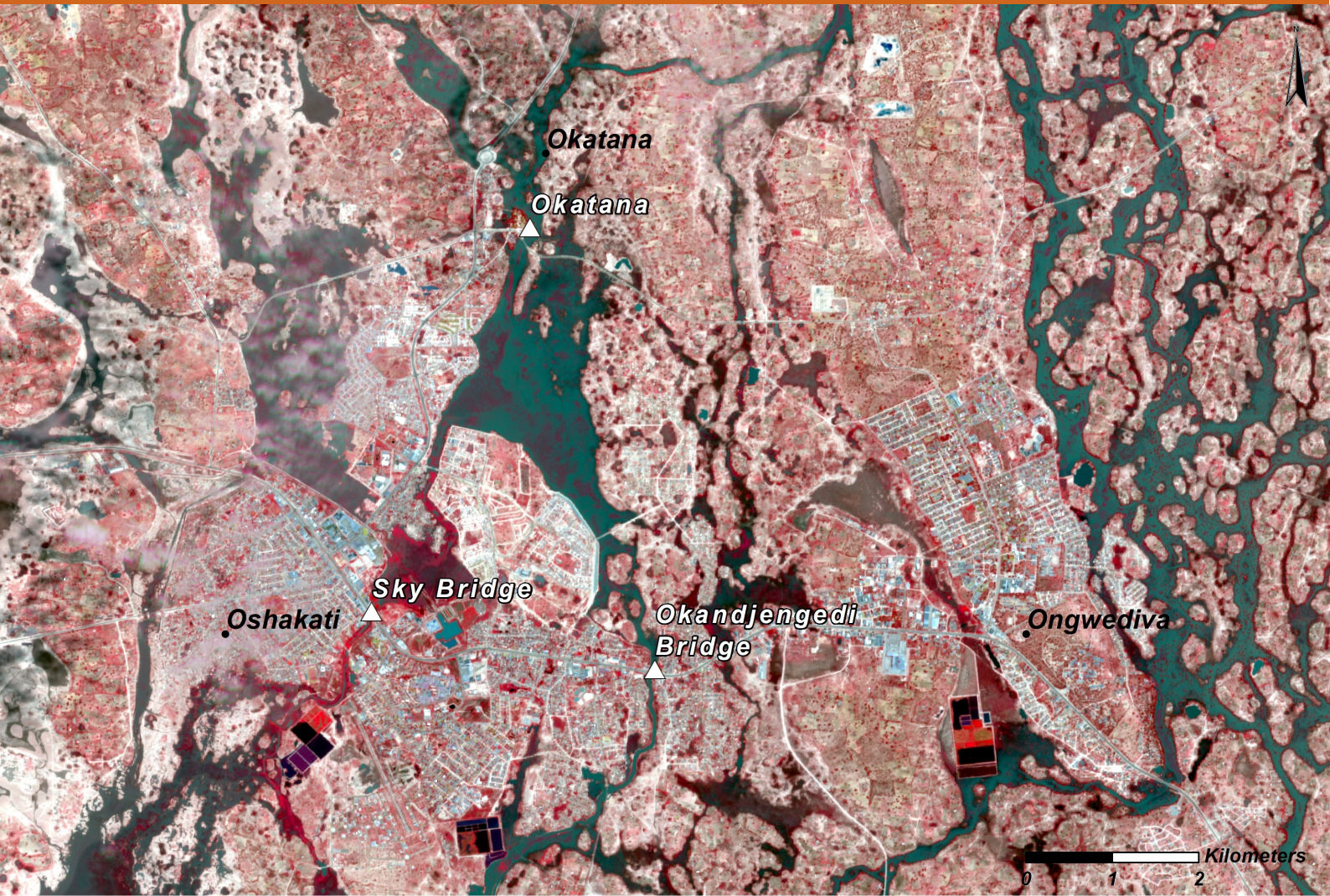
The last year that high flooding was recorded before 2023, was in 2011, when Namibia had to declare a state of emergency due to the extent of flooding in the north of the country, that claimed 62 lives (*Reliefweb 2011*). Flood levels in 2011 peaked in March (*NHS 2023*).

