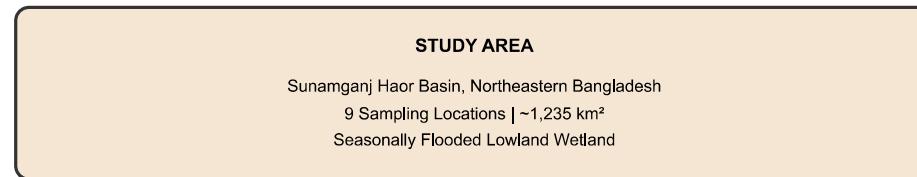


# DETAILED METHODOLOGICAL FLOWCHART

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



## 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

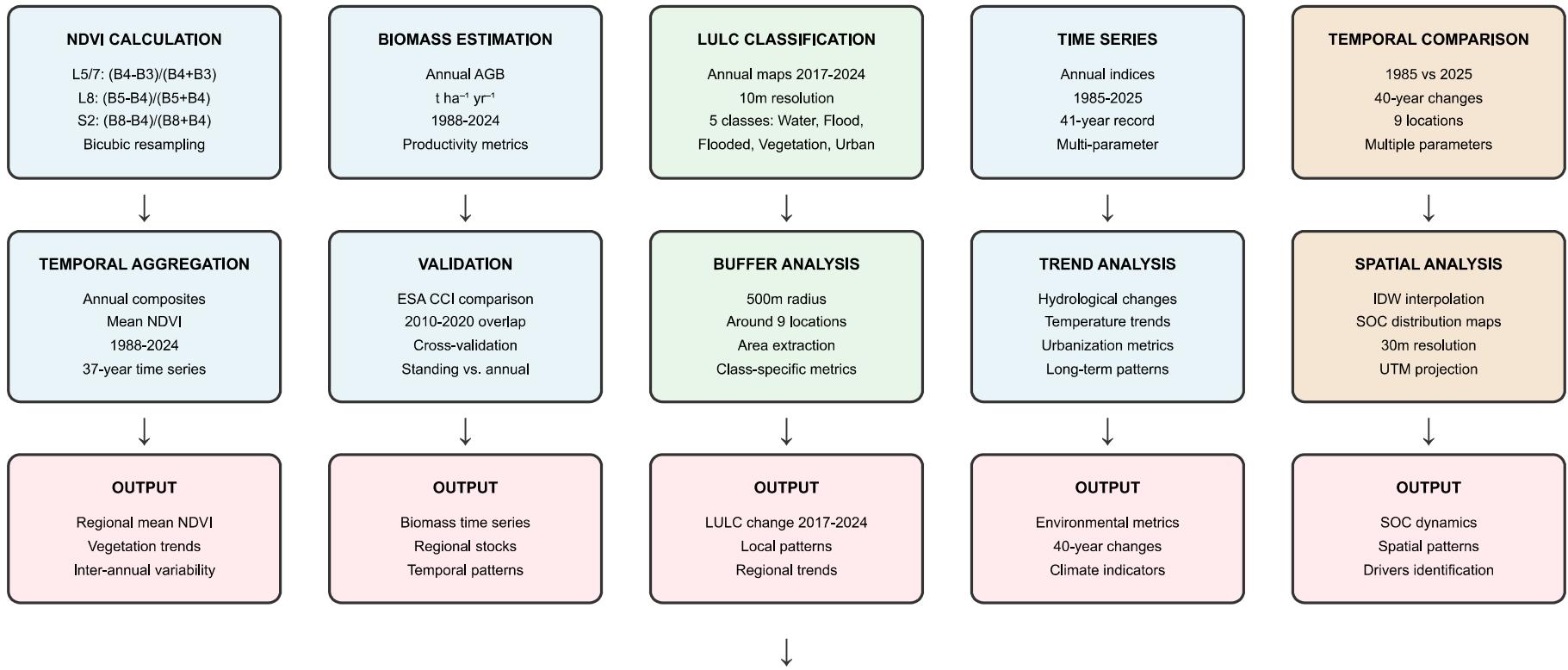
### INDEX CALCULATION

NDVI | NDWI  
BUI | LST  
Multi-spectral  
Thermal bands

### LAB ANALYSIS

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





## DATA INTEGRATION & SYNTHESIS

### MULTI-SOURCE INTEGRATION

Spatial joins by location | Temporal alignment (1985, 2025, 2017-2024)  
 Correlation analysis | LULC-SOC relationships  
 Environmental indices-SOC dynamics | Biomass-carbon linkages  
 Statistical analysis | Pattern identification

## RESULTS & INTERPRETATION

### VEGETATION DYNAMICS

NDVI trends 1988-2024  
 202% peak increase  
 Inter-annual variability  
 Agricultural intensification

### BIOMASS PATTERNS

0.28-0.55  $t \text{ ha}^{-1} \text{ yr}^{-1}$   
 Standing: 20-30 Mg  $\text{ha}^{-1}$   
 Regional: 25-38 M Mg  
 Validation confirmed

### LULC CHANGES

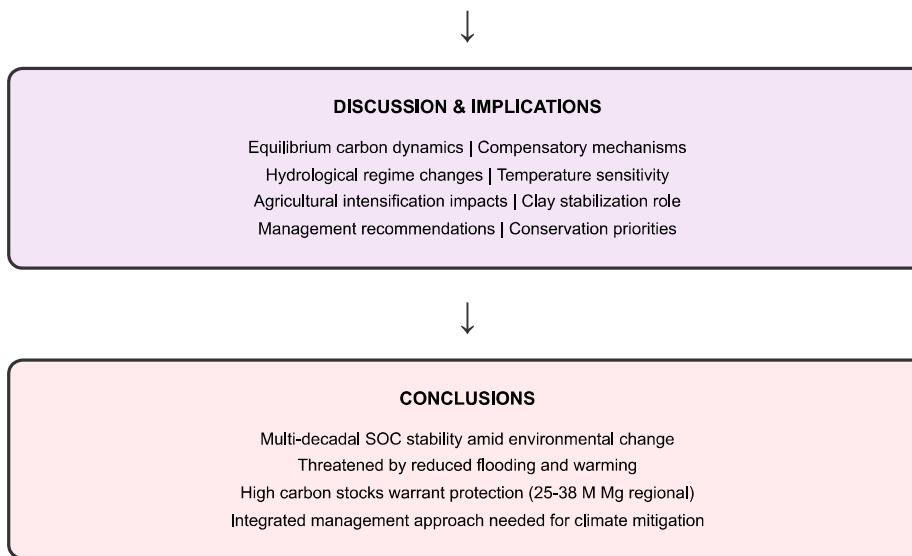
Water +8.2%  
 Flood-prone -16.3%  
 Vegetation +10.2%  
 Urban +12.5%

### SOC DYNAMICS

96-351 Mg  $\text{ha}^{-1}$   
 Apparent stability  
 Clay control ( $r=0.67$ )  
 Land use effects

### ENVIRONMENTAL TRENDS

Temperature +4°C  
 NDWI -15%  
 BUI +180%  
 Hydrological shifts



Remote Sensing Data   Field Data   LULC Analysis   Processing Steps   Integration/Synthesis   Outputs/Results