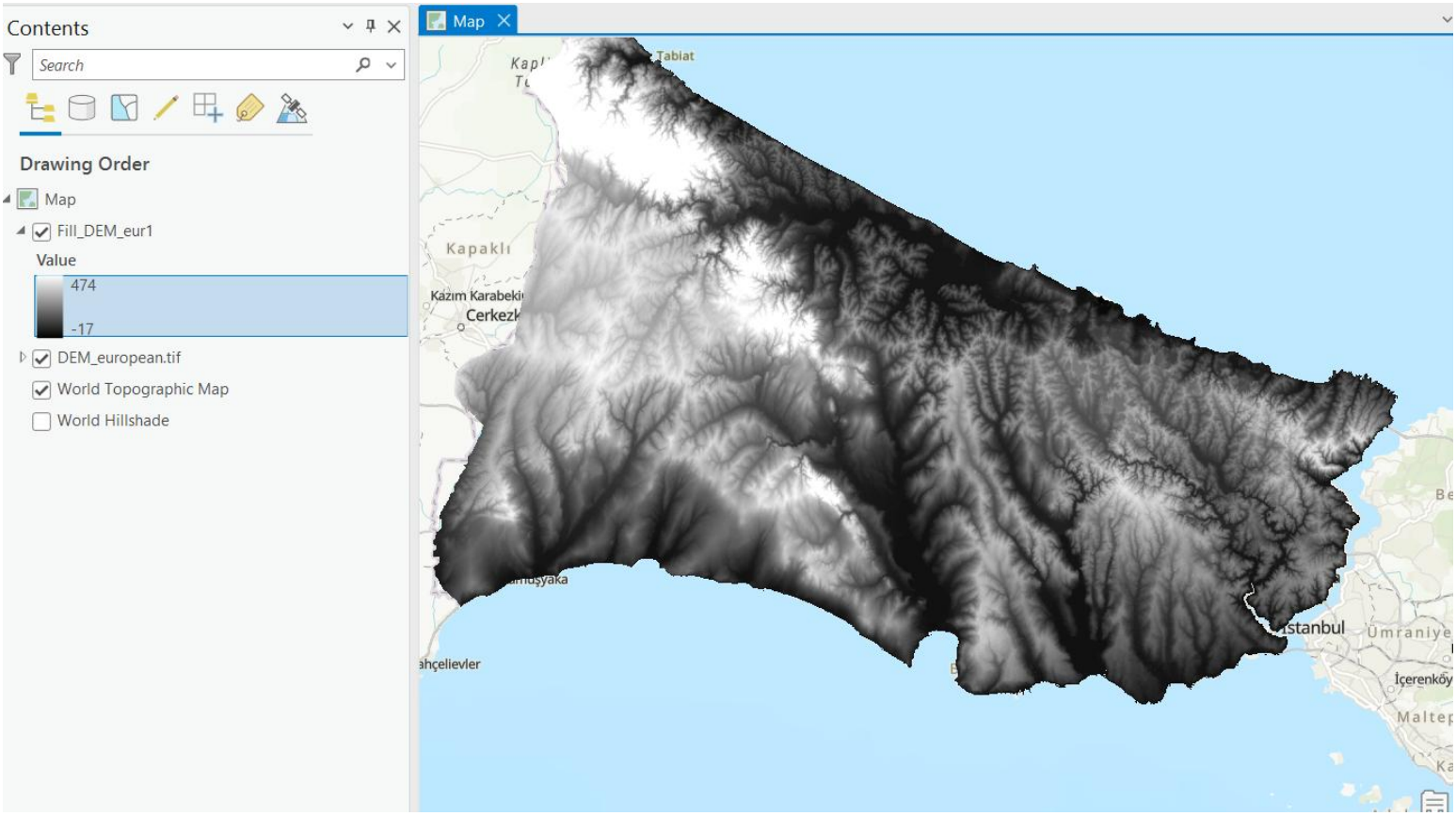
Watershed and Stream Network Analysis – Istanbul (European Side)

Aim of the Study

• To delineate watersheds and extract stream networks on the European side of Istanbul.
• To model hydrological systems using Digital Elevation Model (DEM).
• To analyze flow direction, accumulation, and stream ordering from raster data.

