

DETAILED METHODOLOGICAL FLOWCHART

Soil Organic Carbon Dynamics in Sunamganj Haor Wetlands (1985-2025)

STUDY AREA

Sunamganj Haor Basin, Northeastern Bangladesh
9 Sampling Locations | ~1,235 km²
Seasonally Flooded Lowland Wetland



DATA SOURCES

LANDSAT DATA

1985-2024
L5 TM | L7 ETM+ | L8 OLI
Collection 2 Level-2
Surface Reflectance
30m resolution
Cloud cover <70%

SENTINEL-2 MSI

2015-2025
Level-1C TOA Reflectance
Bands: B2, B3, B4, B8
10m resolution
Cloud cover <30%
Annual composites

ESA CCI AGB

2010-2020
Multi-sensor fusion
ALOS PALSAR | ASAR
100m resolution
Above-ground biomass
Validation dataset

FIELD SAMPLING

1985 & 2025
9 Locations
Topsoil (0-15 cm)
Subsoil (15-30 cm)
GPS: ±5m accuracy
Diverse land uses



DATA PROCESSING & ANALYSIS

QUALITY CONTROL

Cloud masking
QA band filtering
Scene-level: >70%
Pixel-level masking



CONVERSION MODEL

NDVI to biomass
Quadratic relationship
Validated for wetlands
Saturation correction



CLOUD MASKING

Scene filter <30%
NDVI threshold >0.2
Pixel-level removal
Conservative masking



INDEX CALCULATION

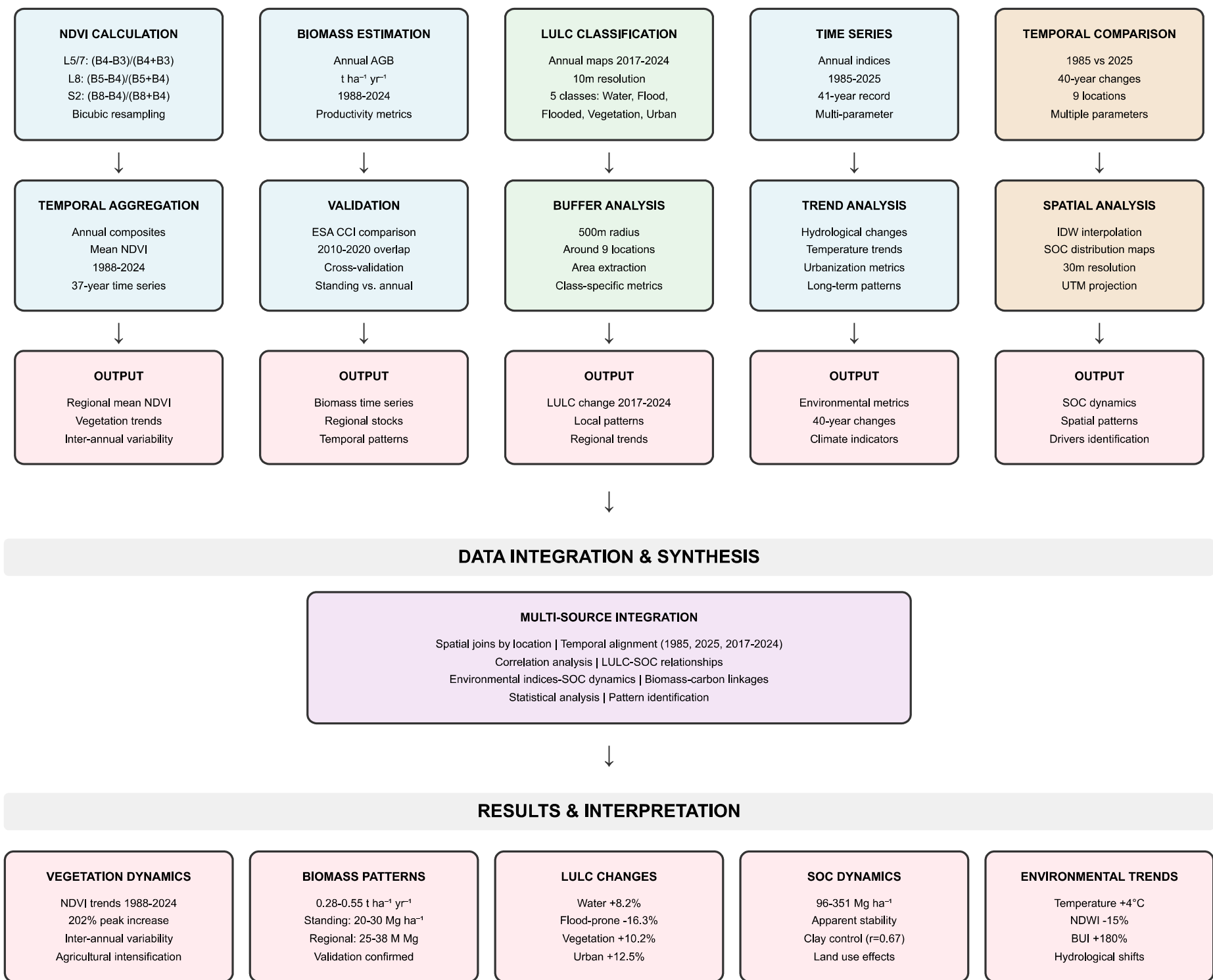
NDVI | NDWI
BUI | LST
Multi-spectral
Thermal bands



LAB ANALYSIS

SOC% | Stock
pH | TN | Clay
SBD | CEC
Physicochemical







DISCUSSION & IMPLICATIONS

Equilibrium carbon dynamics | Compensatory mechanisms
Hydrological regime changes | Temperature sensitivity
Agricultural intensification impacts | Clay stabilization role
Management recommendations | Conservation priorities



CONCLUSIONS

Multi-decadal SOC stability amid environmental change
Threatened by reduced flooding and warming
High carbon stocks warrant protection (25-38 M Mg regional)
Integrated management approach needed for climate mitigation

