



Food and Agriculture Organization
of the United Nations

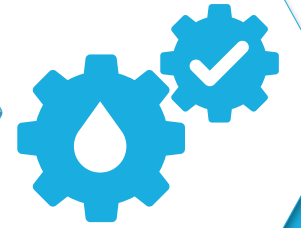
IMAGE-BASED TECHNIQUES: THE FUTURE

Eva Pek

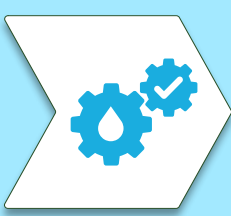
Land and Water Division (NSL), FAO

Tunis, 13 December 2022

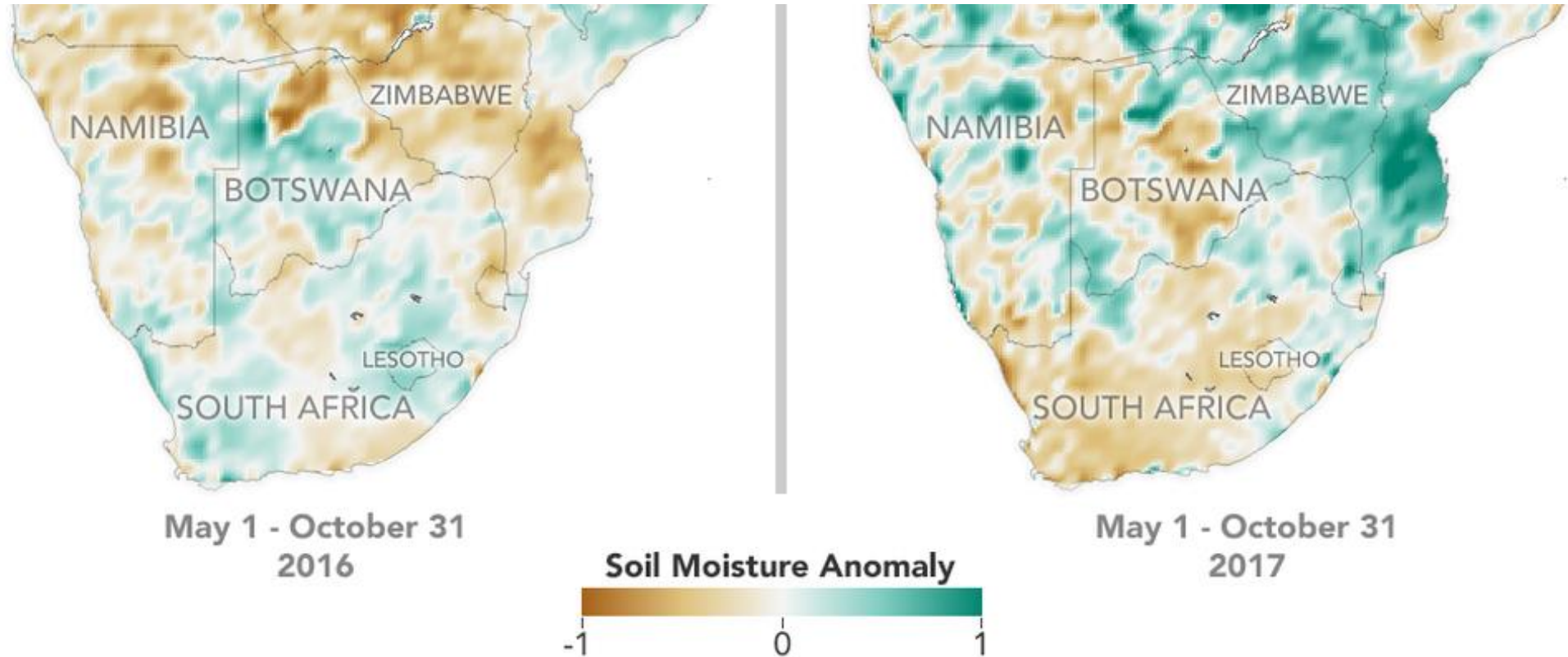
Regional gathering
Tunis, 12 – 16 December 2022



ITALIAN AGENCY
FOR DEVELOPMENT
COOPERATION



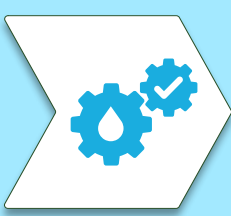
APPLICATION – RECENT ADVANCES



NASA's soil moisture map

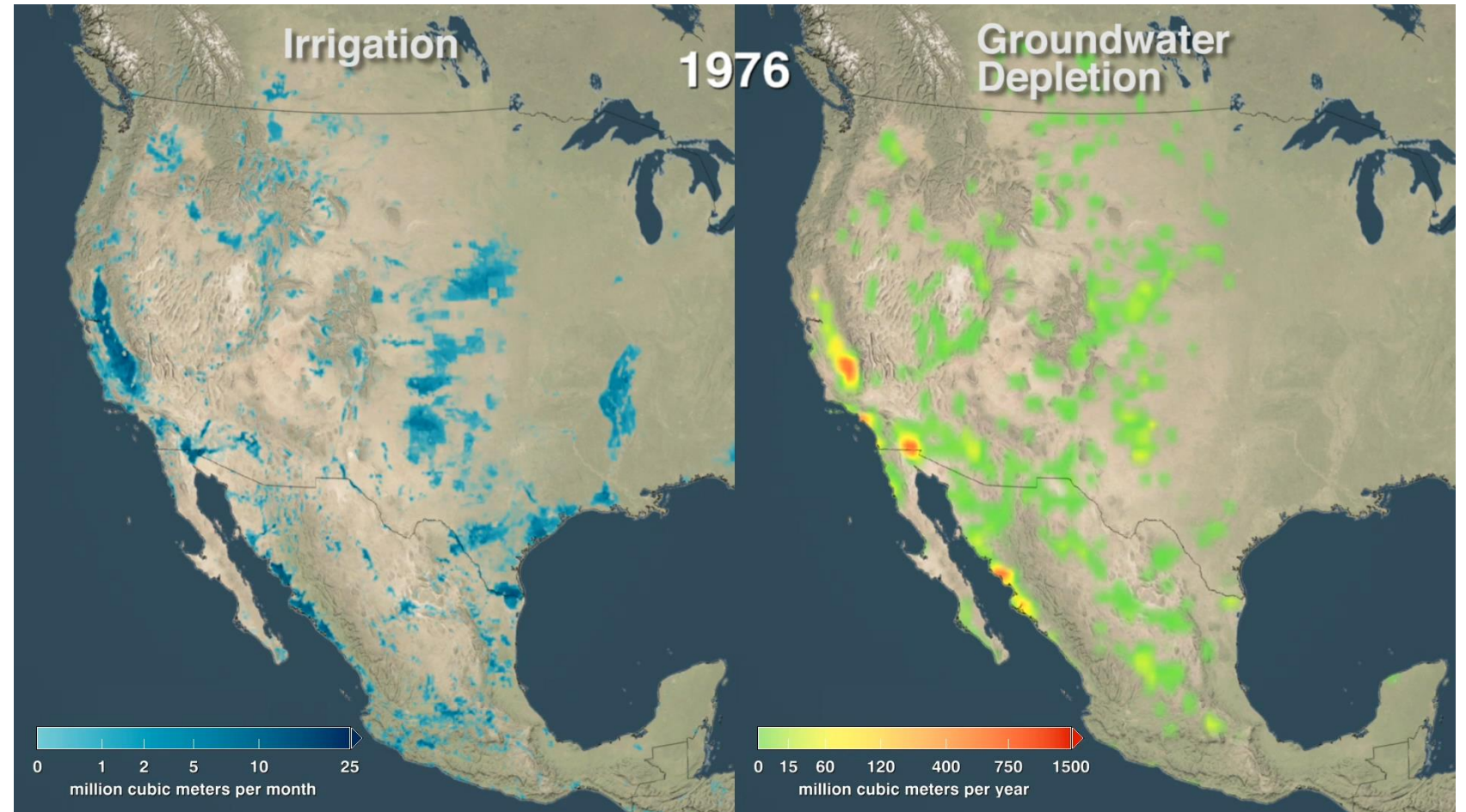
Source: Joshua Stevens/NASA Earth Observatory, 2018. NASA's Soil Moisture Anomaly map. Washington, USA. <https://www.nasa.gov/feature/2018/goddard/new-nasa-soil-moisture-data-spots-droughts-floods>. Cited 13 December 2022

The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries. Dashed lines on maps represent approximate border lines for which there may not yet be full agreement.



