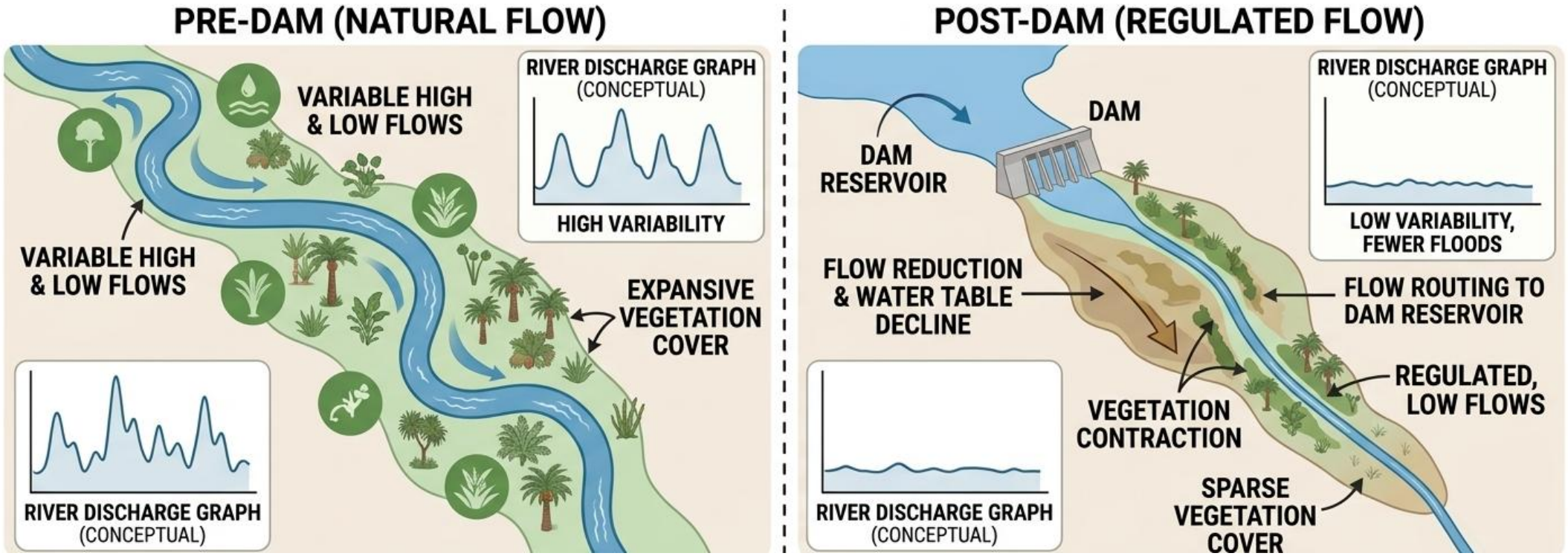
Impacts of Dam-Induced River Flow Changes on Vegetation in the Draa River (Morocco): Insights from Hydrological Modeling and Remote Sensing



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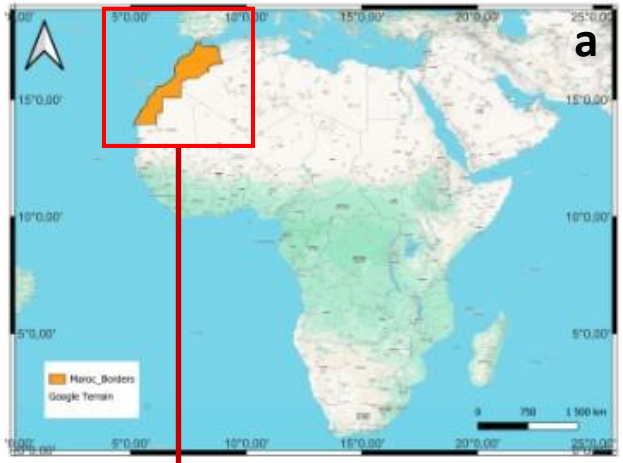
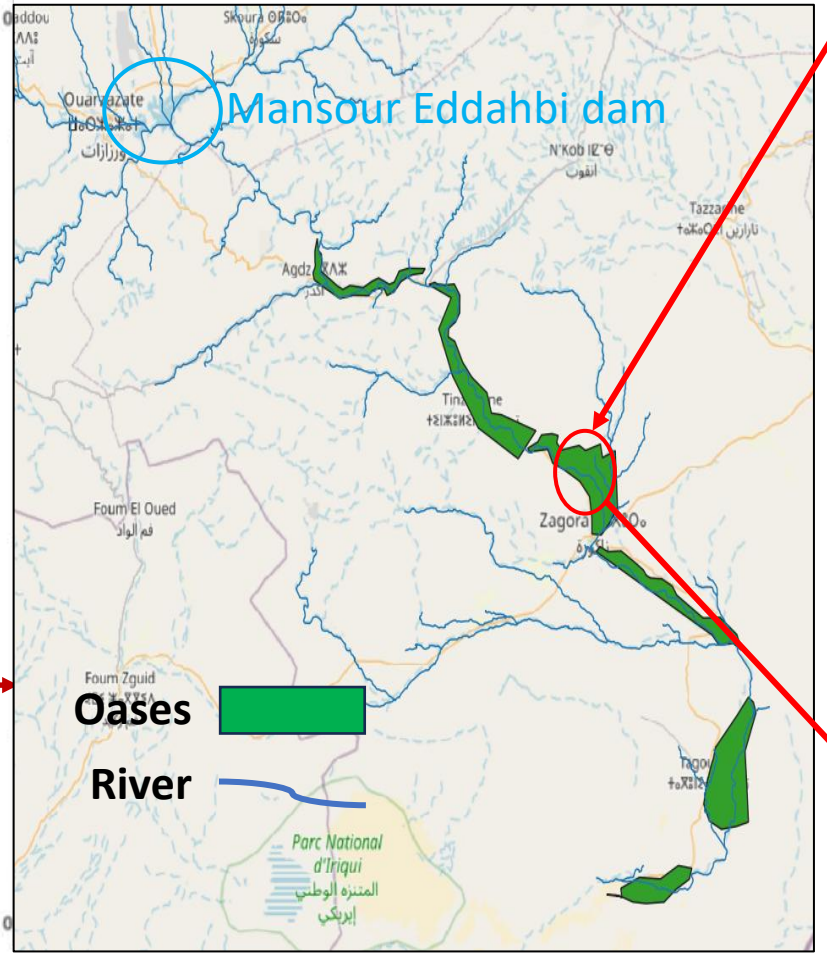
Study Area and Problem Statement

