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Reviving burial in tunnels

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Abstract

Every year the tunneling business is expanding and collaboration with the International Society of City and Regional Planners (ISOCARP) for the future design of cities and urban communities is in the making. During the last half of this century, billions of people migrated to cities, and it is estimated that by 2030 almost five billion people worldwide will reside in urban communities. Hence, "Underground development will be an important tool in reshaping our urban areas to meet the challenges of the future without destroying their heritage or worsening their surface environment" (Esaki, 2005). In 2013, the Organization for Economic Co-operation and Development (OECD) estimated life expectancy to be around 80 years, meaning that in less than a decade we will need to bury billions of people in cities and urban communities, while trying to retain the deceased's beliefs and customs.

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1. Introduction

Religion plays a major role in our lives, and many people worldwide still decline to cremate their body after their death; therefore, cemeteries are essential for city inhabitants. Rites and traditions usually call for burials to be near the place of residence, which allows the remaining family members and friends to visit the grave frequently, at least in the first years. This is a challenge that urban designers and architects must confront while trying to solve the problems of future urbanization.

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In recent years, population growth, the rising cost of land and the extensive preservation of green areas have made cemeteries a burden and a nuisance, particularly for large cities and communities. Many graveyards that were once on the city's outskirts have become lifeless islands in populated areas (Fig. 1), rarely visited by the second and later generations. Cities worldwide face the challenge of allocating less land to maintain current burial practices. In response, some cities have begun to bury their dead at a great distance from the community; others have started to stacked burials, one on top of the other, while still others are constructing buildings and even skyscrapers for the practice of burial (Fig. 2).

Another common practice in some places is to ask the living relatives of the deceased to pay a property tax for the grave after a few years, in order to avoid the grave being destroyed and the land reused. However, many find this solution disrespectful.

Fig. 1. "Lifeless Island" cemetery, Paris, France.

Fig.2. Tower cemetery, Santos, Brazil.

These factors, therefore, present both an opportunity and an inherent challenge. The opportunity lies in better use of environmental resources and existing technology to solve a universal and recurrent need. In addition, the main challenge is how to address this need while respecting sensitive religious, social and cultural practices.

The innovative solution we propose and have already implemented is the use of underground burial. This concept raises many architectural and technical issues, as well as religious questions. On the technical side, there is the need to allocate an appropriate site using a suitable geological survey; next, appropriate excavation methods must be chosen; and then all other aspects can be addressed, such as; architecture, ventilation, fire safety, accessibility, waterproofing and finishing materials. The social and religious aspects are no less critical as any technical solution is unlikely to be adopted unless it is perceived as legitimate and respectful. To better understand the latter, we