Input Data

• Digital Elevation Model (Raster – GeoTIFF)
• Manually created stream initiation points

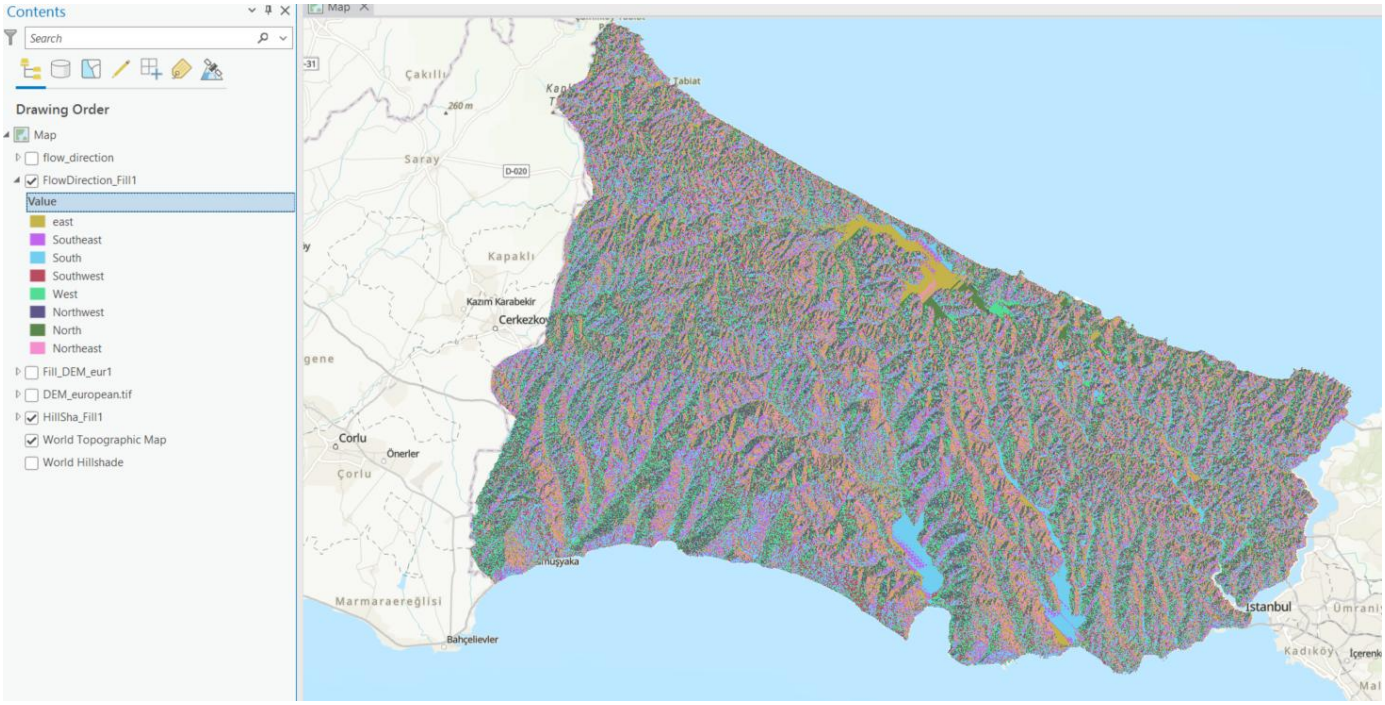


Methodology Overview