Africa



Morocco

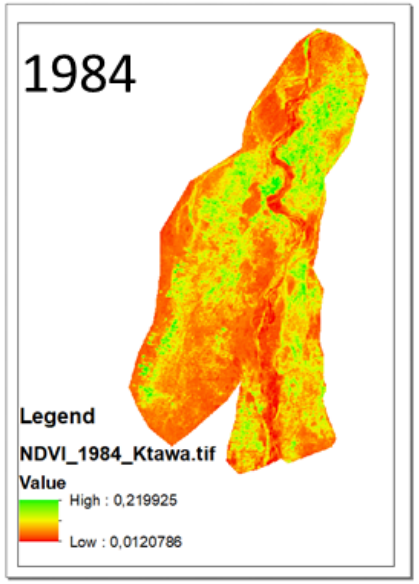
Middle Draa Valley

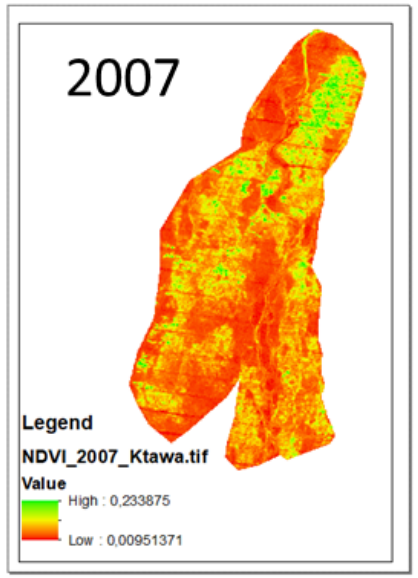


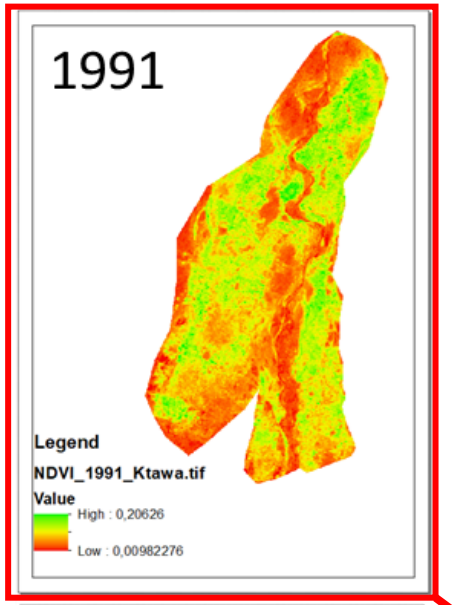
Tools used in the study :

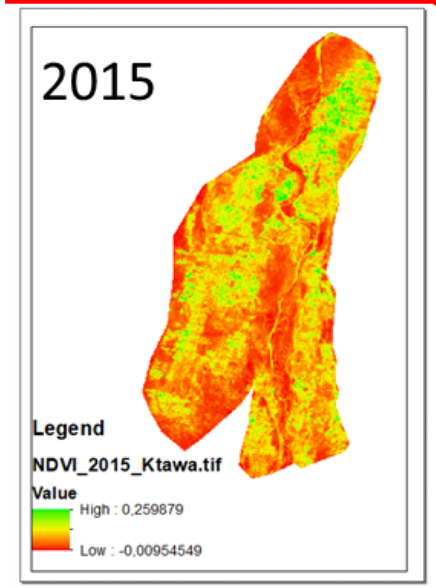
- Remote sensing data (NDVI)
- Hydrological data analyses