APPLICATION – RECENT ADVANCES

NASA's
irrigation
and
groundwater
depletion
map



Source: NASA's Scientific Visualization Studio, 2017. Irrigation and Groundwater Depletion map. Washington, USA. <https://svs.gsfc.nasa.gov/4523>. Cited 13 December 2022.

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QUESTION

Beyond productivity:

What about the
infrastructure?

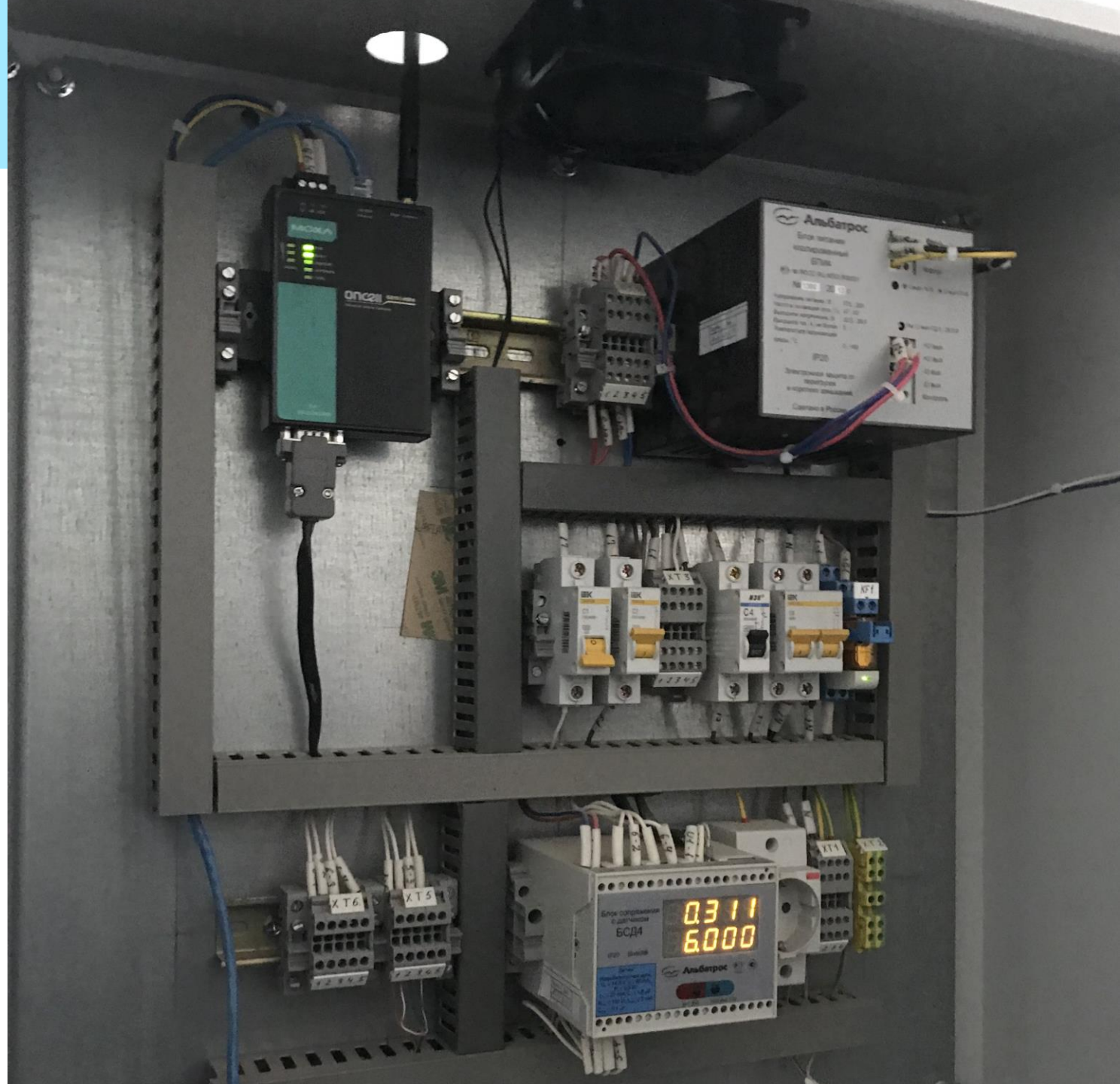
CRITERIA

Infrastructure-specific



CRITERIA

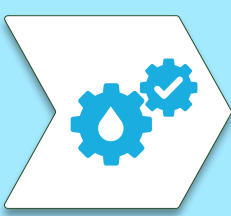
Infrastructure-specific
Performance and not
efficiency specific



CRITERIA

Infrastructure-specific
Performance and not
efficiency specific
Economic





CRITERIA

Infrastructure-specific

Performance and not
efficiency specific

Economic

Downscaled





PROGRESS IN TECHNOLOGY

Frequency of satellite images

Resolution

Methodology

The background is a solid blue color with several white geometric shapes. There are four large, outlined chevron shapes pointing to the right, arranged in a row. There are also several smaller, outlined rectangular shapes scattered around. A thick white horizontal line is positioned near the top of the page.