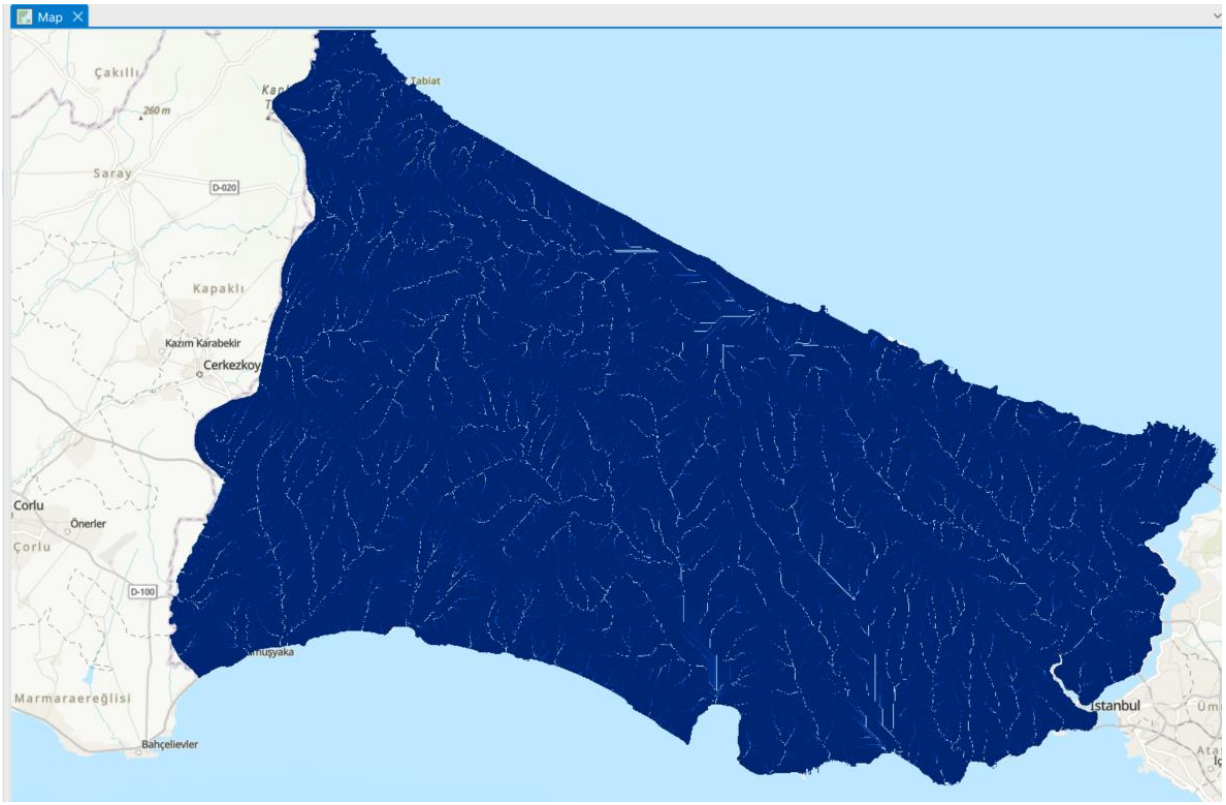
1. Fill Sinks
2. Flow Direction
3. Flow Accumulation
4. Stream Initiation Points
5. Watershed Delineation
6. Stream Network Extraction
7. Stream Ordering