By 07 February 2023, the flooding of the iishana had claimed two lives (*The Namibian 2023*) Flooding peaked in early February (*NHS 2023*).

By 07 February 2023, in Namibia's Ohangwena and Oshana regions (Reliefweb 2023):

- **2 190 people affected**
⇒ **1 890 in Ohangwena and 300 in Oshana region**
- **111 households affecting 582 people were totally submerged**
- **327 households affecting 1 608 people were partially submerged**
- **35 schools affected, 18 of which were closed due to accessibility issues and/or damage**



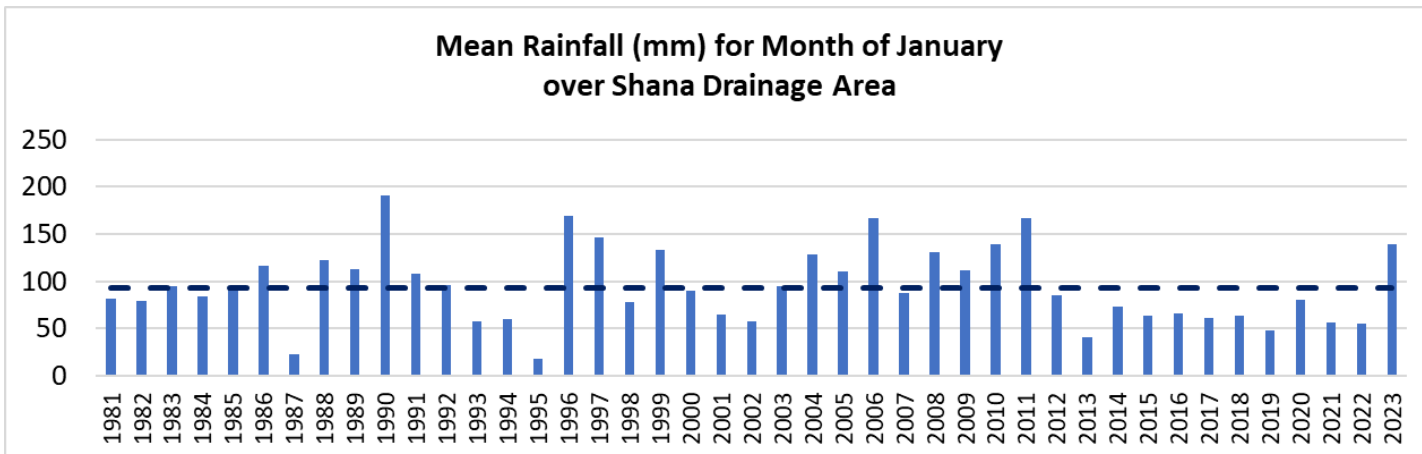


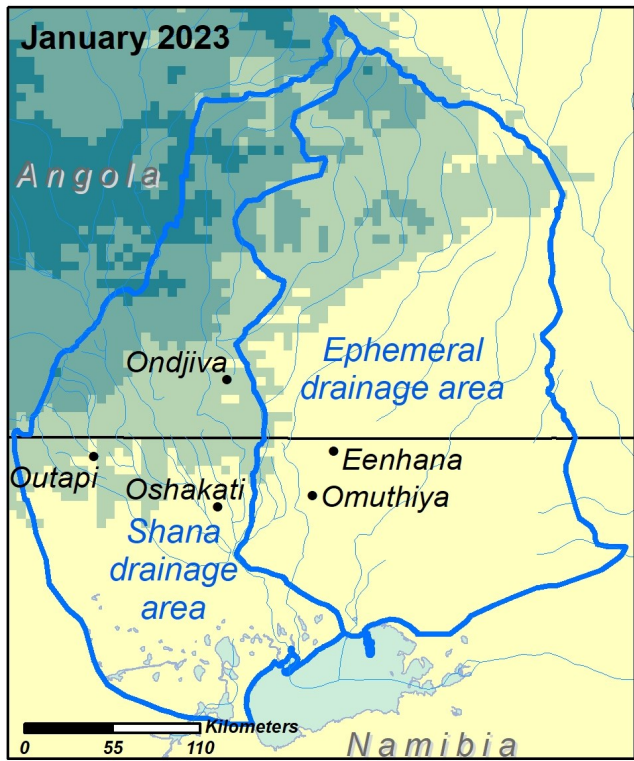
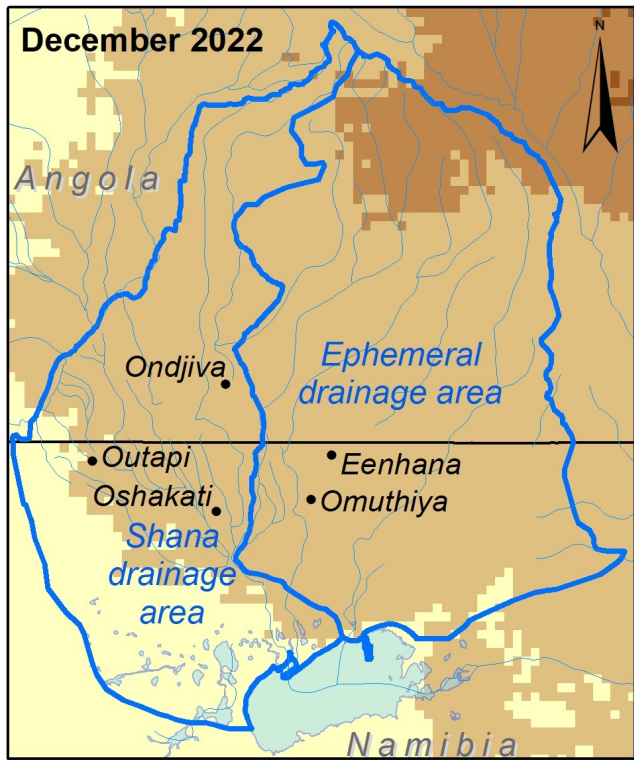
Sentinel 2B RGB(843) Image of 13 February 2023

Historic gauging data, provided by Namibia’s Hydrological Services (NHS) at the Ministry of Agriculture, Water and Land Reform, suggests that the peak