Possible strategic directions of our future works



**Reservoir
operation**



**Farmers-developed
irrigation**



**Reservoir
operation**



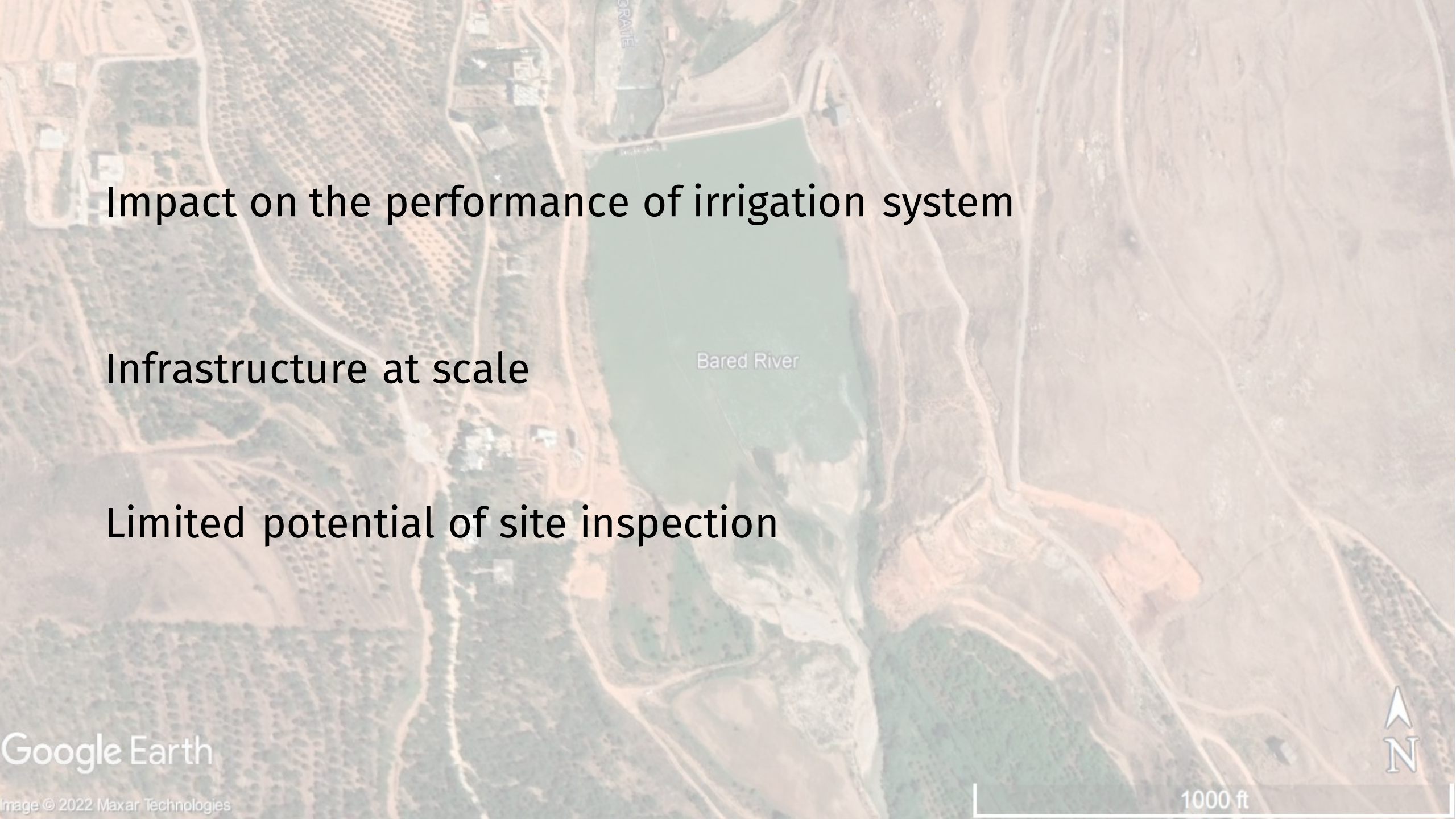
**Farmers-developed
irrigation**



Google Earth

Image © 2022 Maxar Technologies

Source: Google EarthPro v7.3.3.7786 (2020). Lebanon. Cited 12 December 2022.

An aerial satellite-style image of a river valley. The Bared River flows through the center, surrounded by agricultural fields and some buildings. The terrain is hilly and shows signs of irrigation infrastructure. The text 'Bared River' is visible in the middle of the river.