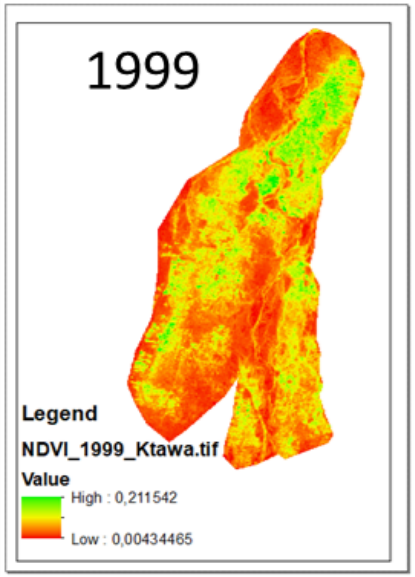
Evolution of vegetation density (NDVI) in the Ktaoua oasis

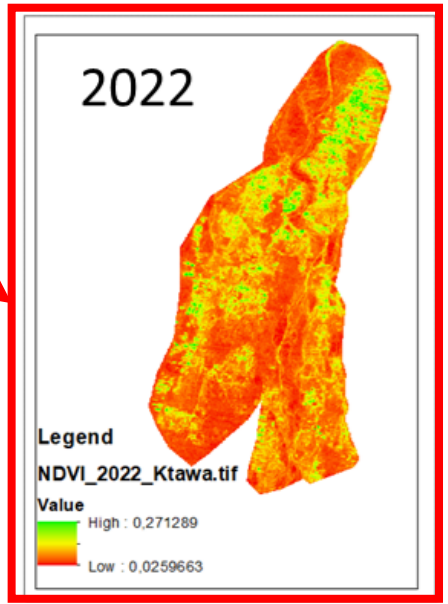




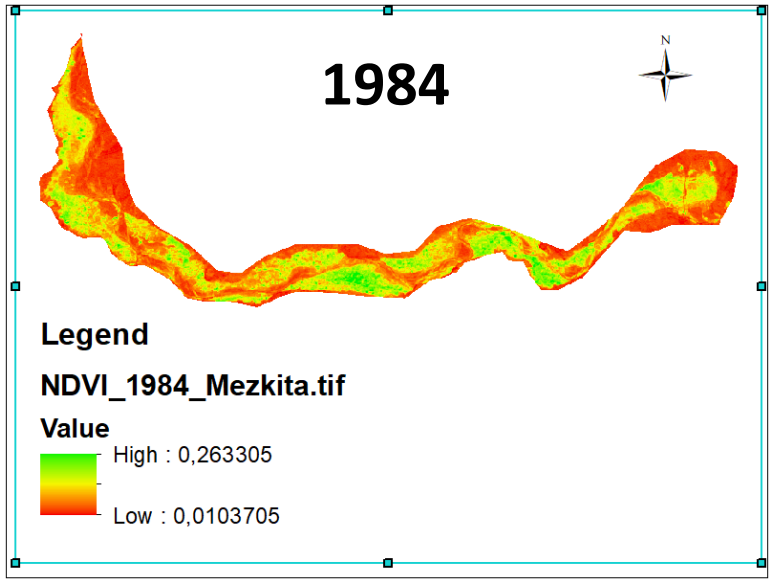