water levels measured at two gauging stations, Sky Bridge and Okatana, did not exceed the peak levels measured at the end of March 2011. However, the peak level at Okandjengedi Bridge, between Oshakati and Ongwediva, did exceed the March 2011 peak.

Highest water levels	Peak on 02 March 2009	Peak on 06 April 2010	Peak on 28 March 2011	Peak in February 2023
Sky Bridge	1.35 m	1.11 m	1.67 m	0.80 m on 3 Feb
Okandjengedi Bridge	1.25 m	1.03 m	1.40 m	2.25 m on 3 Feb
Okatana	1.30 m	1.07 m	1.54 m	1.49 m on 1 Feb

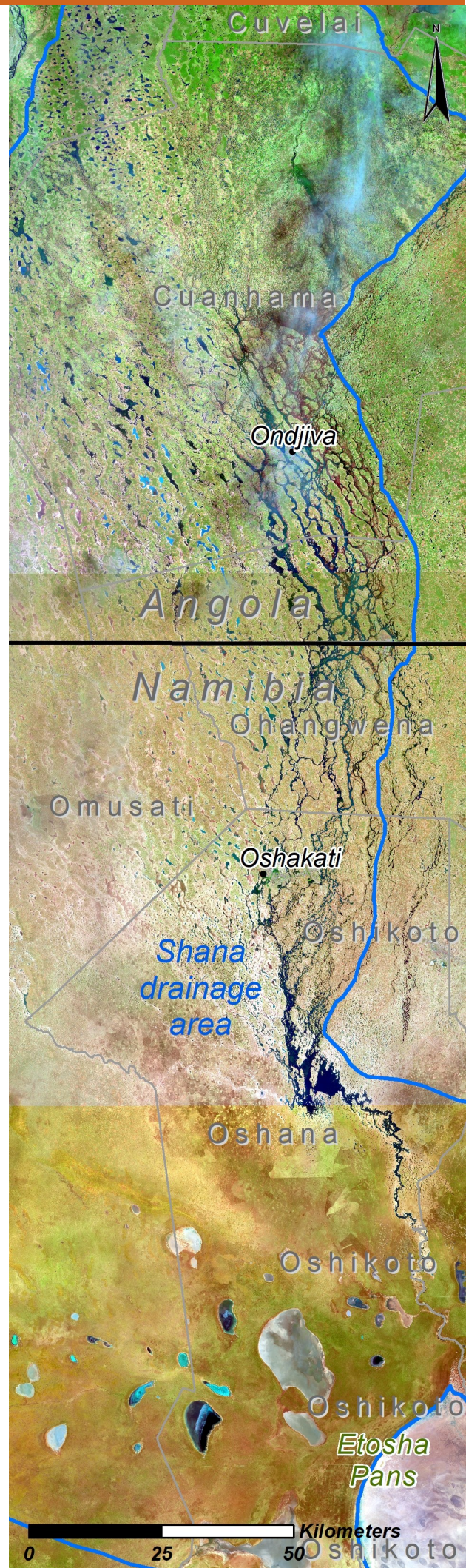
The average rainfall, as derived from CHIRPS 2.0 precipitation data, for January 2023 for the Shana Drainage Area, in which most of the flooding occurred, was well above the historic average January rainfall from 1981 to 2022. It has been the highest rainfall for the month of January, since 2011.





