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## Good practices in cultural heritage management and the use of subsurface knowledge in urban areas

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### Abstract

City growth threatens sustainable development of cities. Over the past decades increased urbanization has created more pressure - not only on the suburban outskirts - but also in the inner core of the cities, putting important environmental issues such as water management and cultural heritage under stress. Cultural heritage, either standing monuments or archaeological remains, is internationally recognized as an important legacy of our history. The European Convention on the Protection of the Archaeological Heritage incorporates concepts and ideas that have become accepted practice in Europe. Conservation and enhancement of archaeological heritage is one of the goals of urban planning policies. One of the key objectives of the European policy is to protect, preferably in-situ, archaeological remains buried in the soil or seabed and to incorporate archaeological heritage into spatial planning policies. Conflicts with prior uses and unappreciated impacts on other subsurface resources, amongst them archaeological heritage, make use of underground space in cities suboptimal. In terms of ecosystem services, the subsurface environment acts either as a carrier of archaeological heritage in situ (stewardship) or supports above-ground cultural heritage. Often, it's not enough to protect the heritage site or monument itself: new developments outside a specific protected area can lead to changes in groundwater level, and cause serious damage to heritage buildings and archaeological deposits. This paper presents good practices in cultural heritage management and the use of subsurface knowledge in urban areas.

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## 1. Introduction

City growth threatens sustainable development - a pattern of growth in which resource use aims to meet human needs while preserving the environment for present and future generations [6] - of cities. Over the past decades increased urbanization has created more pressure - not only on the suburban outskirts - but also in the inner core of the cities, putting important environmental issues, such as water management and cultural heritage, under stress.

Historic cities face the challenge of new developments. This (re)development is typically part of a planned renewal, but at the same time directs attention to how historic buildings and archaeological deposits in the inner city should be managed [9]. In contrast to the attention given to the visible (above-surface) expressions of cities, there is a marked lack of appreciation of the subsurface among those who plan, develop and manage cities [13]. The subsurface contains a legacy of former developments (Fig. 1), that should be acknowledged in modern urban development. This lack of appreciation of the subsurface is manifested in a lack of coordinated policy on the subsurface. Consequently, the area beneath the cities is used inefficiently at best and unsustainably at worst; safeguarding of subsurface ecosystem services, such as “stewardship” for archaeological heritage, lacks robustness and conflicting uses of the subsurface are largely unaddressed. Conflicts with prior uses and unappreciated impacts on other subsurface resources, amongst them archaeological heritage, make use of underground space in cities suboptimal. In terms of ecosystem services, the subsurface environment acts either as a carrier of archaeological heritage *in situ* (stewardship) or supports above-ground cultural heritage. Often, it’s not enough to protect the heritage site or monument itself: new developments outside a specific protected area can lead to changes in groundwater level, and cause serious damage to heritage buildings and archaeological deposits [2].

This paper provides examples of good practice related to the protection and preservation of 1) standing monuments and sites, and 2) archaeological heritage and artefacts *in-situ*, in a dynamic city environment. The main objective of this paper is to enhance awareness of cultural heritage as a driver for urban subsurface knowledge development and related sustainable urban water management.

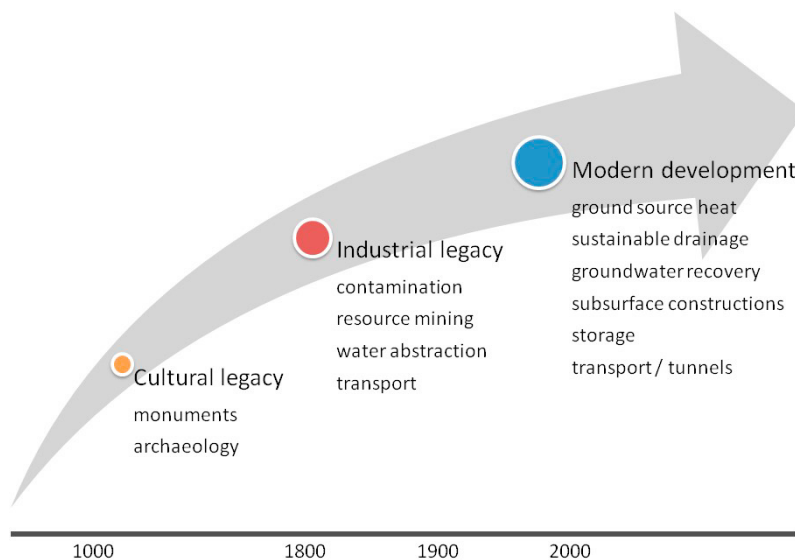


Fig. 1 Urban development legacies

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