Impact on the performance of irrigation system

Infrastructure at scale

Limited potential of site inspection

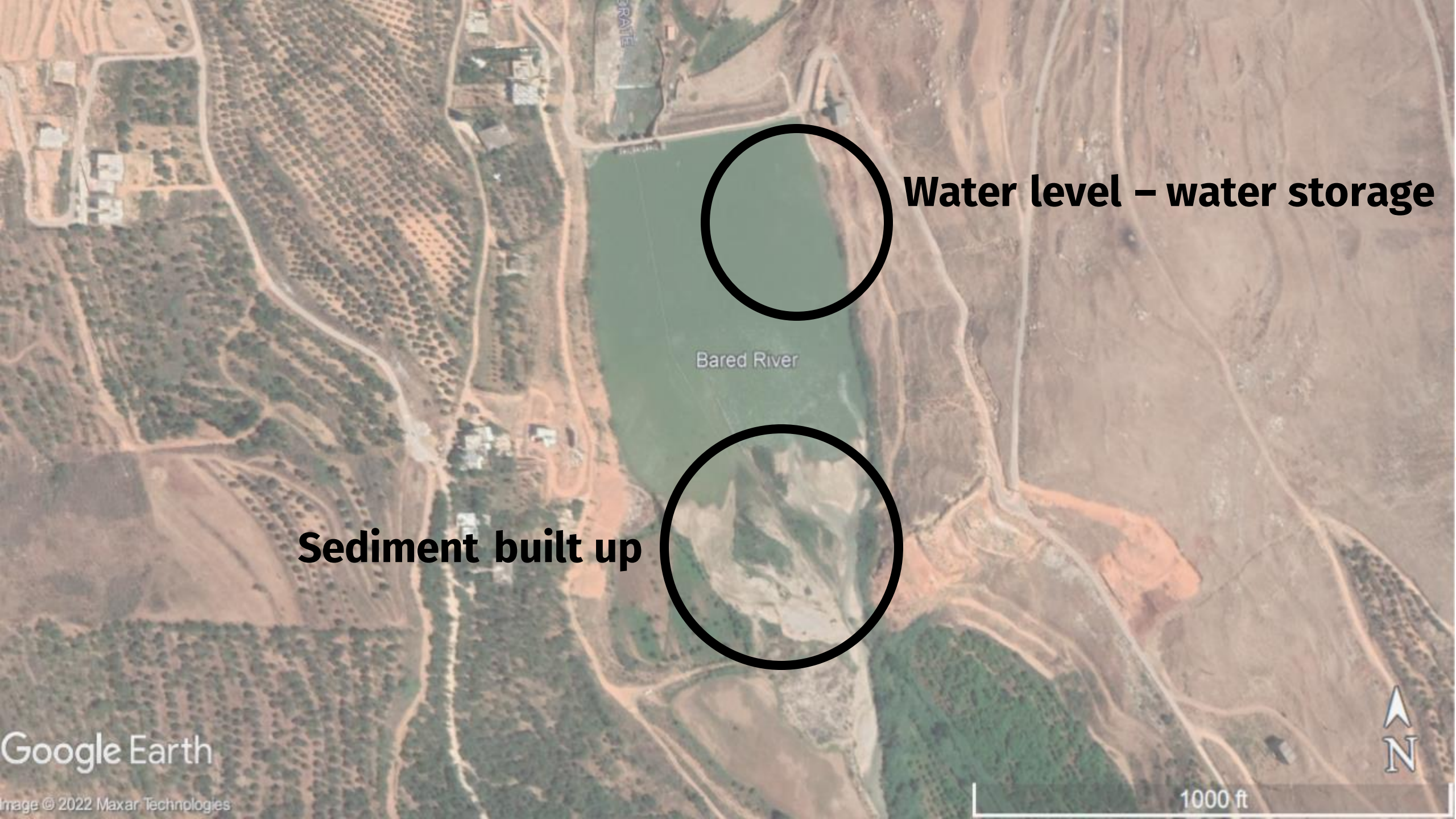




Water level – water storage

Bared River





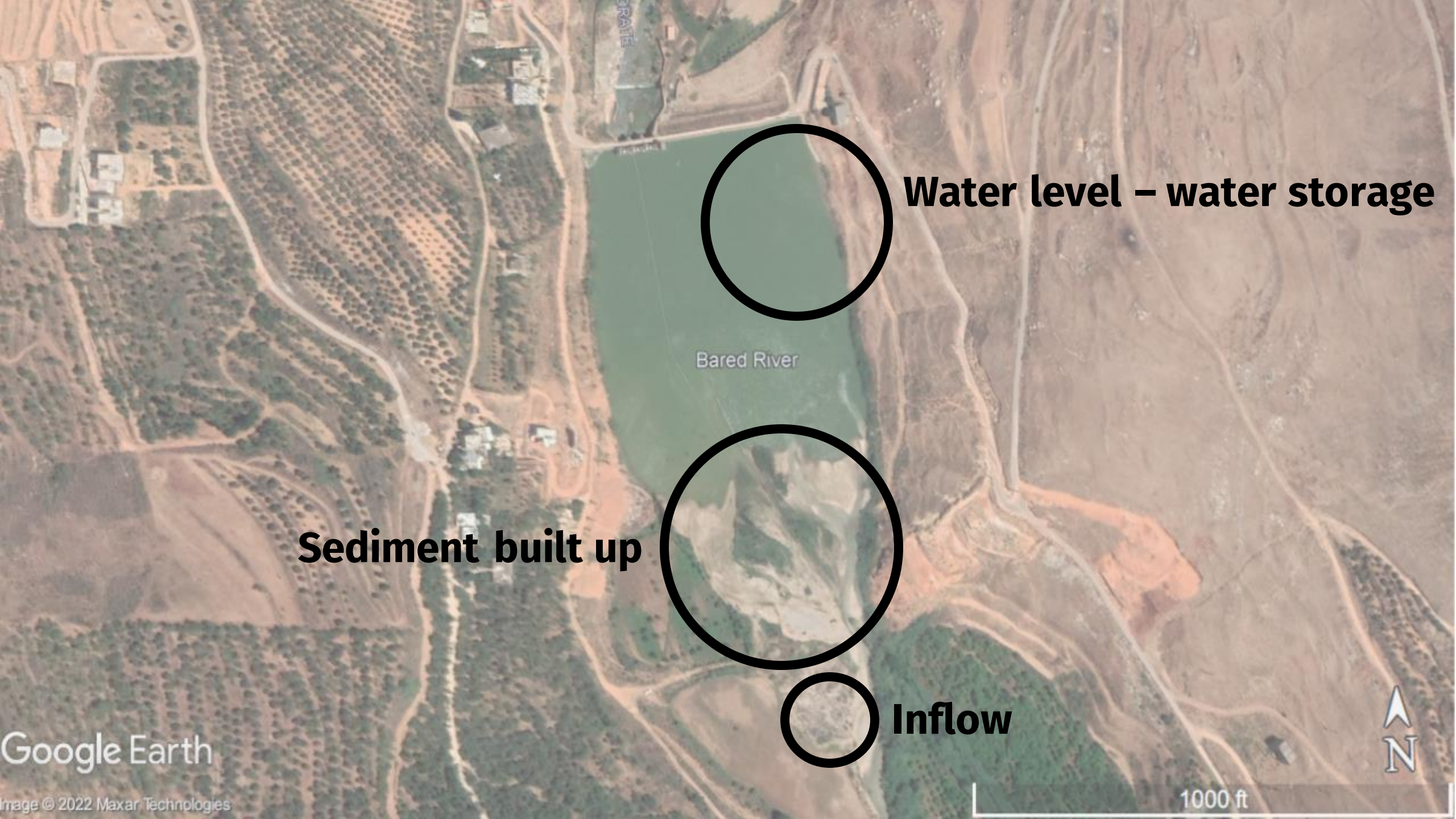
Water level - water storage



Sediment built up

Bared River





Water level – water storage

Bared River

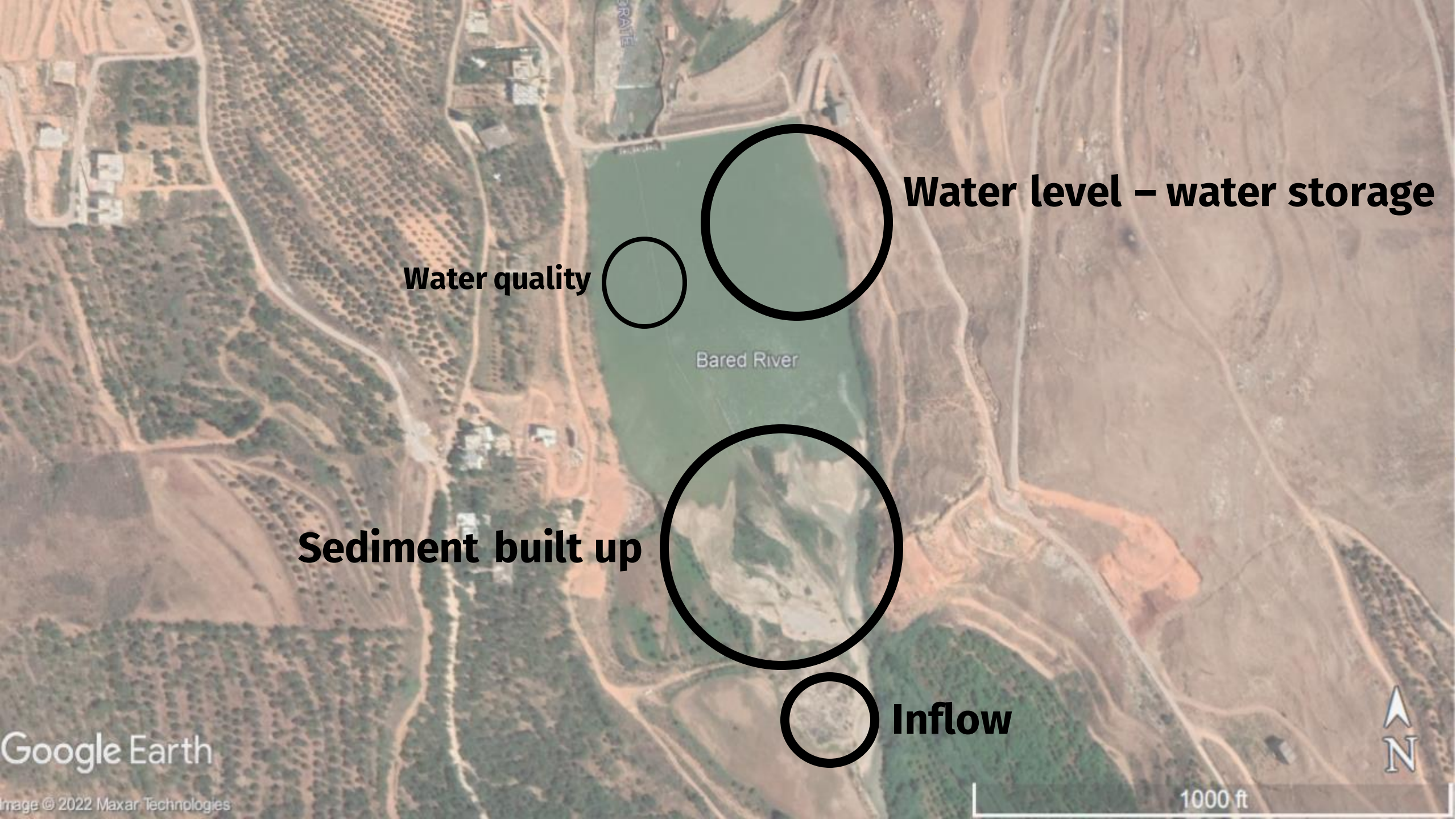


