

Turbidity – Simple Definition:

Turbidity is a measure of how **cloudy**, **murky**, or **dirty** water is due to **suspended particles** like:

- Mud
 - Algae
 - Industrial waste
 - Microorganisms
 - Sediments
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In Other Words:

Turbidity = Water Clarity

- **Clear water** → **Low turbidity**
- **Muddy or polluted water** → **High turbidity**

You can think of turbidity as how **transparent** water is:

- If you can **see through** it → low turbidity
 - If it looks **cloudy or brownish** → high turbidity
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Why Turbidity Matters:

Impact Area

How Turbidity Affects It

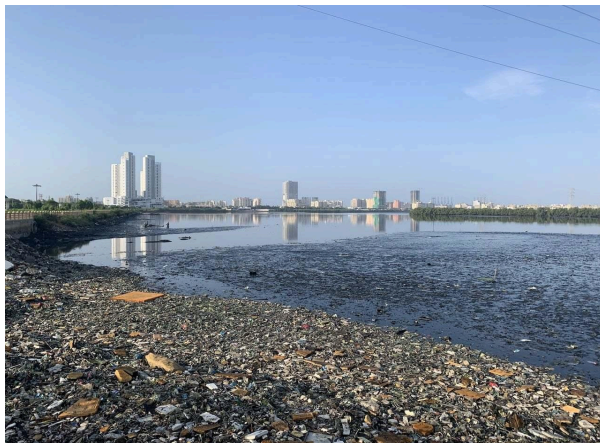
Aquatic Life

Blocks sunlight → affects plants and fish breathing

Human Health Can carry bacteria or pollutants

Water Quality Indicates pollution or sediment runoff

**Satellite
Analysis** Can be tracked using remote sensing (like NDTI)



Real-World Turbidity in Karachi's Coastal Waters

1. Visible murkiness & debris

Many photos from Karachi beaches (shown above) reveal visibly **brown, murky water** loaded with **plastic waste** and sewage runoff ([Dawn](#)). This aligns with NDTI analysis: higher red reflectance (due to sediments) = higher turbidity.

2. Sewage & industrial pollution

Reports show Karachi discharges **420 MGD of untreated sewage** into the Arabian Sea—about **88%** of its total ([Frontiers](#), [Dialogue Earth](#)). Coastal fishing communities are impacted: former productive waters now deserted by marine life .

3. Microplastics & algal blooms

One study at Clifton Beach found **300+ microplastic particles per gram** of sand, with persistent algal blooms that release toxins ([Aaj English TV](#)), a sign of disturbed water quality and elevated turbidity.

4. Scientific case: Haleji Lake, Sindh

Remote sensing combined with in-situ data showed turbidity increased from under **5 NTU** to about **15–30 NTU** between 1999 and 2011, marking a clear decline in water clarity due to rising sediment/pollution ([ResearchGate](#)).

Why Monitoring Turbidity Matters (and How Satellites Help)

- **Indicator of health:** High turbidity often signals habitat degradation, blocked sunlight, decreased oxygen, damaged ecosystems.
 - **Public health alert:** Polluted water can carry pathogens and toxins, unsafe for swimming and fishing.
 - **Satellite advantage:** Tools like satellites (Sentinel-2) allow:
 - Spatial mapping of turbidity patterns
 - Time-series tracking to see trends and seasonal peaks
 - Detection of pollution sources like river mouth plumes ([MDPI](#), [ResearchGate](#)).
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✓ Summary

- **Turbidity** = water murkiness from suspended particles.
- Karachi's coast is notably turbid, directly observed and documented.
- Environmental concerns (sewage, plastics, algal growth) are primary contributors.
- Satellite-derived indices (like NDTI) validated by field data offer robust monitoring tools essential for water quality management, pollution mitigation, and conservation.