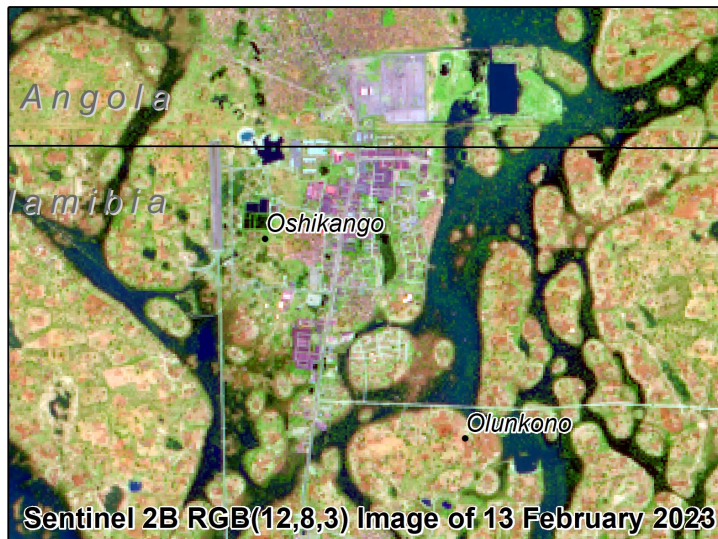
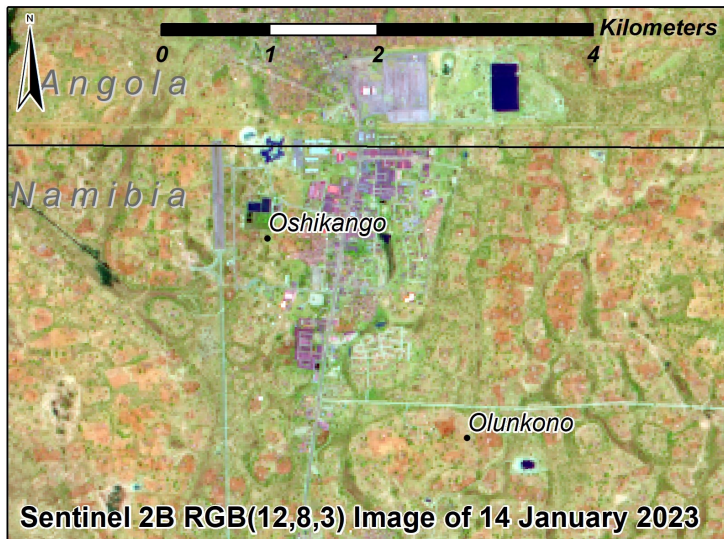
Standardised Precipitation Index (SPI)

- Extremely dry
- Severely dry
- Moderately dry
- Near normal
- Moderately wet
- Very wet
- Extremely wet
- Cuvelai Drainage Areas
- River/Oshana
- Etosha Pans



While December 2022 was a moderately dry month for most of the Shana Drainage Area, the map of the Standardised Precipitation Index (SPI) for January 2023 confirms reports that high rainfalls in Angola generated the flooding experienced in Namibia in the Shana Drainage Area. The Shana Drainage Area in Angola experienced moderately wet to extremely wet rainfall during the month of January 2023.

