

## The urbanization process in Central Italy. A network approach.

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The period between the Final Bronze Age and the Orientalizing Age is a time of great changes and developments in the Italian Peninsula which led to the creation of regional ethnic and political groups and to the formation of the first city-states in Western Europe.

This time between the end of Pre-history and the beginning of proper history has been called by Renato Peroni as Proto-history, because at this time there is the development of all more important features of later urban societies (settlement centralization, social differentiation, craft specialization, creation of central ritual places, incipient market economy) but only at a potential or not fully developed level.

In particular in middle Tyrrhenian Italy (Latium, Etruria and Campania) it is possible to observe the formation of large Early Iron Age nucleated settlements (proto-urban centres) from the merging of numerous dispersed Final Bronze Age villages (pre-urban centres), converging on the same plateaux that later will be occupied by the cities of the Archaic Age.

This process happens almost emblematically and paradigmatically in southern Etruria, where the shift from small dispersed villages to big nucleated centres is rather abrupt and revolutionary; while is rather more gradual and slightly later in Latium vetus, where Early Iron Age proto-urban centres develop from the enlargement of smaller Acropoleis. When the intra-regional organization of these systems of settlement is considered both in Etruria and Latium is possible to observe a certain degree of hierarchy. During the Bronze Age both in Etruria and Latium vetus there seems to be a 2-3 level hierarchy with settlement larger than 6 ha likely functioning as redistribution centres and providers of central services. While in the Early Iron Age a settlement hierarchy of 4-5 tiers seem to be in place with larger proto-urban centres functioning as central. However in this respect there is a clear difference between Etruria and Latium vetus: in Etruria major settlements are generally larger than 100-200 ha; while in Latium vetus only Rome reached similar dimension and other primary order centres are generally between 20 and 25 ha and in some cases between 40 and 80 ha.

We are applying a network approach to investigate this process in both regions (1) to determine the influence of river and terrestrial routes in the development proto-urban centres, (2) to predict the importance of settlements, (3) to characterize the evolution of the communication patterns before, during, and after the urbanization process at a local as well as global level.

The considered networks have been identified in the following way [1]. Settlement directly connected by a terrestrial route or by a river have been connected in the network via a bidirectional unvalued link; in fact, for simplicity, it has been assumed that movement of goods, ideas and people would flow in both directions in an equal measure.

Our analysis takes advantage of many different methodology developed within the framework of social network analysis and network theory. We started by characterizing the nodes through centrality indexes and the topology of the networks by means of

usual measures such as network diameter, density, average clustering coefficient, and average path length [1, 2]. We have thus been able to confirm that rivers connection, at least at an intra-regional scale, were more relevant during the Bronze Age rather than in the Iron Age since in this last phase the river network seems to be unable to add anything valuable to the information provided by the terrestrial routes.

We are currently elaborating a model for the evolution of system. A proper choice of the set of parameters will hopefully allow us to reproduce different scenarios by tuning their values. A final step will be to reconnect the output of the model to our present case studies.

[1] Fulminante, F. 2012. Social Network Analysis and the emergence of central places: A case study from central Italy (Latium vetus). *BaBesch* 87: 1–27.

[2] Fulminante, F., Prignano, L. and Lozano, S. (in press). Social Network Analysis and Early Latin cities (central Italy). In Attema, P. and Seubers, J. (eds), *Urbanization and State Formation in the Italian Iron Age*, Groningen 31-01-2012/01-02-2013. Groningen: Groningen University Press.