Sediment built up



Inflow





Water quality



Water level - water storage

Bared River

Sediment built up



Inflow





Bared River

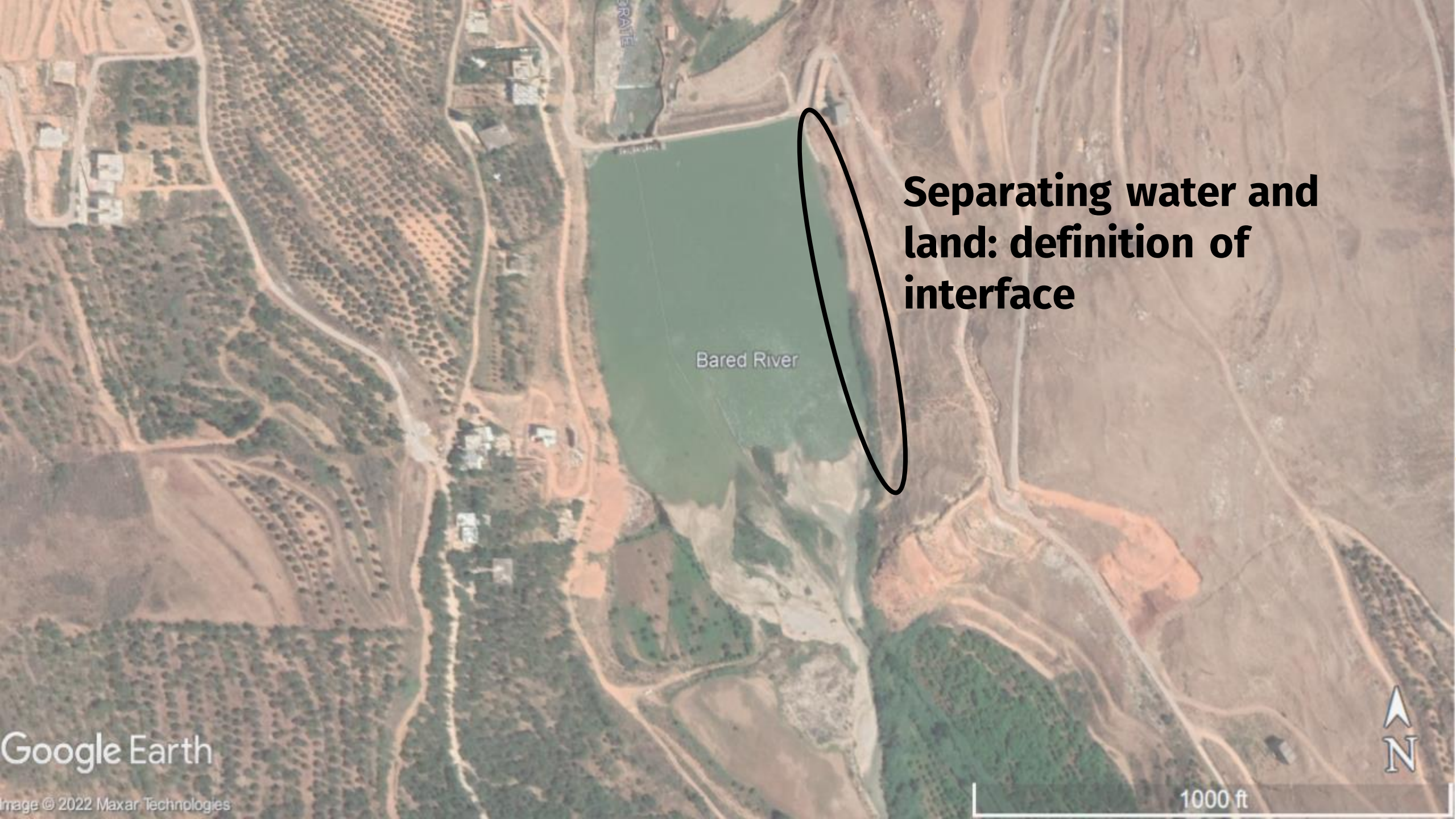
Challenges

Google Earth

Image © 2022 Maxar Technologies



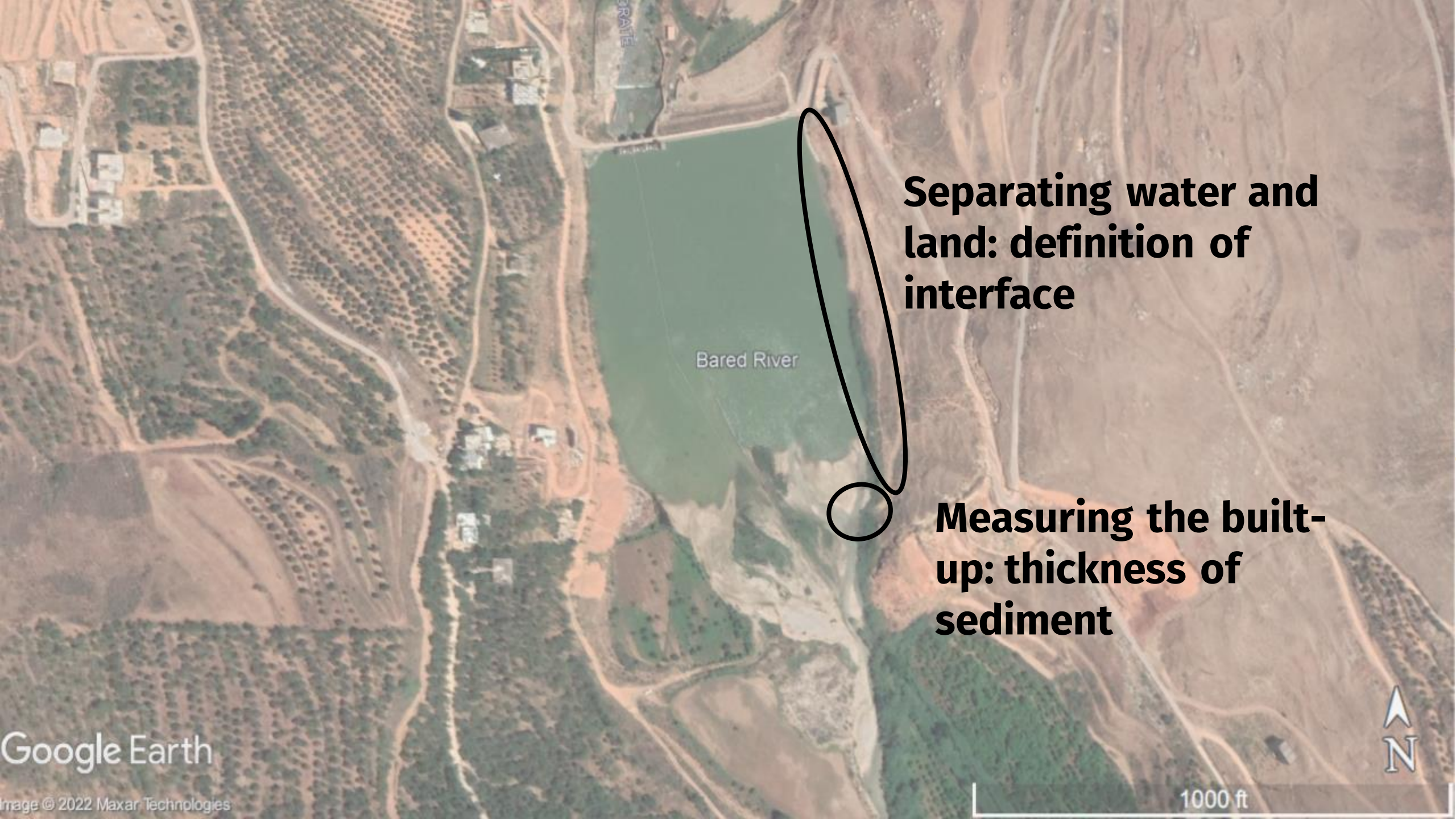
1000 ft



Separating water and land: definition of interface

Bared River