Hill shade

Flow Direction

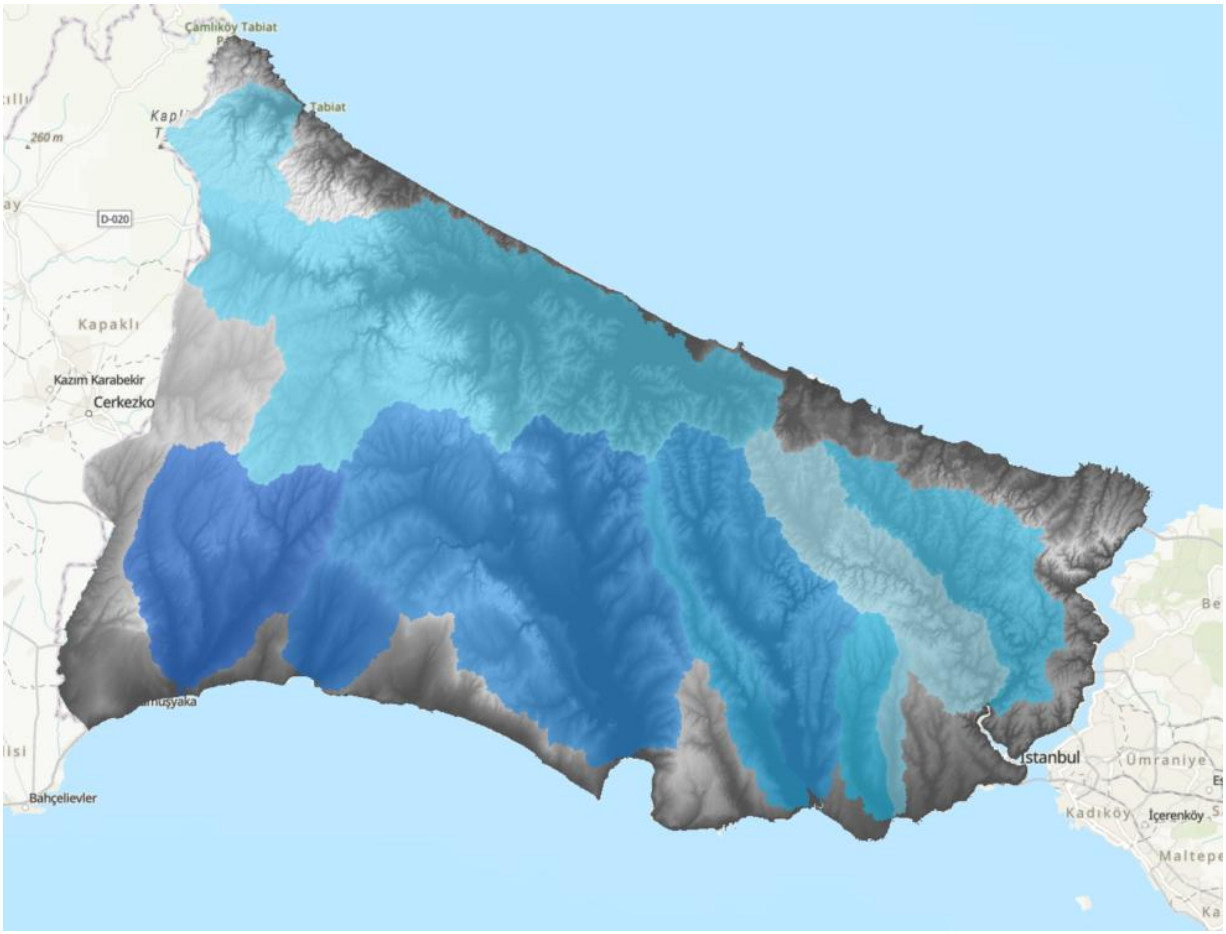


Flow Accumulation



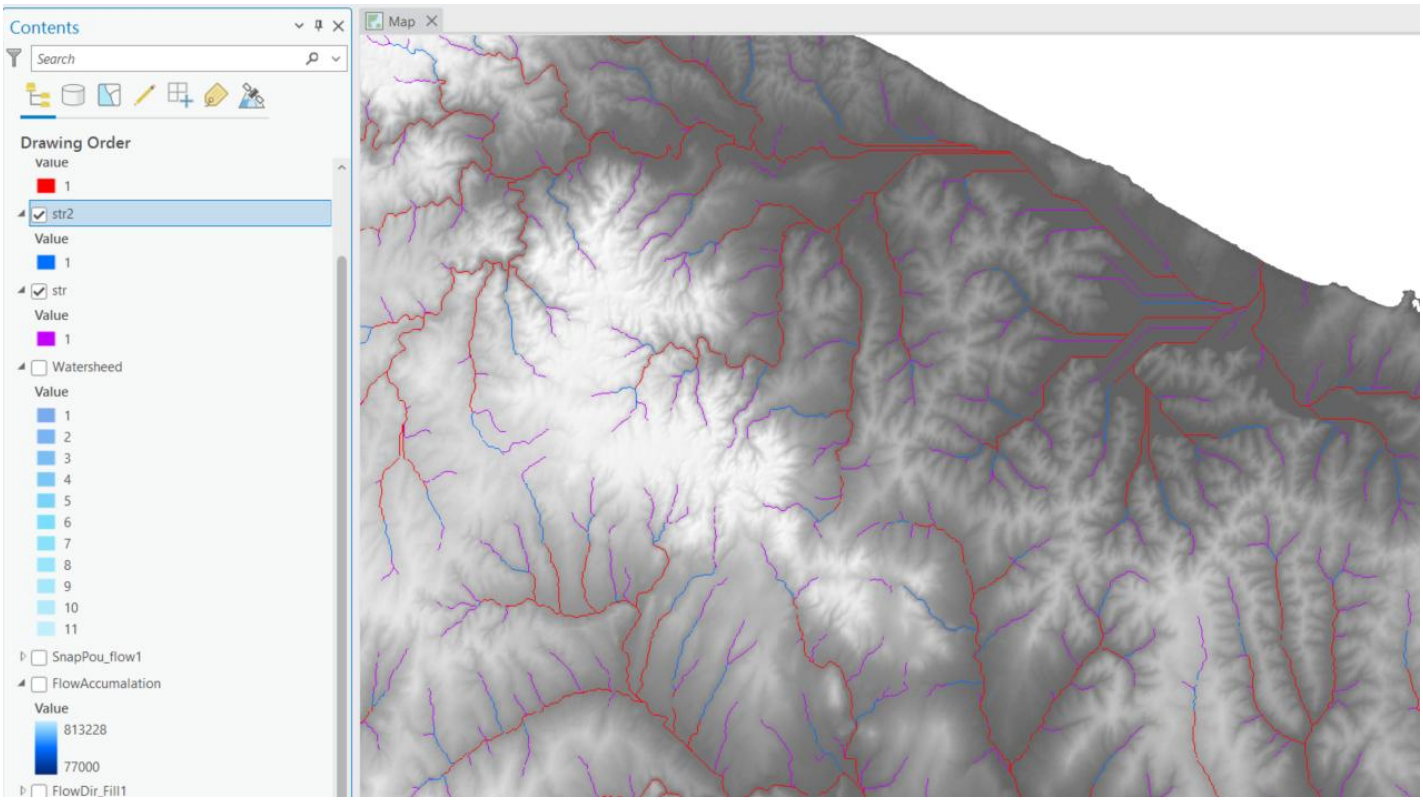
Watershed Delineation

Watersheds were created using manually placed pour points over flow accumulation rasters. The Snap Raster method was used to align input points precisely with the high flow cells, ensuring accurate delineation.



