Chapter 13
The Advantages of Using Laser Scanners in Surveying in Protected Sites: A Case Study in Historical Peninsula in Istanbul

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ABSTRACT
Since the 2000s, terrestrial laser scanning, as one of the methods used to document historical edifices in protected areas, has taken on greater importance because it mitigates the difficulties associated with working on large areas and saves time while also making it possible to better understand all the particularities of the area. Through this technology, comprehensive point data (point clouds) about the surface of an object can be generated in a highly accurate three-dimensional manner. Furthermore, with the proper software this three-dimensional point cloud data can be transformed into three-dimensional rendering/mapping/modeling and quantitative orthophotographs. In this chapter, the study will present the results of terrestrial laser scanning and surveying which was used to obtain three-dimensional point clouds through three-dimensional survey measurements and scans of silhouettes of streets in Fatih in Historic Peninsula in Istanbul, which were then transposed into survey images and drawings. The study will also cite examples of the facade mapping using terrestrial laser scanning data in Istanbul Historic Peninsula Project.

INTRODUCTION
Even if modern scientific methods are used for documenting and taking inventory of regions and locales in areas that have been registered as protected sites by Directorates of the Preservation of Cultural and Natural Heritage, obtaining data about the entirety of those areas is a long, arduous process. It is now possible to generate highly precise three-dimensional digital documentation which is accurate down to the millimeter, and this
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has brought a whole new dimension to survey projects and restoration work.

BACKGROUND

Although surveys using conventional instruments, topographic and photographic surveys have been used as accurate methods for documentation in protected sites in latest years in our country, the latest technology in improving three dimensional surveying in historical areas can be called as laser scanning technology. It facilitates having all information about the object or the whole area with 3 dimension by using point cloud system. Terrestrial Laser Scanners (TLS) produces 3-dimensional (3D) point clouds which also offers continuous monitoring opportunities. Terrestrial Laser Scanning method is very efficient data collecting tool depending on non-invasive surveying techniques. The gathered information can easily be integrated with high resolution digital images and inserted into the CAD programmes. TLSs are preferred systems in producing knowledge about the measures of deformation such an object or in documenting of cultural heritage or in renewing urban planning of historical sites.

USING 3D LASER SCAN TECHNOLOGY IN SURVEYING

Values of the Historical Peninsula in Istanbul

For nearly 8,000 years Istanbul’s Historic Peninsula has been home to numerous civilizations, and with its numerous mosques, churches, tombs, madrasas (theological schools for muslims), bathhouses, and Ottoman commercial buildings, the peninsula is a unique place in a world where cultures have accumulated in layers. Since 1985 four protected sites on the Historic Peninsula of Istanbul have been included on the World Heritage List, as they were recognized by UNESCO and Turkey adheres to the Convention Concerning the Protection of the World Cultural and Natural Heritage. These sites are the Sultan Ahmet Archaeological Park, Süleymaniye Mosque and its associated conservation area, Zeyrek Mosque (Pantocrator Church) and its conservation area, and the Land Walls of Istanbul.

Requirements of Surveying

Located in the Historic Peninsula, the neighborhoods in the regions of Süleymaniye, Zeyrek and Cankurtaran, along with their traditional Turkish houses and streets that have preserved their organic forms, still reflect aspects of urban life that were typical in the Ottoman era. These neighborhoods developed in such a way that civil and social needs were met through a central mosque and its attendant burial ground, hospices (soup kitchens), markets, primary schools, madrasas, hospitals and libraries, and in this way the neighborhoods took on their particular forms. However, intensive construction brought about rapid urbanization in the last century, together with large infrastructural works in the region and transportation projects, have had a negative impact on the world heritage sites in the Historic Peninsula and the unique silhouette of the buffer zone. In light of this situation, the government has attempted to take some preventative legal measures and efforts have been made to create properly implemented models of protection. In response to the new laws that were passed, in 2006 the Directorate of Environmental Protection of the metropolitan municipality set about drafting plans for protected sites on the Historic Peninsula and urban design projects. As a result, it came to light that work needed to be carried out to document the existing architectural and natural fabric of the Historic Peninsula if such an urban design project was to be carried out.
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