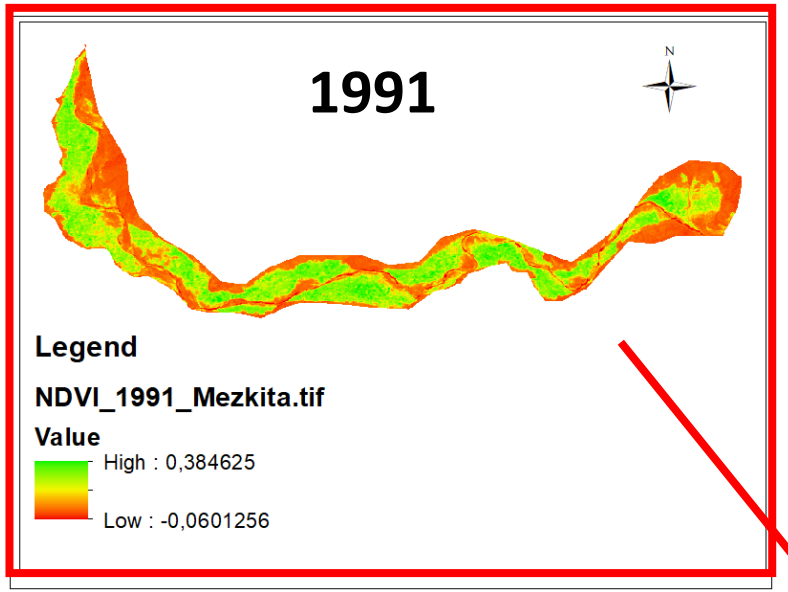


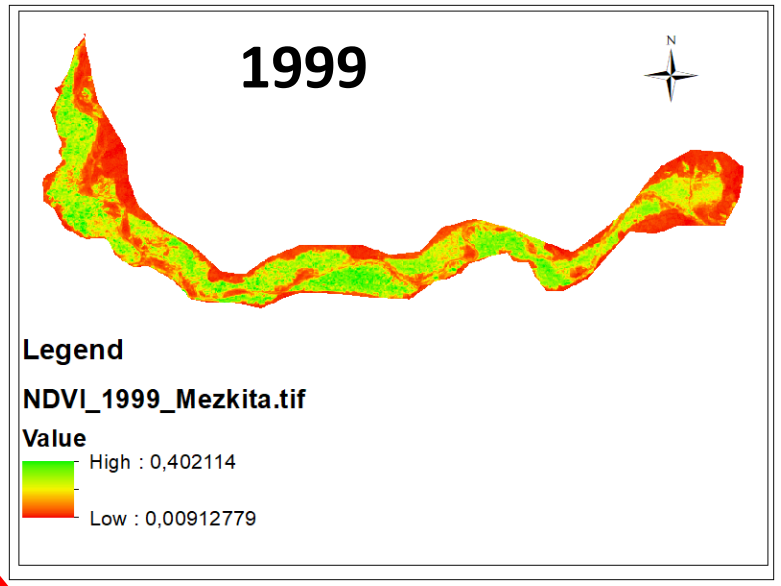


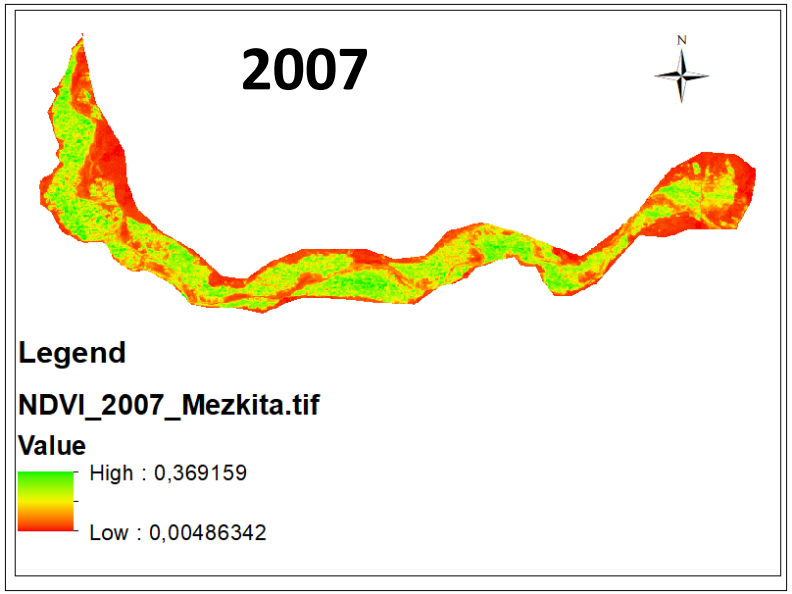


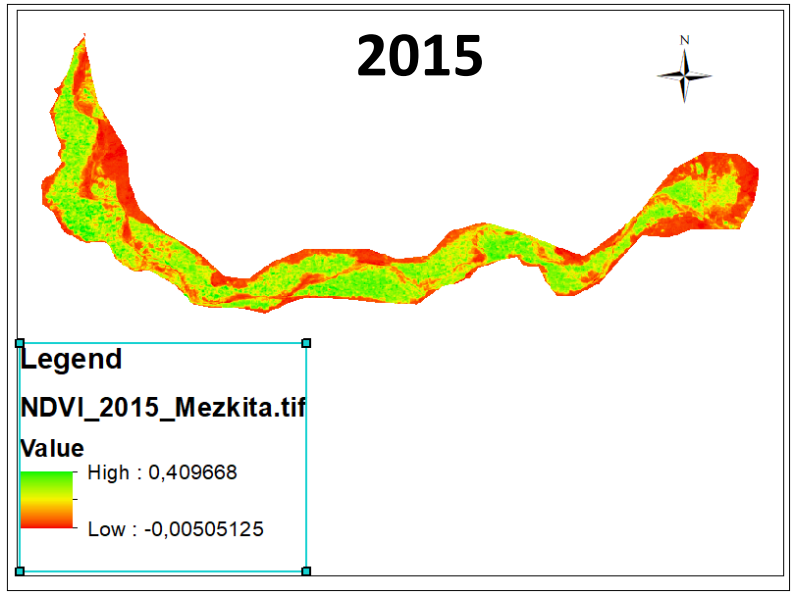
Evolution of vegetation density in the Mezquita oasis