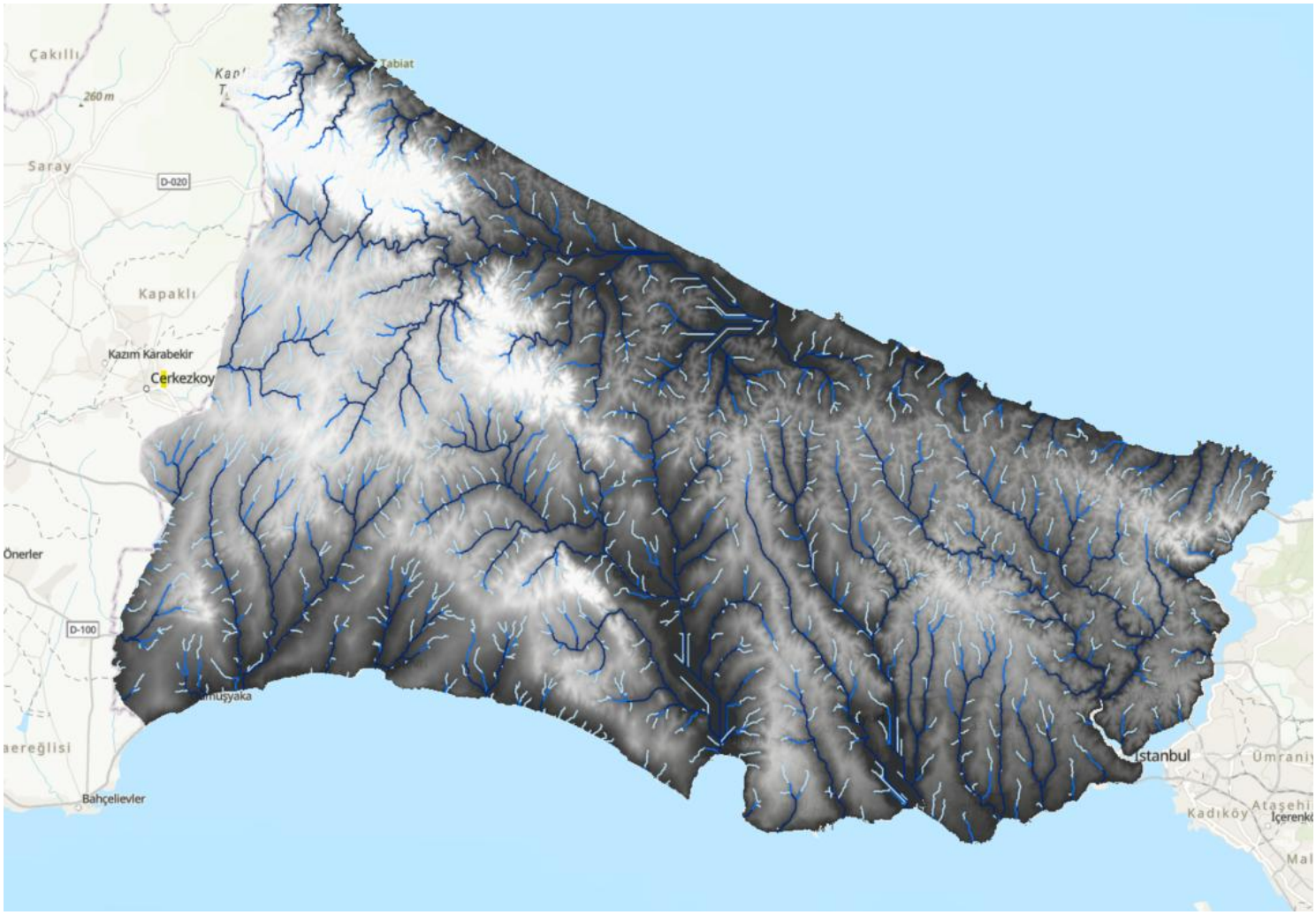
Stream Network Generation

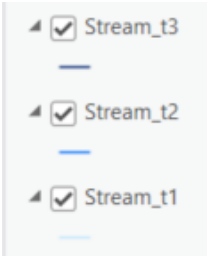
Stream networks were extracted by applying different threshold values to the flow accumulation raster. Thresholds tested include: 1000, 3140, and 6480. These values define how much accumulated flow is needed to initiate a stream.