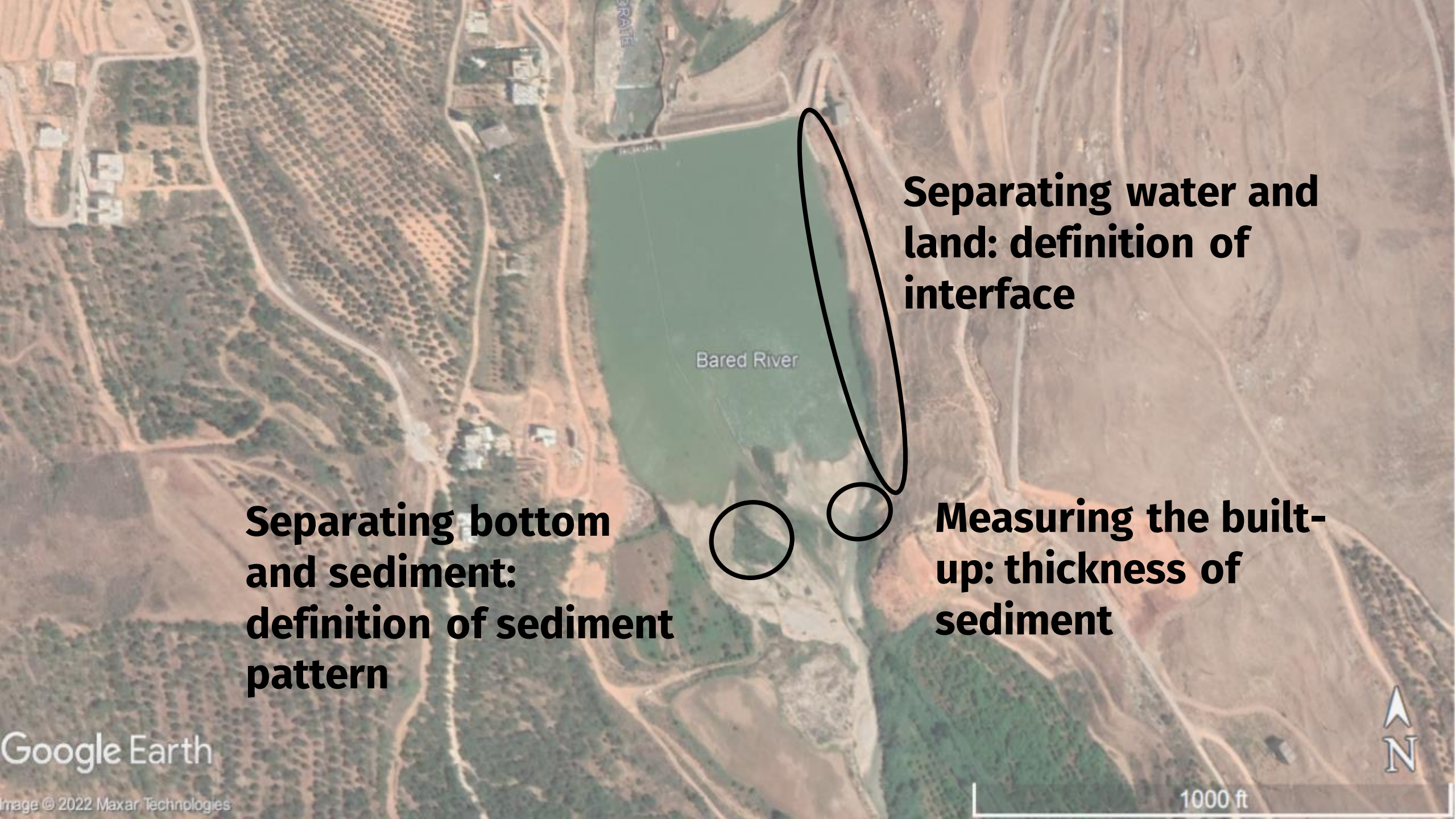


Separating water and land: definition of interface

Measuring the built-up: thickness of sediment

Bared River





Separating water and land: definition of interface

Separating bottom and sediment: definition of sediment pattern

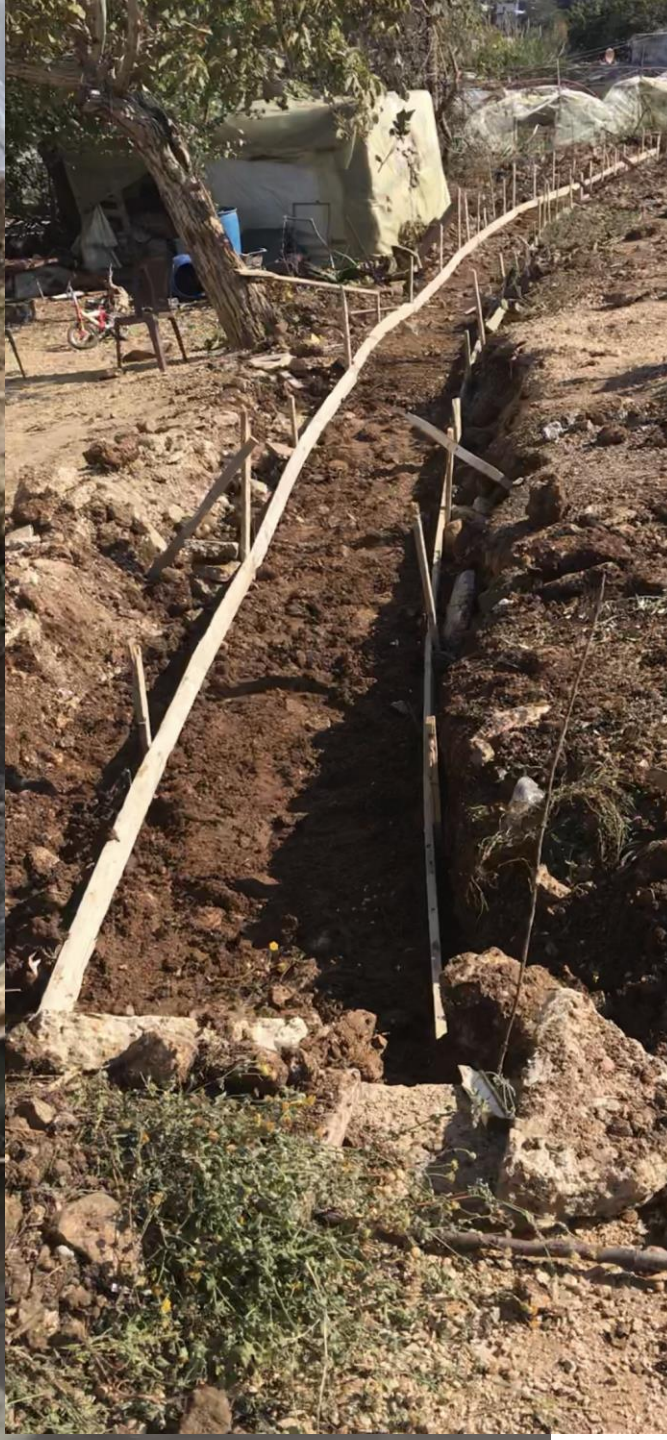
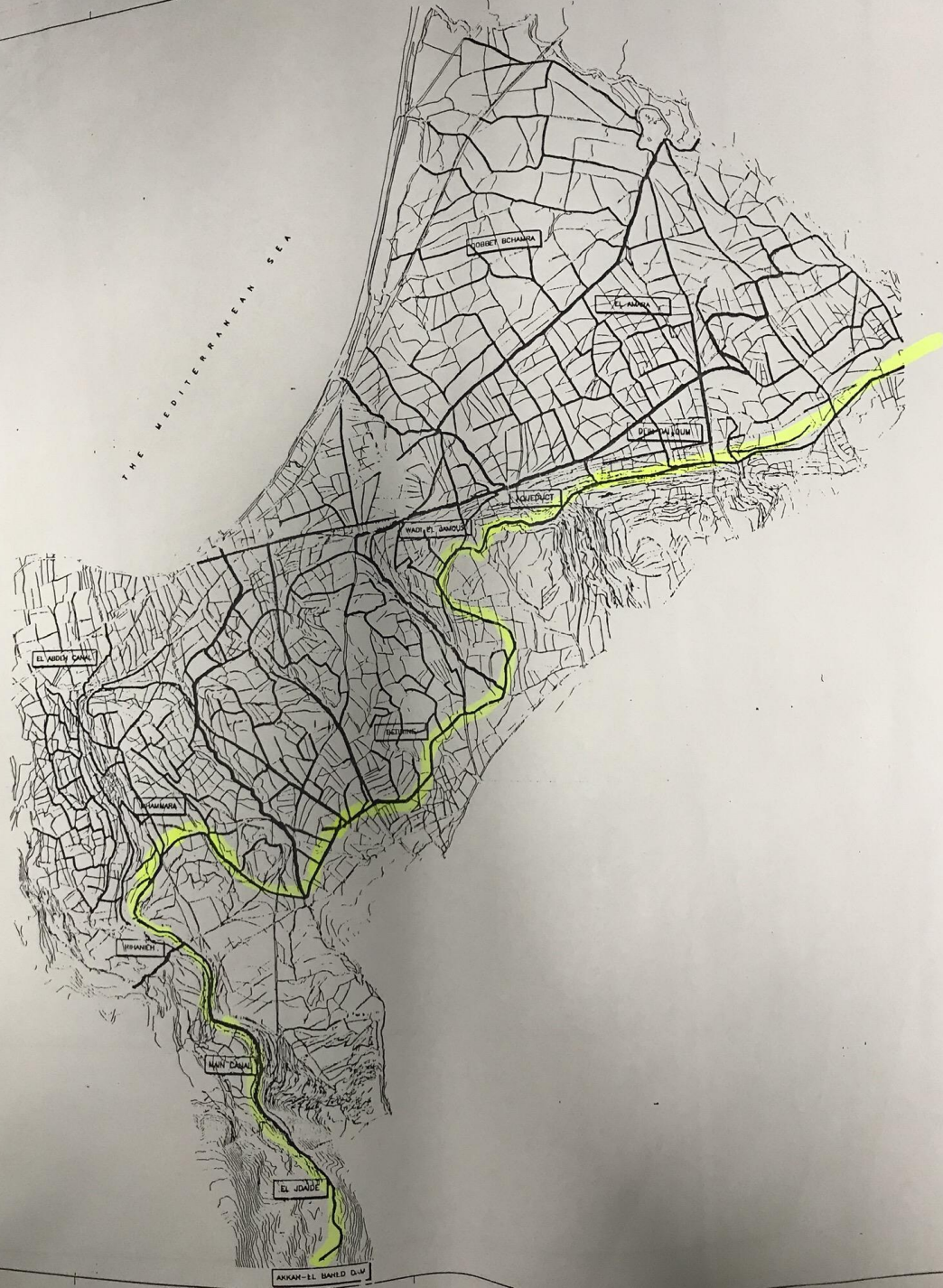
Measuring the built-up: thickness of sediment