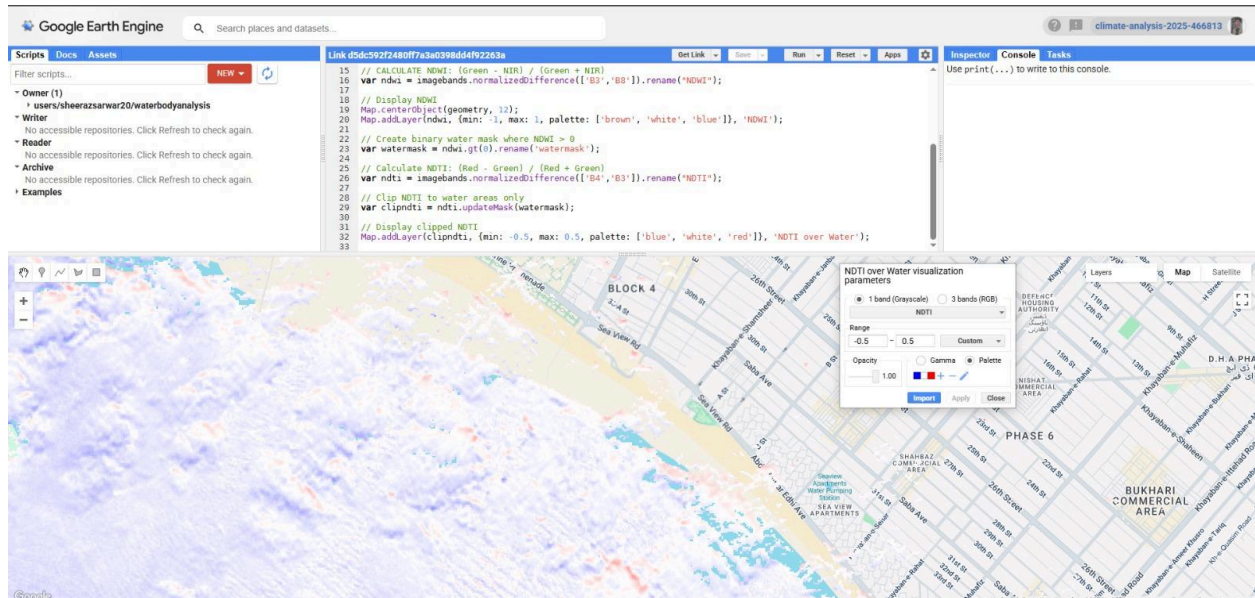
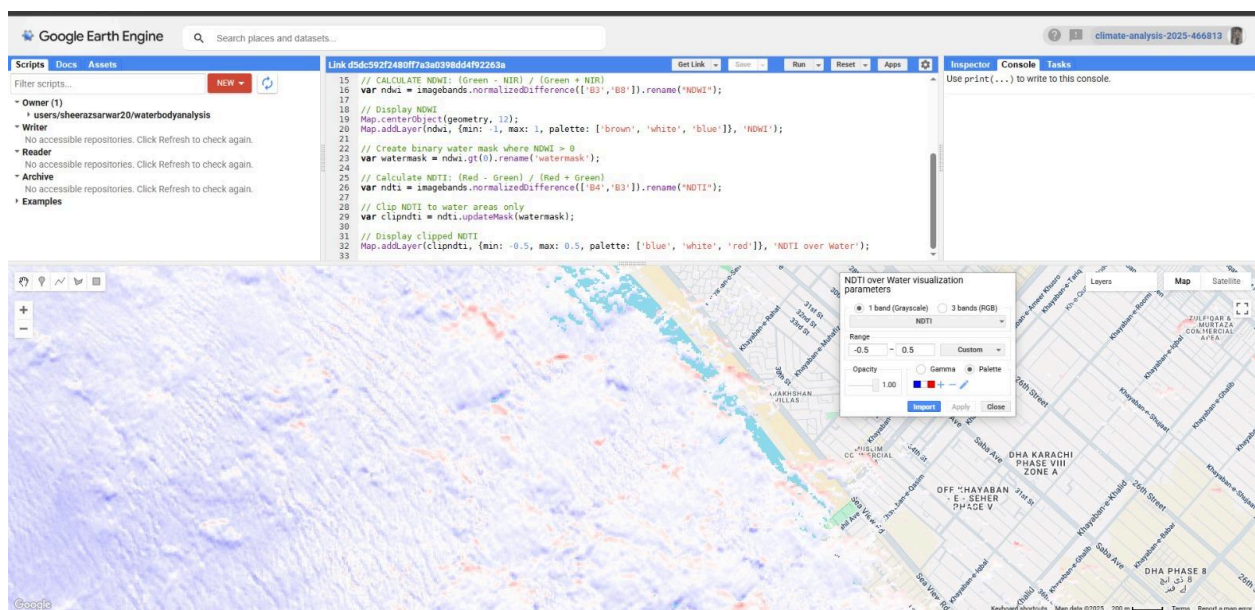
Here's a clean, professional **PDF layout format** you can follow to document your **Earth Engine turbidity analysis** using screenshots + explanation. This format is ideal for university projects, reports, or environmental studies:

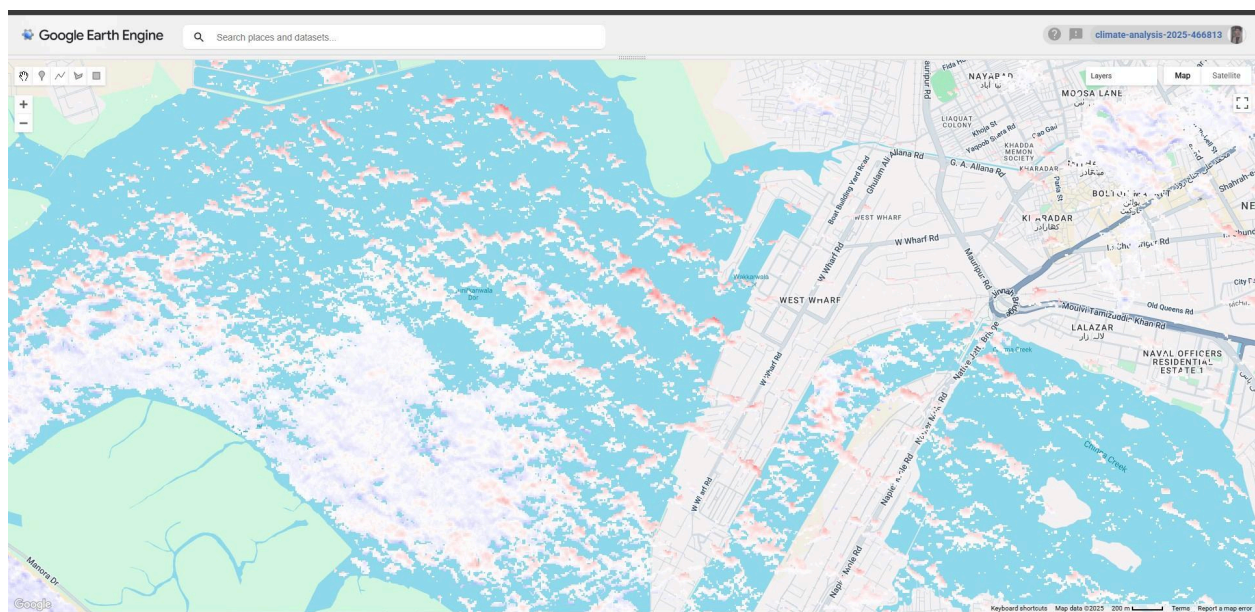
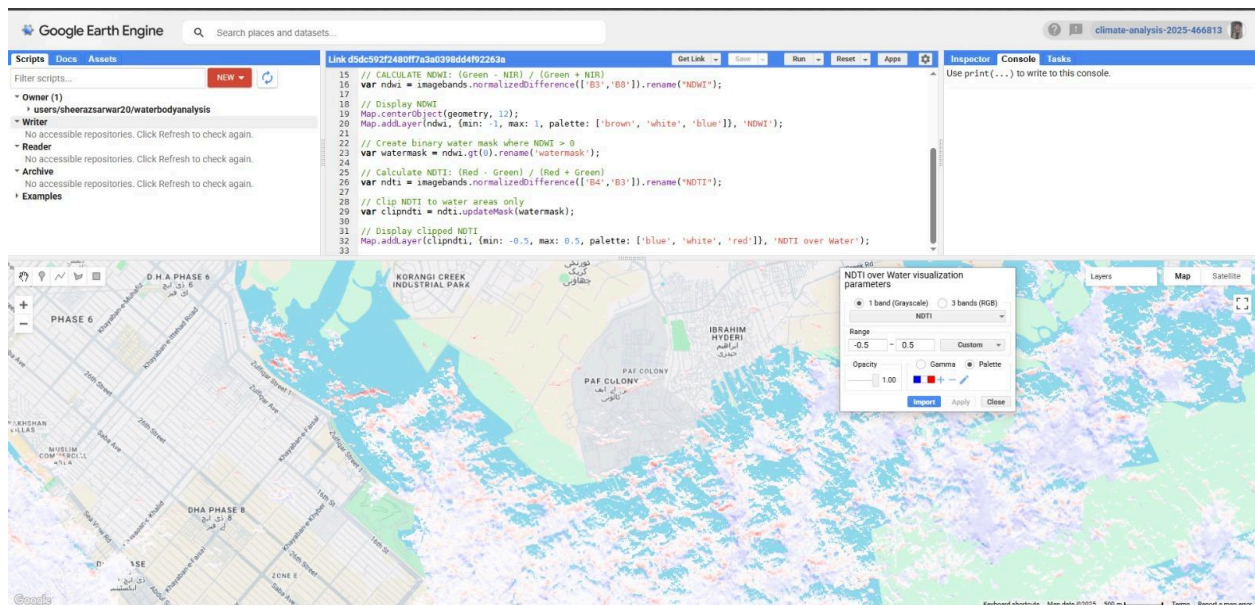
Turbidity Analysis using Google Earth Engine (Karachi Coastal Waters)

Study Area: Karachi Sea View

- **Sensor:** Sentinel-2 SR Harmonized
- **Date Range:** June 1–30, 2025

Screenshots of Google Earth Engine map centered on Karachi Sea View





Interpretation of Results

- **Clear water** = low NDTI (blue)
- **High turbidity** = red zones near coast or river mouths

✓ 7. Summary

- Earth Engine helps visualize and monitor coastal turbidity.
- Sentinel-2 bands (Green, Red, NIR) effectively reveal sediment or pollutant levels.
- Karachi Sea View shows patterns of elevated turbidity due to urban impact.