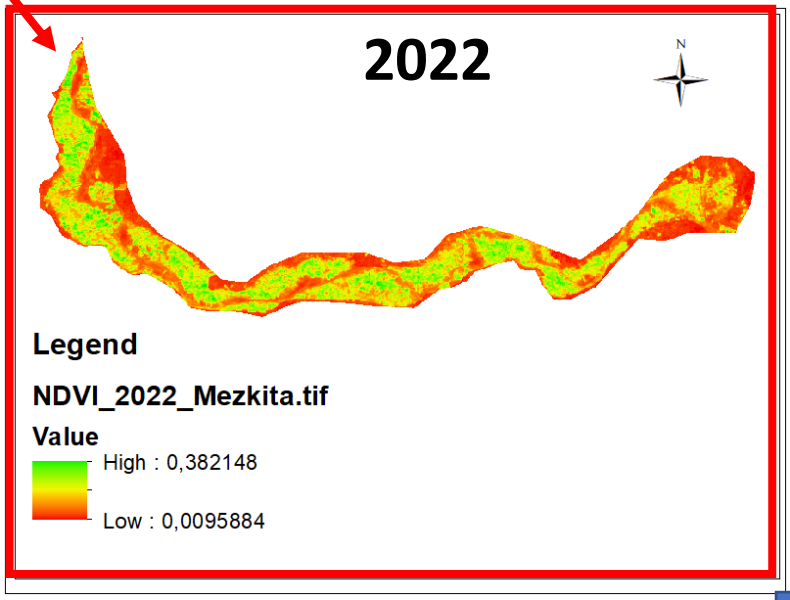




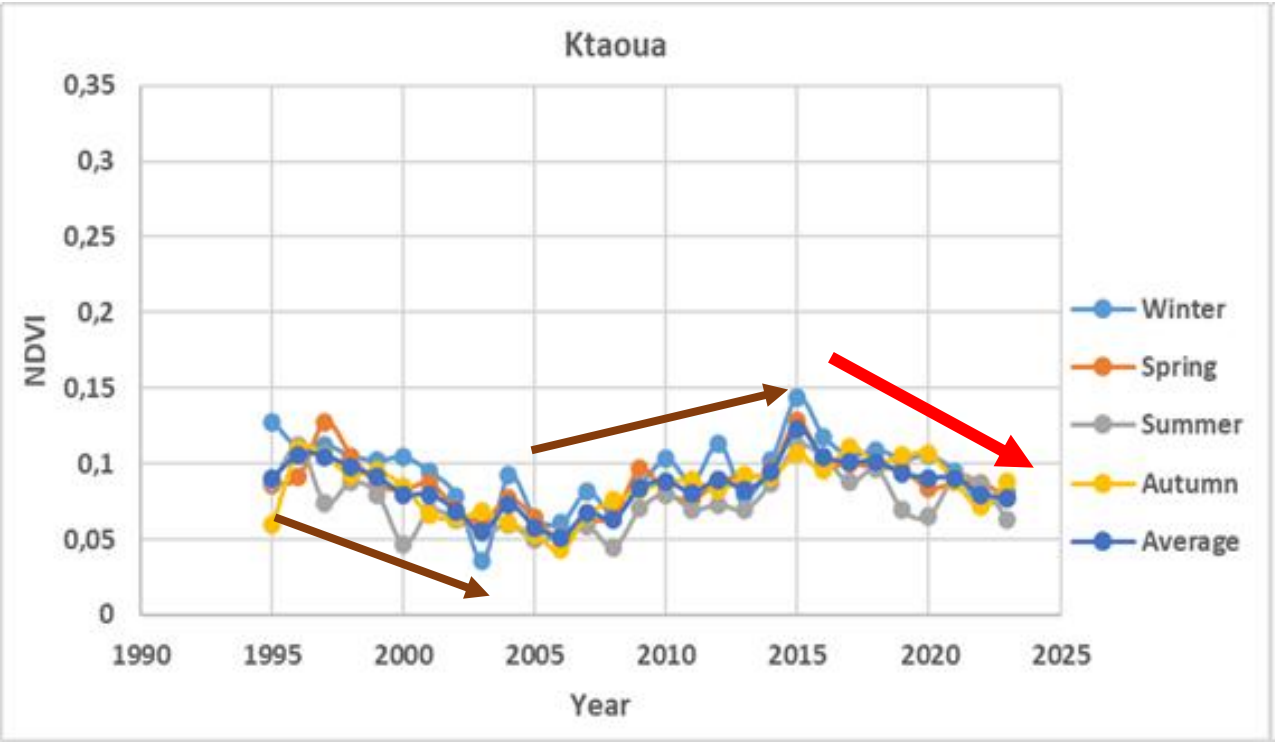


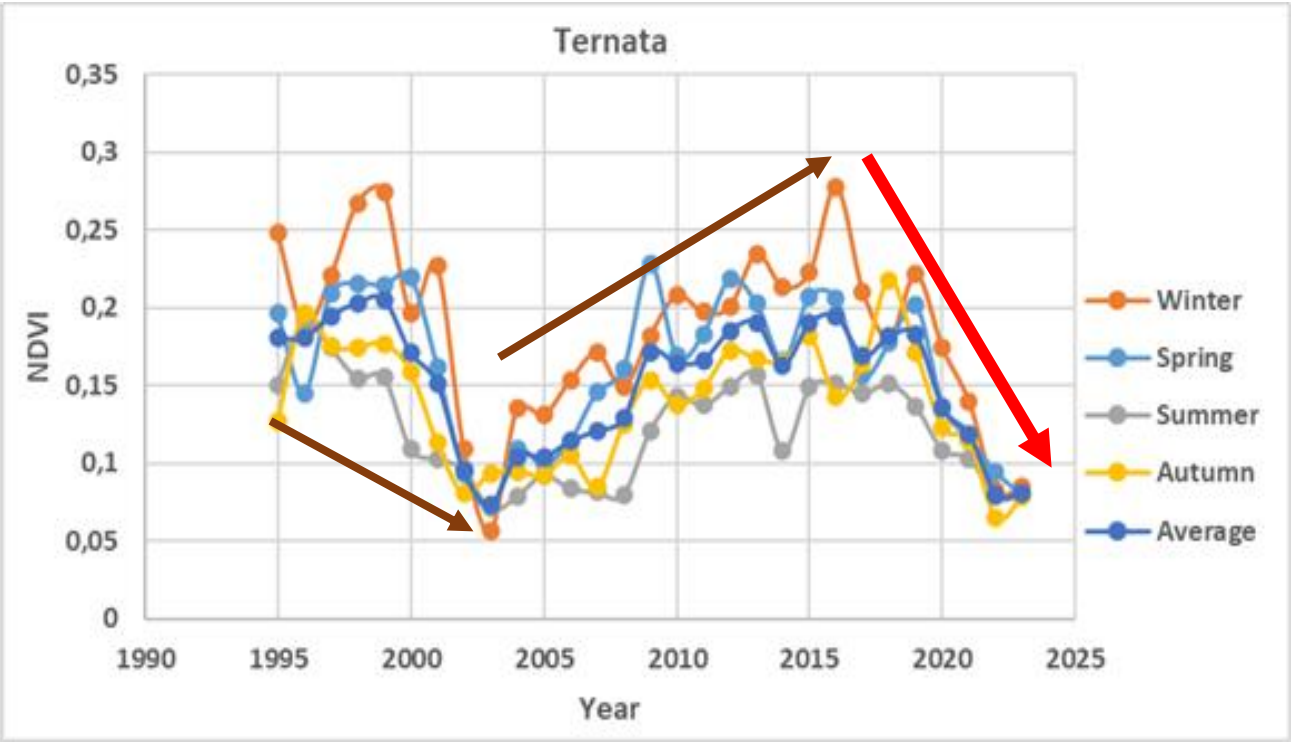