**Reservoir
operation**



**Farmers-developed
irrigation**

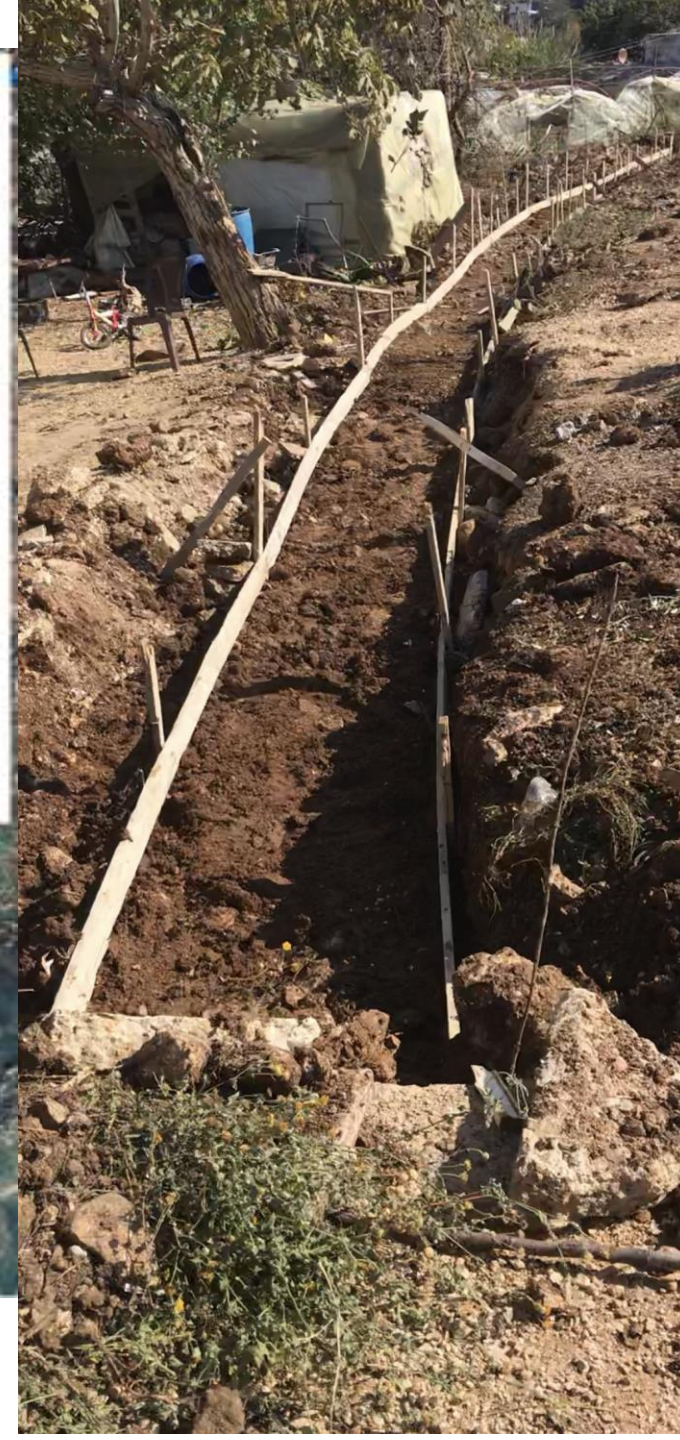
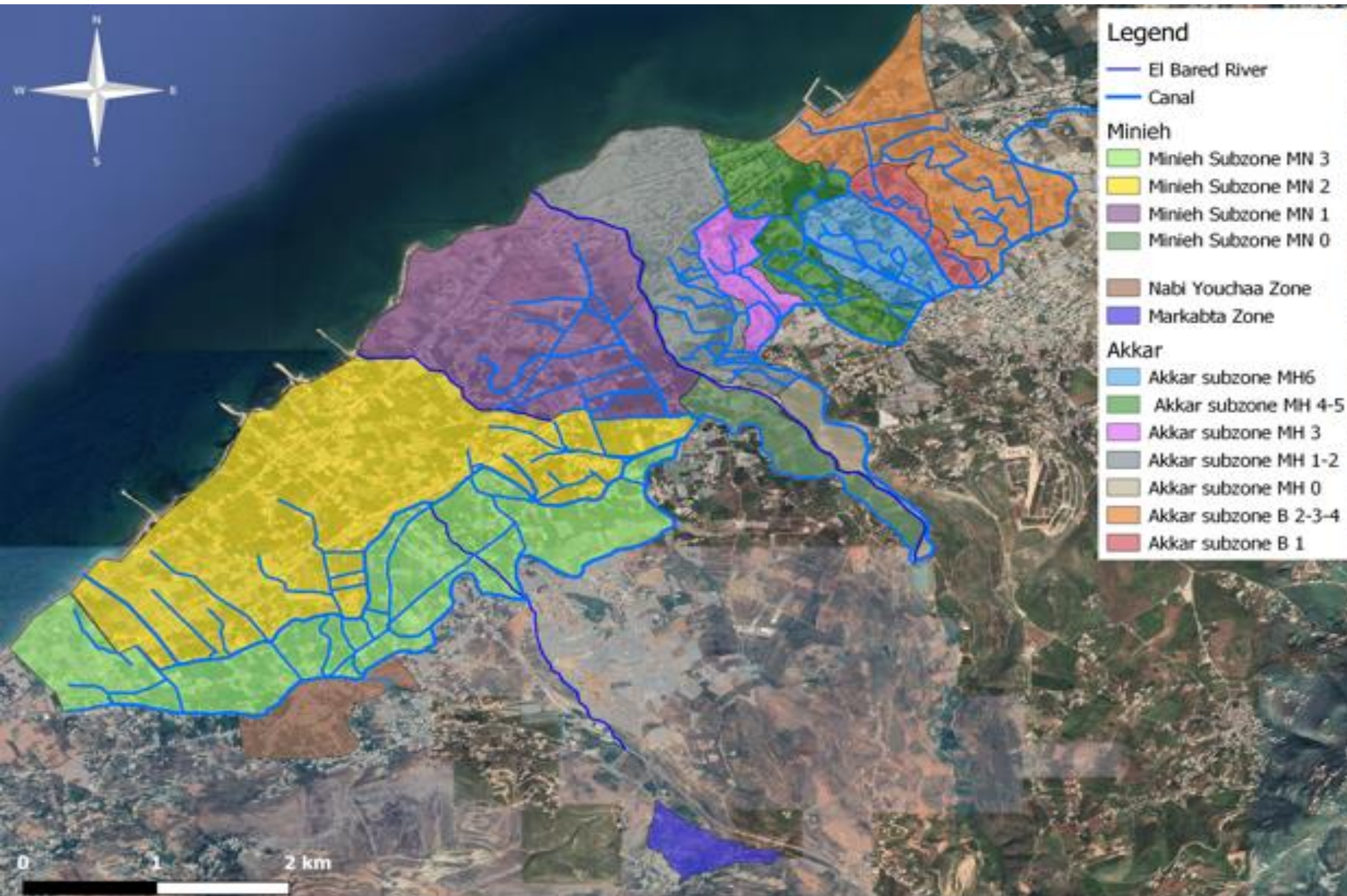


Dynamic in time and space

Social influence

Historical database








Mubuku irrigation scheme

Phase II

Legend

-  Division
-  Drain
-  Main canal

Google Earth

Image © 2022 CNES / Airbus





900 m

Mubuku irrigation scheme

Phase II

Legend

-  Division
-  Drain
-  Main canal



Mubuku irrigation scheme

Phase II

Legend

-  Division
-  Drain
-  Main canal






 Kasese Airport



Mubuku irrigation scheme

Phase II

Legend

-  Division
-  Drain
-  Main canal



Google Earth

Image © 2022 CNES / Airbus


Source: Google EarthPro v7.3.3.7786 (2020). Uganda Cited 12 December 2022.