Stream Ordering

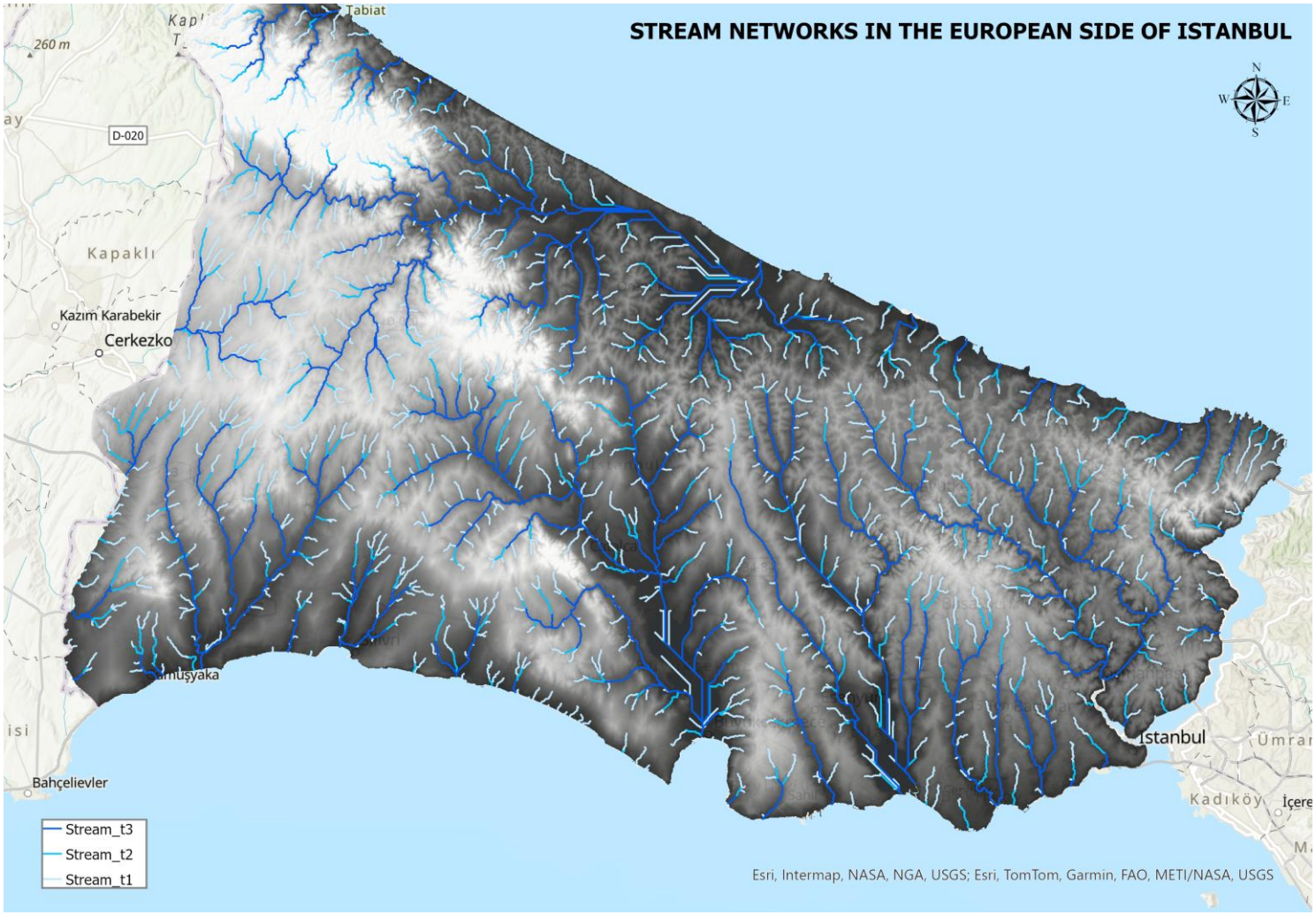
Using the generated stream network and flow direction data, stream order classifications were computed. Both Shreve and Strahler methods can be applied to understand the hierarchy of river segments. Stream orders were then converted to polylines for clearer interpretation.

