Pre-analysis Wadi Mawr, Yemen
NPP over time and space

*Upstream (pink) and Downstream*
The map shows the NPP change between 2009 and 2018 of Wadi Mawr. The graphs show the average NPP per selected area over time. The locations of these areas are visualized in the map and correspond to the color of the graphs. Overall a decreasing trend can be observed of 3 of the downstream areas, with exception of the dark blue area which shows a peak (identified as natural vegetation) in 2016 causing a neutral trend instead of the rough decreasing trend of the other years. For the upstream area an increasing trend is visible. It should be noted that no separation between cropland and natural vegetation has been made at this stage. This will be done in the next steps of this analysis. In addition to the trends, these graphs show that the NPP downstream is lower than upstream. The maximum values of the upstream area are 3 to 10 times higher than the downstream areas, of which the blue areas show the lowest values.
AETI over time and space

Upstream (pink) and Downstream
The map shows the AETI change between 2009 and 2018 of Wadi Mawr. The graphs show the AETI per selected area over time. The locations of these areas are visualized in the map and correspond to the color of the graphs. Compared to the NPP, no clear trend in AETI can be observed for the downstream areas, with the exception of the orange area which shows a slightly increasing trend. For the upstream area an increasing trend is visible. Similar as the NPP, a clear difference in quantity between upstream and downstream can be observed. The maximum values of the upstream AETI are 1.5 to 2 times higher than the downstream areas. Similar as for the NPP, the blue areas have the lowest AETI.
Seasonal E and NPP Patterns

Up- and Downstream

Evaporation and Net Primary Production upstream per month 2009-2018

Evaporation and Net Primary Production downstream per month 2009-2018
Seasonal E and NPP Patterns

*Up- and Downstream*

This figure shows the NPP (green) and AETI (blue) seasonal patterns between 2009 and 2018. The top graph of the upstream area shows a clear seasonal pattern of a flood peak (high AETI) followed by a biomass peak (high NPP), which is typical for spate irrigation systems. This graph can be used to identify the start- and end-date of the growing seasons. The seasonal signal of the bottom graph (downstream), is more irregular than the upstream area. This can be due to various reasons. For example, the fields may not have been well prepared for floods in the downstream areas as it is unclear each year whether enough flood water is available for these areas and when they will arrive. The actual reason behind this should be further analyzed and combined with ground data and local knowledge.
Filtering Out Natural Vegetation

Example
Filtering Out Natural Vegetation

Example

This map shows the NPP of 11 July 2018. The seasonal graph of the previous slide indicates that this is an off-season period in which there is little biomass production. Therefore, the areas which show biomass production in this period are likely covered with natural vegetation (e.g. Prosopis). As this is a relatively large area and mainly occurs upstream, it is vital to further analyze the spatial and temporal distribution of biomass growth in these off-season periods. Such analysis will contribute to obtaining an understanding of the trend in natural vegetation growth in Wadi Mawr, as well as an improved understanding of the up- and downstream NPP trends without these natural vegetation areas. For example, the current trends for the upstream area of figure 2 and 3, are likely heavily influenced by natural vegetation.
Precipitation versus AETI and NPP

*Upstream*
These two graphs show the NPP and AETI compared to the precipitation. No clear similarity between the precipitation pattern and the NPP and AETI patterns can be observed. This is expected for a spate system in contrary to for example a rainfed irrigation system. The next step of this analysis is to delineate the catchment and compute the precipitation over the catchment rather than the precipitation over the wadi only. It is expected that a similar pattern for precipitation and AETI will be found. If this is not the case it would indicate the influence of other water sources and/or errors in the data.
Overview Findings

• No relationship NPP&AETI and precipitation over the wadi. (common for spate)
  • precipitation over the catchment (TBD)
• NPP upstream 3-10 x higher than downstream.
• NPP is decreasing downstream & increasing upstream (including natural vegetation)
• AETI upstream 1.5 -2 x higher than downstream.
• AETI is consistent downstream & increasing upstream
• Seasonal pattern AETI & NPP more erratic downstream than upstream.
  • Particularly the NPP seasonal patter becomes more irregular for the downstream area over time.
• The middle downstream branch lower NPP (3x) and AETI (1.5x) compared to the other two downstream branches
Analyses to be conducted

• Analysis based on seasonal cumulative values rather than annual means
• Comparing WaPOR portal seasonal biomass maps with cumulative seasonal biomass values
• Natural vegetation (Role & Filter)
• GBWP maps & analyses
• Catchment precipitation analysis
• NPP during conflict compared to NPP prior to the conflict
• Cultivated area temporal and spatial trend