Legend

- Division
- Drain
- Main canal

Challenges

80 m

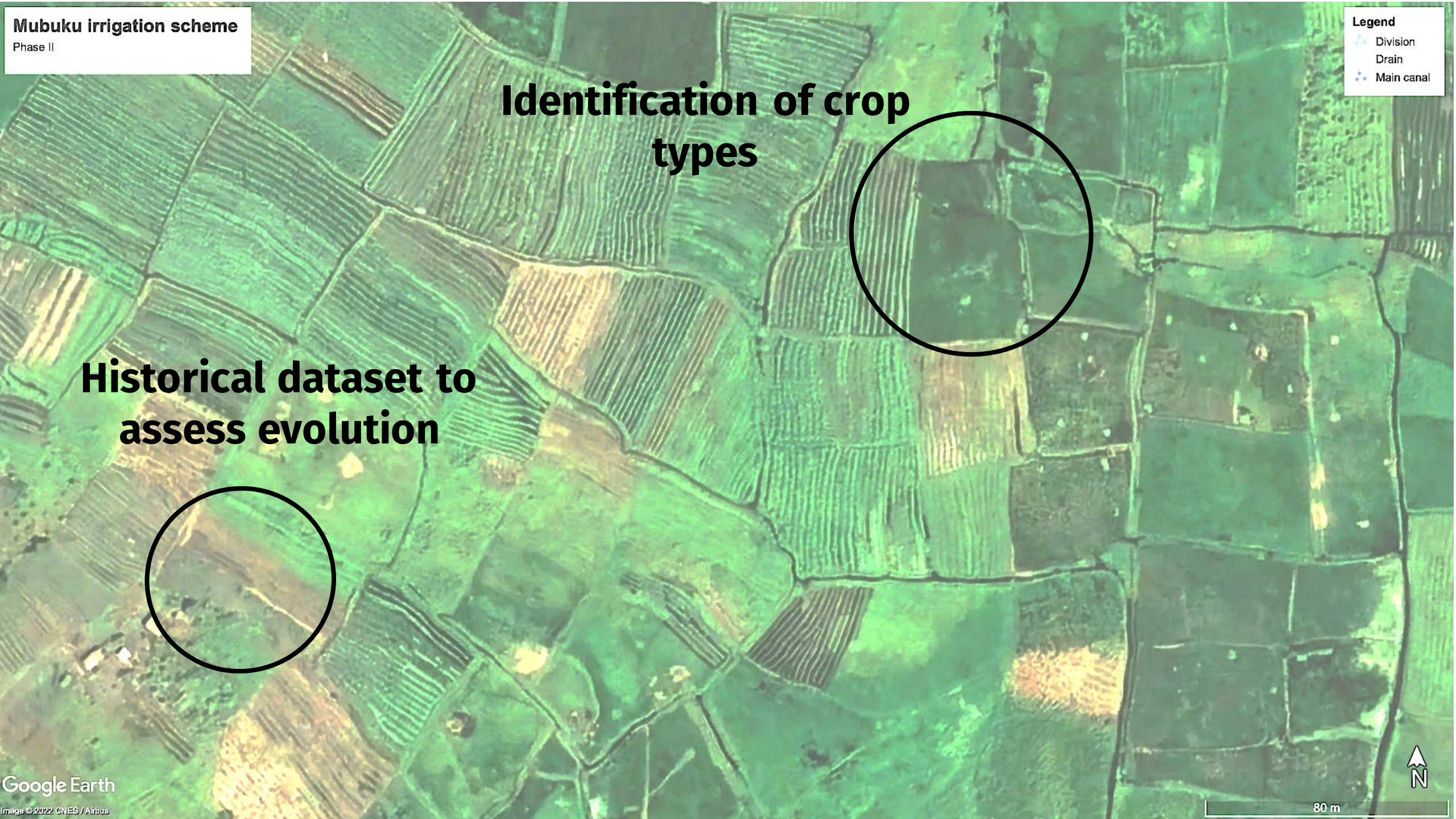


**Historical dataset to
assess evolution**



Identification of crop types

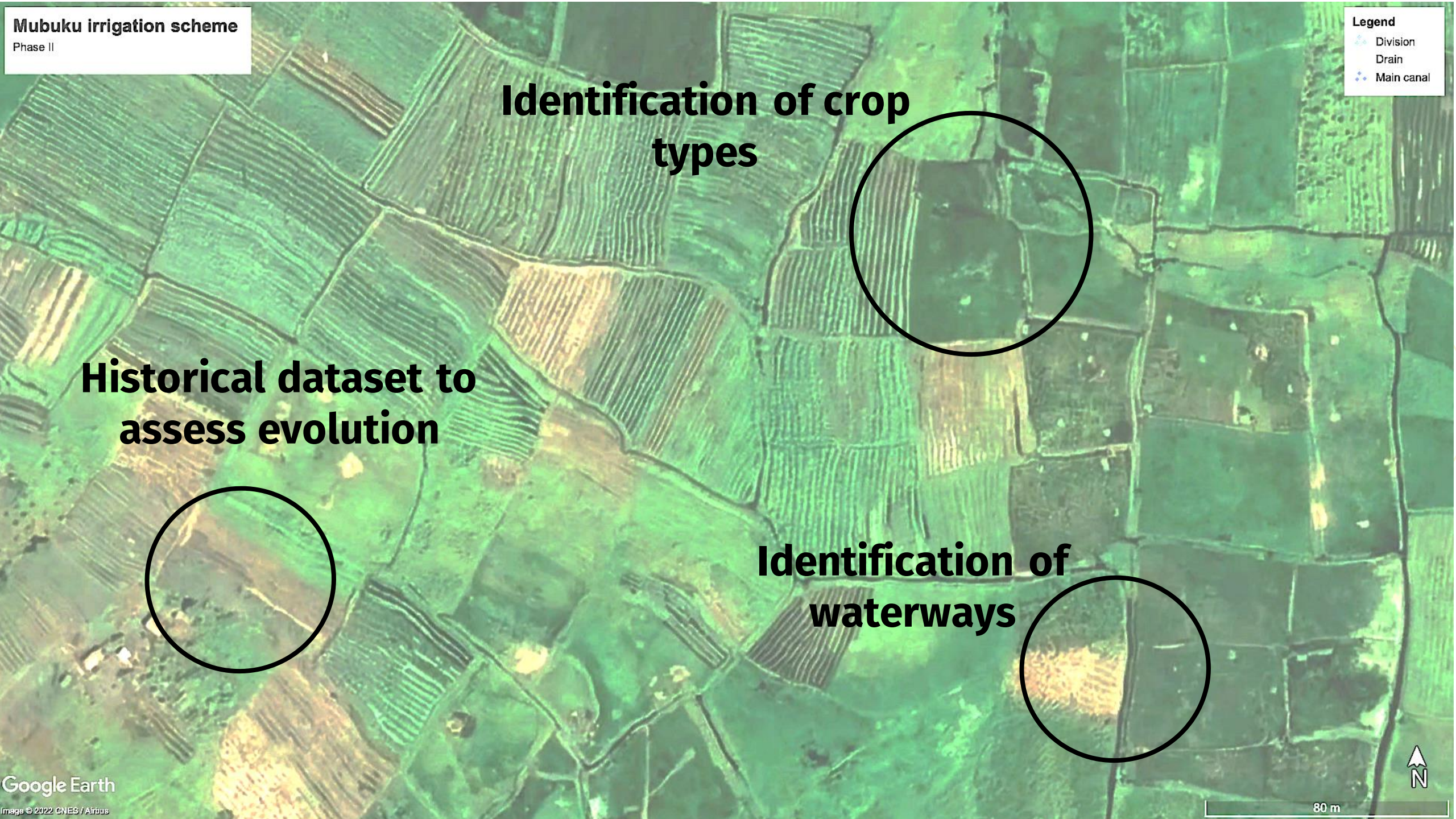
Historical dataset to assess evolution



Identification of crop types

Historical dataset to assess evolution

Identification of waterways



DISCUSSION

The background is a solid blue color with several white, stylized chevron or arrow shapes pointing to the right. These shapes are layered and slightly offset from each other, creating a sense of depth and movement. The word "DISCUSSION" is centered in the middle of the image in a bold, white, sans-serif font with a thin black outline.