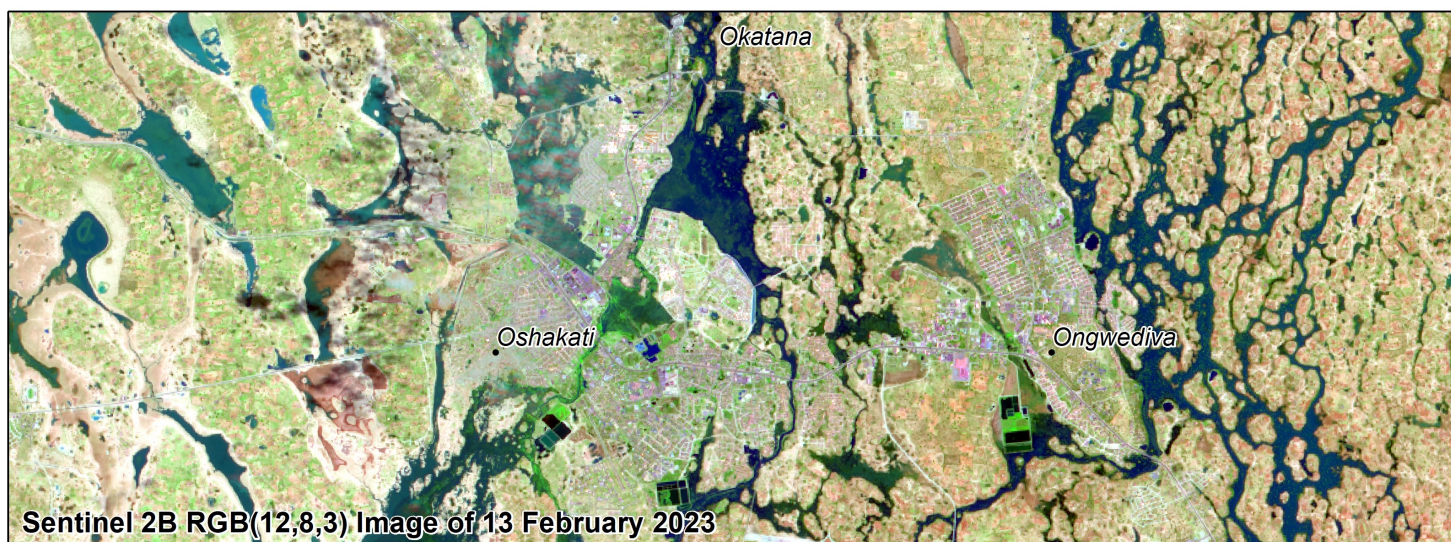
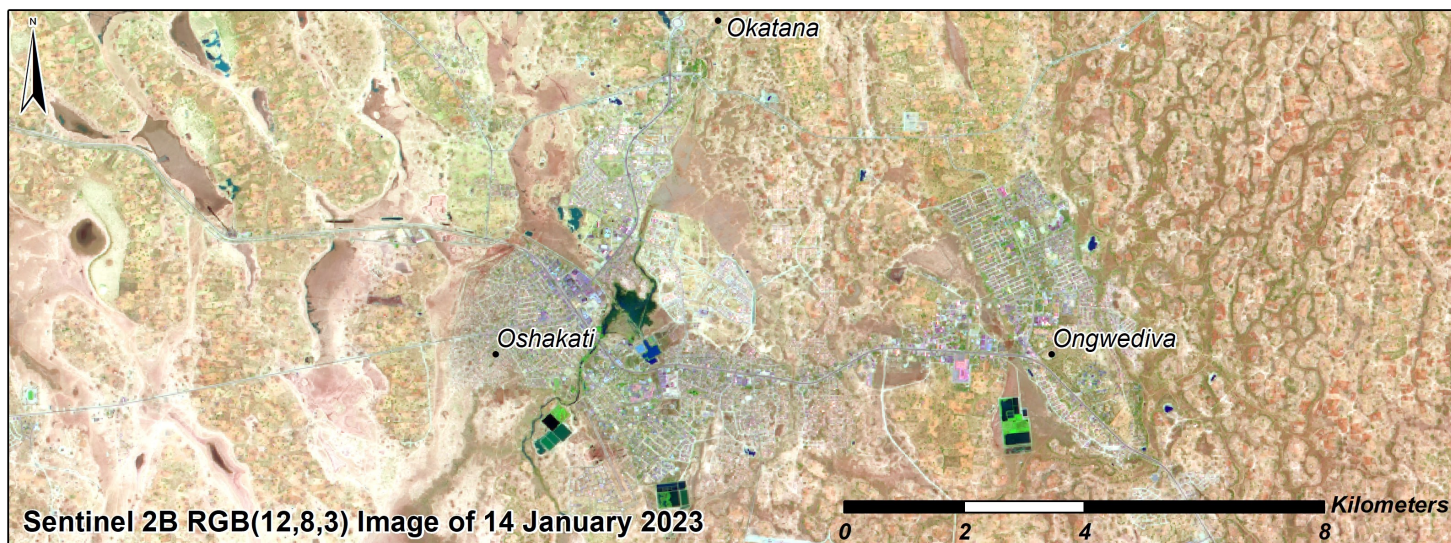
Notably, as can be observed in the composite Sentinel imagery (Copernicus ESA) of 18 January 2023, depicted as RGB (12, 8, 3), the resulting flooding, depicted as prominent turquoise or blue hues, occurred in a narrow band along the eastern boundary of the Shana Drainage Area, moving from Angola to the south into Namibia, to just north of Namibia's Etosha pans.



