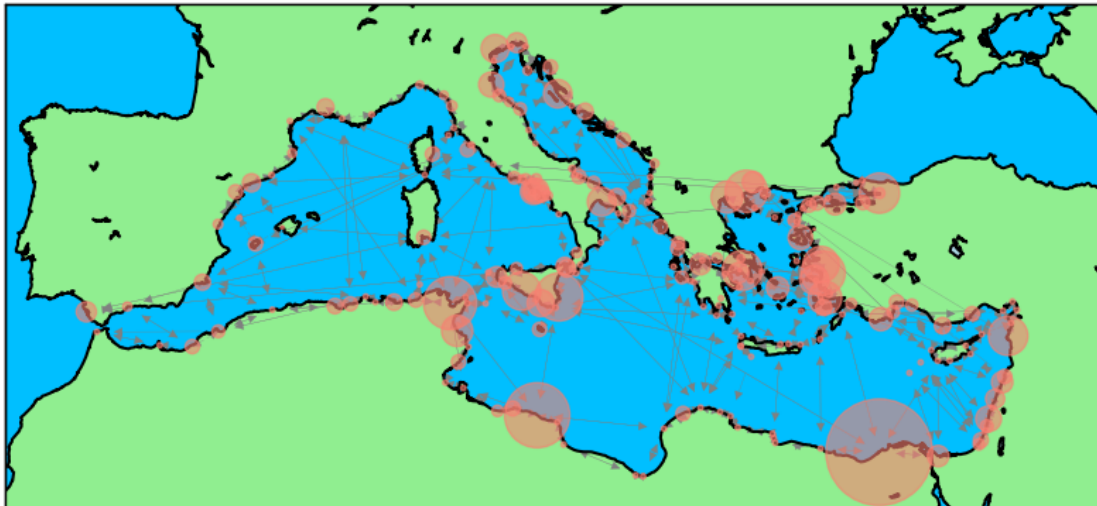


# Navigating Success: A Network Analysis of Maritime Trade and Urban Prosperity in the Roman Empire

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The urban development during the Iron Age in the Mediterranean region exhibits considerable variation in terms of population growth and economic expansion. While some cities flourished, others stagnated or declined. Identifying the determinants of urban success is complex, particularly given the stochastic nature of historical processes. However, by leveraging network analysis and economic geography, it is possible to identify key structural and resource-based factors that contributed to the differential development of these urban centers.

In this study, we employ a network-based approach to investigate the growth dynamics of Mediterranean cities during the Iron Age. Specifically, we analyze their positions within the maritime trade network, hypothesizing that connectivity and position in this network played a crucial role in facilitating urban expansion. To construct this network, we utilize data from the Orbis database [1], which provides extensive historical reconstructions of trade routes and transportation costs.



*Figure 1, representation of maritime network and cities sizes at 350 AD*

Beyond trade connectivity, we also consider the role of regional resources in shaping urban trajectories. The presence of essential resources such as metal ores and olive oil production facilities (identified through data on mines and oil presses [2]) is mapped onto the trade network, allowing us to assess their contribution to economic and demographic growth. By integrating these resource allocations with network topology, we evaluate whether cities with both strong trade linkages and resource availability experienced more significant development.

Our findings suggest that network position indeed played a substantial role in urban success, with cities occupying strategic locations exhibiting greater population expansion and economic vitality. However, our analysis also indicates that resource endowment had also an important impact: cities with access to key natural resources, especially those critical for trade and economic specialization, were more likely to sustain long-term growth. These results highlight the interplay between geographic positioning within trade networks and local economic assets, emphasizing that both factors jointly contributed to shaping the urban landscape of the Iron Age Mediterranean.

1. Scheidel, W. (2015). *ORBIS: The Stanford geospatial network model of the Roman world*.
2. Bowman, Alan, and Andrew Wilson, eds. *The Roman agricultural economy: organization, investment, and production*. OUP Oxford, 2013.