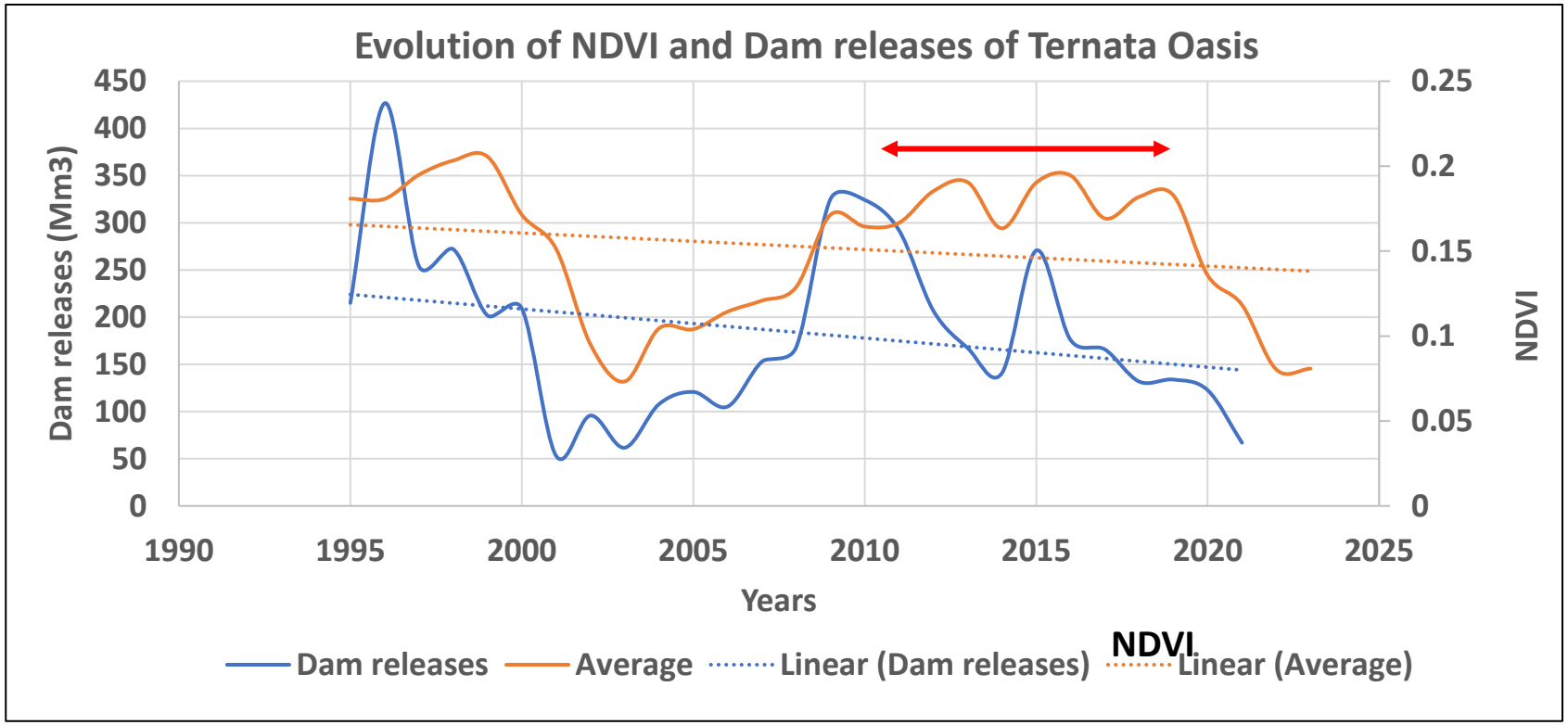
Dynamics of vegetation density

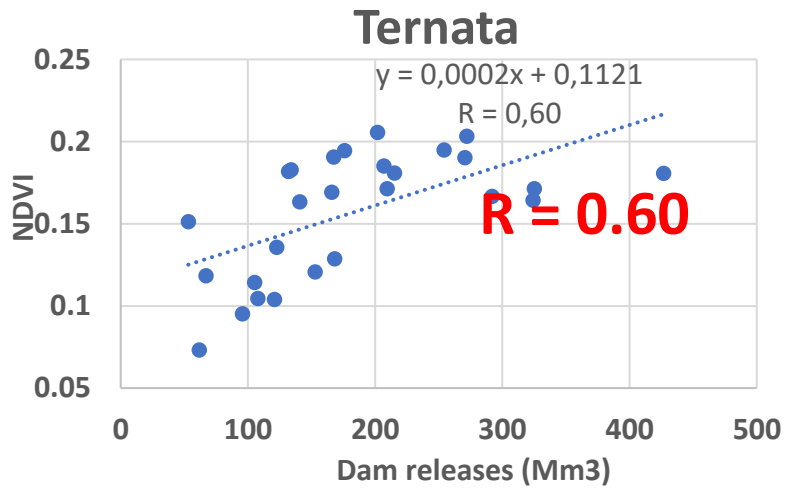




- Between 1995 and 2003: decrease in vegetation density
- Between 2003 and 2015: increase in vegetation density
- Between 2015 and 2023: significant degradation of vegetation

