"Measuring the Scale of a Minoan Building Project. Methodological and Interpretive Issues"

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Abstract
The presentation evaluates the manpower involved in the construction of a sample of 23 Neopalatial buildings (Crete) through an energetic approach by estimating the time (expressed in person-hours) invested in building projects. It addresses the impact of construction on the communities, the status and availability of the builders, and the perception and use of material, structural and symbolic features in Minoan architecture.

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SUMMARY

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The presentation evaluates the manpower involved in the construction of a sample of 23 Neopalatial buildings (Crete) through an energetic approach by estimating the time (expressed in person-hours) invested in building projects. It addresses the impact of construction on the communities, the status and availability of the builders, and the perception and use of material, structural and symbolic features in Minoan architecture.

The methodology is based on a corpus of standard costs that allow estimating the time necessary for a given volume of wall to be erected or a given surface of material to be laid, expressed in person-hours per m³ or m². It takes into account the different stages of the building process, i.e. the procurement of raw materials, their transport to the building site, their manufacture, and their assembling into an edifice. Standard costs are based on tests comparable to experimental archaeology, observations of workers and craftsmen using pre-mechanical techniques, specialized works intended for architects and engineers of the late 19th and early 20th centuries, and reports of national and international institutions supporting agricultural and architectural projects in developing countries. The application of the standard costs to the 23 selected buildings takes into account the properties of the materials (such as the density of the stone), the loss of material in the process of manufacture, the varying proportions of materials within the wall, and the possible reuse of building components. However, only the building shell is considered because the state of preservation of decorative elements can vary strongly, which introduces marked distortions when comparing different buildings.

The results of the application are interpreted along two main lines, considering first the way in which the energetic impact of specific materials and techniques influenced the choices and behaviors of the builders, and second whether the estimation of the manpower allows considering the nature, availability and competences of the builders involved in varying types of buildings.

The estimation of the person-hours invested into the leveling of the terrain prior to the erection of the building proper confirms the marked difference already noticed by other authors regarding edifices adapting to the local topography and edifices for which the local topography is adapted. But besides such categories, the energetic approach highlights the side-effects of such choices, including in some cases the excessive volumes of walls (and the costs generated by their construction) necessary for adapting the building to the slope, while in others it shows the pervasive character of Minoan building categories, with otherwise ‘modest’ buildings competing with high standard ones in terms of leveling costs. The appreciation of the costs generated by varying stone masonries shows the reluctance of Minoan builders to spend energy building walls in time-requiring techniques if the results are
not exhibited in prominent settings. This is especially the case for ashlar masonry, which generally composes façade walls, or internal walls of prominent rooms. This principle is only bypassed in few buildings, several of which are at Knossos, where it is suggested the lavish use of ashlar walls corresponds to symbolic display of the resources of the people sponsoring the projects. This principle is also worth for other rather elaborate and costly masonries, such as pseudo-ashlar walls, though in the case of megalithic masonry, its position in the buildings suggests it may have fulfilled structural functions. Beyond the comparison of a rather high or low cost for each type of material and technique, the energetic approach enhances the symbolic and structural properties of the materials.

Taking this statement one step further, and as it is noticed that the erection of unfired mudbrick walls generates higher costs than the construction of a wall of identical dimensions in rubble stones, one may wonder whether the use of mudbricks was not partly encouraged by the properties of this material. It is generally stressed that mudbricks were common on many sites due to the large availability of raw material, earth. However, it is not excluded that other, less constrained criteria were also at play. Indeed, rubble stones are widely available as well, and the physical properties of unfired mudbricks regarding the transfer of heat and humidity may have proved a valued quality encouraging the builders to make use of such material.

The size of the blocks incorporated into the masonry has also been considered along the lines of the energetic approach, the question being: are the dimensions of the blocks recurring enough, especially in regard with a transportation limit of about 2100 kg if one considers a cart pulled by only one animal on a reasonable slope? Interestingly, the dimensions of the blocks are not proven to respect this limit: blocks exceeding this weight are generally found in the same building, together with lighter ones, suggesting the energetic impact of transport was not a key parameter for Minoan builders. Nevertheless, larger blocks tend to be placed in façades, most probably for symbolic rather than structural reasons.

Regarding the nature and availability of the builders, the workforce necessary to fulfill a building project (considering the total number of person-hours necessary for the completion of the project, a 90-days-long project and 8-hours-long working days) was compared to the workforce potentially provided by the inhabitants (considering a minimum surface per individual and the active involvement of 20 to 33% of the population in the construction project). Despite methodological difficulties regarding the parameters set, and the need to consider the total costs along the lines of the construction sequence, this comparison highlights a series of buildings for which necessary and available workforces are colluding, while in few other cases workforce was to be found outside the social unit inhabiting the building. This stresses the way in which access to resources allow calling for extra manpower, whether it is skilled or not. And indeed, an intermediate category of buildings show how excess in Minoan Neopalatial architecture is expressed both ways, either by calling for craft-specialists or by mobilizing large crews for executing dull heavy work. But in any case, the numbers estimated are incredibly low. Even the construction of the palace at Gournia must not have required a huge number of workers, as 40 individuals would have been enough to erect the initial phase of this building in 3 months, and only slightly more, 49, for executing the ashlar modifications of the second phase along similar terms. This proves that even monumental building projects had quite a reduced impact on Minoan communities.
Devolder 2013, graph 15. Total construction costs of the buildings.

Devolder 2013, graph 16. Proportion of the costs of the different building materials and construction tasks.