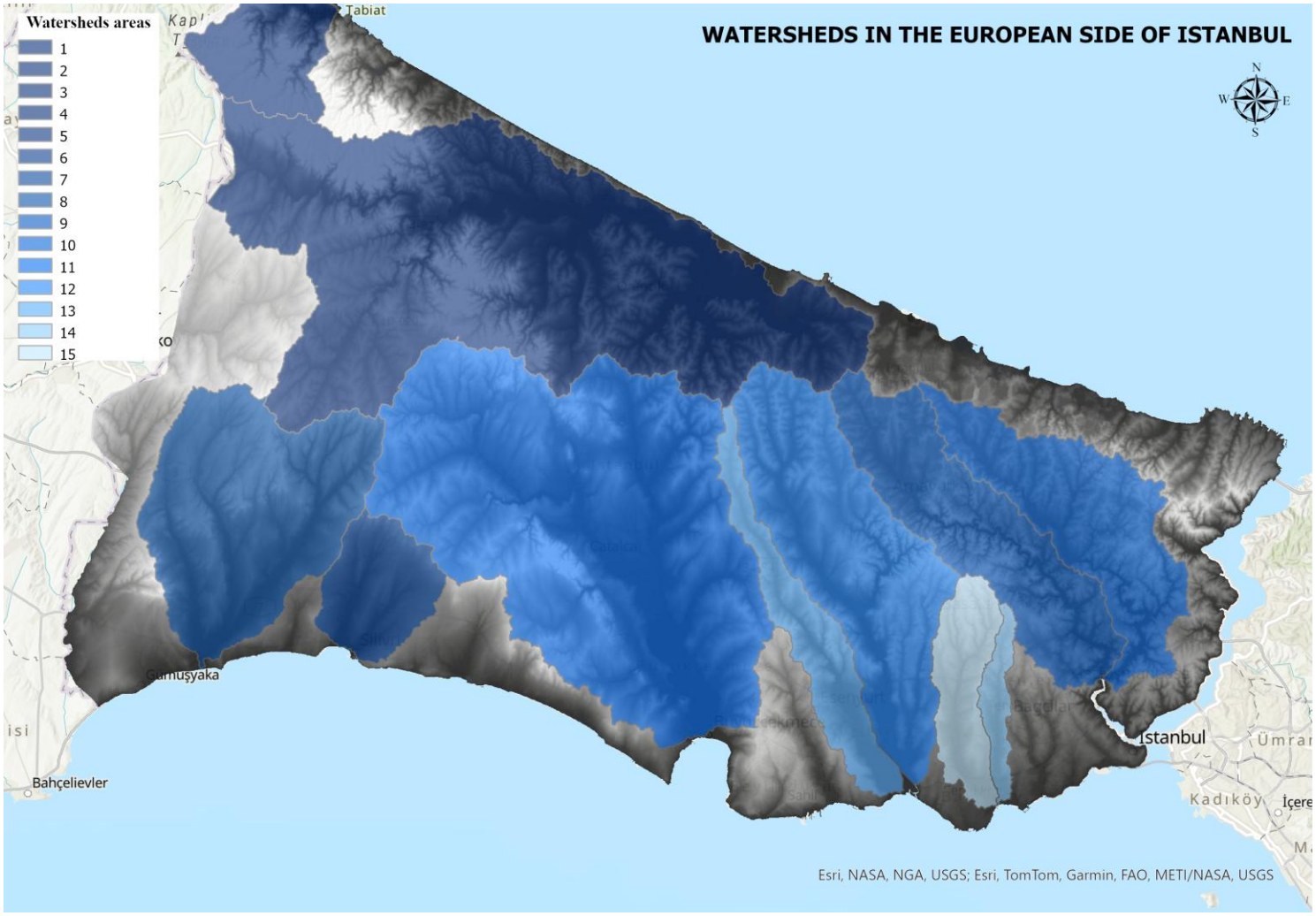




Results & Evaluation

Output Data:
• Watershed polygons
• Stream networks (Raster)
• Stream orders (Vector – Polyline)





Hydrological modeling using DEM enables accurate representation of natural drainage systems. By adjusting threshold values, both micro and macro scale hydrological features can be analyzed effectively. These techniques are vital for water management, urban planning, and environmental analysis.