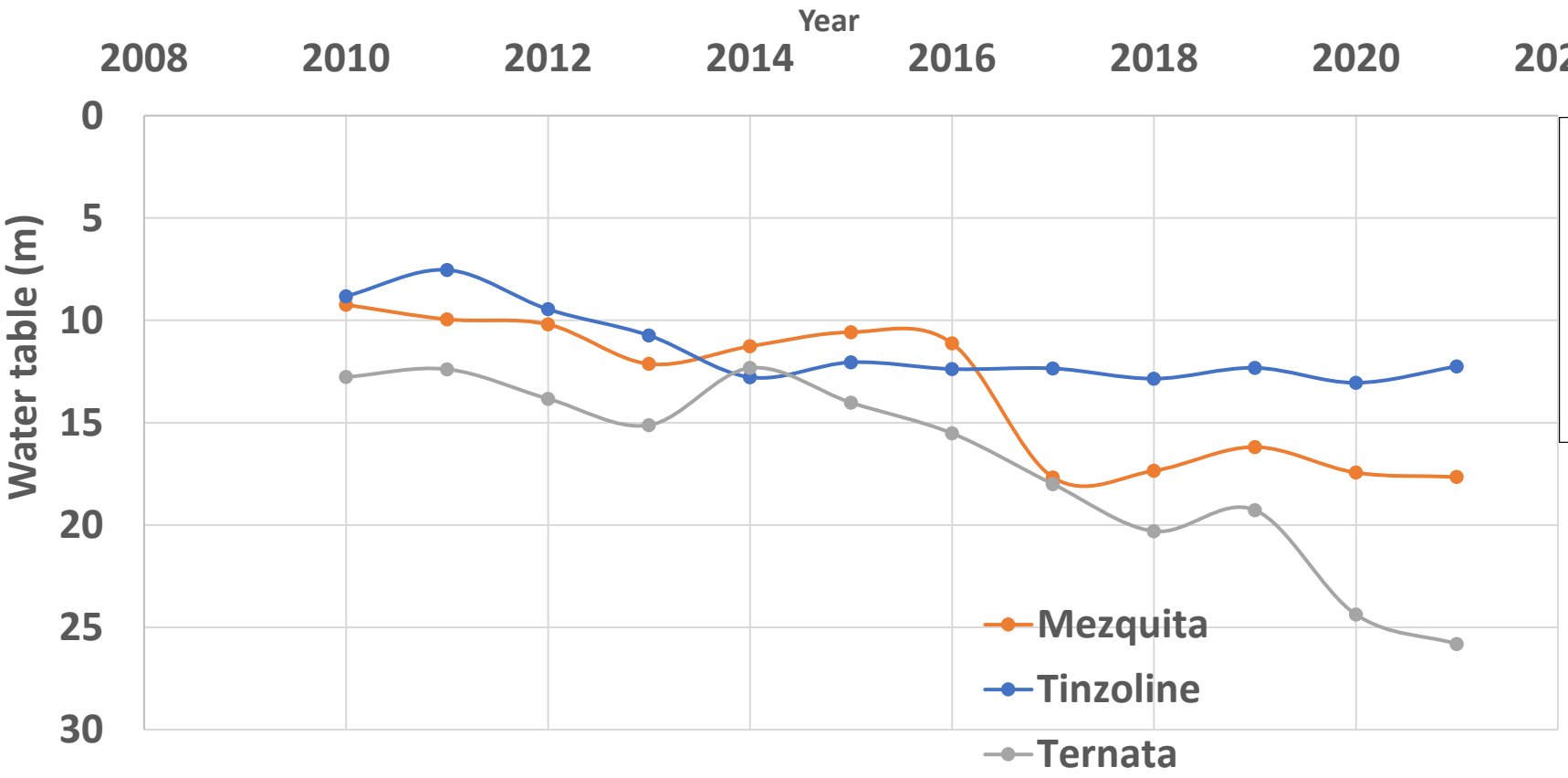
Evolution of dam releases and vegetation density (NDVI) of the Ternata oasis

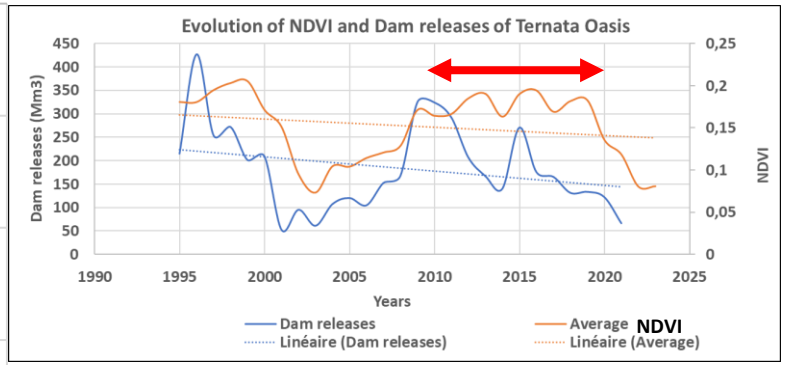




- There is a significant correlation between NDVI and the volume of water released by the Mansour Eddahbi Dam, with R = 0.60.
- We observe a downward trend in both dam releases and vegetation density and health.
- We observed high vegetation density between 2011 and 2019, despite the low volumes of water released by the dam (The use groundwater resources).

Evolution of groundwater depth in the Draa oases





Increased depth of the water table in oases

"Overexploitation of groundwater to irrigate oases"

"The dam is not able to compensate for groundwater losses"

Recommandations and perspectives

Implement a short-term water resource management plan:

- Preserve groundwater resources for date palm irrigation.
- Prohibit water-intensive crops in the Draa Valley oases and other oases in Morocco.

Implement a long-term water resource management plan:

- Improve the dam's operational efficiency (reservoir losses: around 40%).
- Examine and study other water resource management measures (groundwater recharge and rainwater harvesting).
- Develop other economic activities in the region to reduce the irrigated agricultural area and, consequently, water demand.
- Strengthen research on profitable agricultural types adapted to the region's climate and hydrological conditions.

Thank you