The composite Sentinel imagery (Copernicus ESA) of 14 January 2023, depicted as RGB (12, 8, 3) highlights built-up areas in and around Oshikango and Olunkono (above), and Okatana, Oshakati and Ongwediva (below), as hues of magenta and purple. Vegetation as hues of green and water as hues of blue and turquoise. The iishana system is clearly visible, with the bare ground of the oshana showing a brown/beige color representation or some growth in the oshana visible in green tones.

In the composite of 13 February 2023, when the waters had already started subsiding, the extent of flooding is clearly visible as prominent turquoise or blue hues. Built-up areas in magenta and purple hues are tightly sandwiched between the iishana system.

While road infrastructure may deviate and syphon flood waters out of the floodplain and cause flooding in built-up areas, population pressure in populated areas appears to be the driver for built-up areas infringing upon the flood plains.



Data Sources

1. Climate Hazards Center (CHC) CHIRPS 2.0 precipitation data
2. Copernicus ESA Sentinel-2 multispectral data:
 - S2B_MSIL1C_20230213T085009_N0509_R107_T33KWA_20230213T111022
 - S2A_MSIL1C_20230218T085021_N0509_R107_T33KWA_20230218T123025
 - S2A_MSIL1C_20230218T085021_N0509_R107_T33KWB_20230218T123025
 - S2A_MSIL1C_20230218T085021_N0509_R107_T33KWV_20230218T123025
 - S2B_MSIL1C_20230114T085219_N0509_R107_T33KWA_20230114T105023
1. Ministry of Agriculture, Water and Land Reform, Namibia’s Hydrological Services (NHS) gauging data
2. Atlas of Namibia Team vector data
3. Google Earth image data

References

1. 2022. Atlas of Namibia Team. [Atlas of Namibia: its land, water and life, Namibia Nature Foundation, Windhoek.](#)
2. 2023. Namibia Hydrological Service. Flood Bulletins for February and March 2023.
3. 2015. Funk et al. [The climate hazards infrared precipitation with stations—a new environmental record for monitoring extremes.](#)
4. Copernicus Sentinel data [2023].
5. 2011. Reliefweb. [Namibia: Floods cause an emergency.](#)
6. 2023. Reliefweb. [Namibia: Floods DREF Application MDRNA013](#)
7. 2023. Floodlist. [Angola and Namibia – Homes Damaged by Floods in Border Region.](#)
8. 2021. CUVECOM. [The River Basin.](#)
9. 2023. The Namibian. [Second death confirmed as floods leave 460 homeless.](#)