



Managing urban soil sealing in Munich and Leipzig (Germany)—From a wicked problem to clumsy solutions



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ABSTRACT

Cities can be characterized by extensive sealing limiting the supply of ecosystem services. In Europe, soil sealing is still increasing despite decreasing population. This paper shows that the management of urban soil sealing must—due to its complex driving forces, impacts, constraints of its management and different actors—be considered as a wicked problem. By using the method of response–efficiency–assessment (REA), the strategies “legal-planning”, “informal-planning”, “economic-fiscal”, “co-operative” and “informational” are assessed in their degree of efficiency as being ecologically sustainable, economically functional, institutionally accepted, supporting environmental competence and living quality. Responses were assessed by indicators using a content analysis and survey of urban actors and residents in Leipzig and Munich (Germany). Main results of the study show that no single strategy can provide an efficient solution for reducing soil sealing but rather a mix of clumsy solutions are necessary promoting: (1) stricter regulations and an increase in ecological–financial incentives, (2) stronger commitment by urban actors toward sealing reduction supported by informal-planning responses and scientific know-how, (3) information addressed to urban residents supporting self-reflection on impacts of private land consumption and (4) improved horizontal and regional co-operations taking into account cities’ responsibility for urban and global sustainability. This study provides a valuable approach on how to puzzle together clumsy solutions on the example of soil sealing management as a challenge in an urbanized world. This method can also be used for other current wicked problems like climate change.

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Introduction

Soil is the basis of everyday life. Soil is a crucial natural resource; it offers environmental, social and economic functions and is largely non-renewable. Our economic and social development depends on soil as a physical resource, and we build residential, commercial, industrial, transport and recreational areas on it (Blum, 2005). Moreover, there is the need to protect important functions of the soil, which according to the Thematic Strategy for Soil Protection (COM(2006) 231) by the European Commission (EC) are responsible for: biomass production; storing, filtering and transforming nutrients, substances and water; the biodiversity pool; physical and cultural environment for humans and human activities; a source of raw materials; the carbon pool; and an archive of geological and archeological heritage.

Soils and their functions across the European Union (EU) are under threat. In particular, soil sealing has been recognized as one main threat jeopardizing the sustainable use of soils (EEA, 2010,

2012). Soil sealing is defined as the permanent covering of land by completely or partly impermeable artificial material (e.g., asphalt, concrete or pavers) (Prokop et al., 2011). Soil sealing is closely related to land take or land consumption, which is understood as the development of open areas (such as agricultural land and forests) into built-up areas (e.g. settlement and transport areas) (EC, 2012). Current studies on its development show that soil sealing needs intervention; in the EU, an 8.8% increase in artificial surfaces can be observed between 1990 and 2006. In 2006, about 2.3% of the European territory was sealed. These trends must be viewed with a critical eye since the increase in sealing continues despite the shrinking of the European population. The highest sealing averages—exceeding 5% of the national area—are in Malta, the Netherlands, Belgium, Germany and Luxembourg. More high-sealing rates can be found in all major urban agglomerations and most of the Mediterranean regions (Prokop et al., 2011). In general, the increase in urban and semi-urban areas is a major problem for the loss of soils (Blum, 2005). To raise awareness and support member states stop further sealing and land take, the European Commission (EC) published guidelines on preventing, mitigating and compensating for soil sealing, presenting best practices of different European member states (EC, 2012).

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The management of urban soil sealing—urban soil includes land and substrate—is a complex issue, and a more detailed and systematic discussion of such best practice examples is necessary if an efficient soil sealing management approach is to be achieved (Artmann, 2013a). In general, complex behavior traces back to the “(...) inter-connectivity of elements within a system, and between a system and its environment” (Mitleton-Kelly, 2004, p. 293). The management of urban soil sealing can be regarded as a complex system. Important and interwoven system elements which need to be considered for an efficient soil-sealing-management approach are spatial system elements, systemic responses, actor-specific system elements, systemic framework conditions and systemic impacts (Artmann, 2013a,b). Because of this range of interconnected constraints, driving forces and actors, managing urban soil sealing can be assumed to be a wicked problem.

The concept of wicked problems was first introduced by Rittel and Webber (1973) who argued that problems of social policy cannot be analyzed and solved by common, scientifically linear, analytical methods because they are hard to define and comprise underlying complex and changing requirements. In the field of environmental management, wicked problems are discussed in current research, in particular, focusing on forest management (Chapin et al., 2008; Shindler and Cramer, 1999; Wang, 2002) and water management (Freeman, 2000; Lach et al., 2005), while policy responses to global climate change are called “super wicked problems” (Lazarus, 2009; Levin et al., 2012). Although the management of urban environments was said to be a wicked problem (Gaston, 2010), recent research dealing with solving urban wicked problems focuses on questions like housing or transport (Balducci, 2004; Harrison, 2000) or health issues (Caron and Serrell, 2009) rather than how to tackle complex urban environmental problems. In general, it is assumed that solving wicked problems needs “clumsy solutions” which combine different viewpoints and solutions in a flexible and creative way (Shapiro, 1988; Verweij et al., 2006).

This paper aims to fill the gap by focusing on the management of urban soil sealing as a wicked sub-problem of the field urban environmental management (Artmann, 2013a). First, the paper will investigate to which extent the management of urban soil sealing is a wicked problem, taking into account current research findings on this topic. Second, based on these findings, the method of response-efficiency-assessment (REA) (Artmann, 2013a) is introduced and will be tested on its potential to formulate clumsy solutions toward an efficient soil sealing management approach by conducting a case study in Leipzig and Munich, Germany. After presenting results of the case study, clumsy solutions for managing urban soil sealing are derived and discussed. At the end, main conclusions are summarized.

Managing urban soil sealing as wicked problem

To prove that a problem is not only complicated but also complex, and hence, a wicked problem, Rittel and Webber (1973) developed 10 criteria. Those have been merged by Conklin (2006) into six criteria which are also used in this study for simplicity in proving that the management of urban soil sealing can be regarded as a wicked problem. Based on the findings, conceptual demands for a method proving the efficiency of responses coping with wicked problems are derived.

You do not understand the problem until you have developed a solution

Wicked problems have many facets, making it difficult to define “the problem” (Conklin, 2006). This criterion frames the basis of the evolution of wicked problems (Tatham and Houghton, 2011).

According to Rittel and Webber (1973), it is necessary first to understand the context of the problem and gather information focusing on developing a solution concept. In framing the problems, it is also crucial to note that different kinds of stakeholders share different views on the problem, including wicked environmental problems (Stewart et al., 2011).

In the context of managing urban soil sealing, the problem-framing needs to take into account what has to be steered to define sub-targets and create a better overview of the problem (Artmann, 2013a). In studying soil sealing development, a multi-scale approach showed that a holistic soil sealing management approach includes several sub-targets which focus not only on the management of urban gray (such as built-up areas and paved surfaces around buildings), but also of the urban green as its antagonist (like forest, agricultural and recreational areas). Urban green and gray can be steered in a quantitative (protecting and development of green areas and reducing of land take and new sealing) and qualitative manner by incorporating space-efficient buildings and infill development as well as by focusing on green networks and protecting ecologically valuable green areas. Furthermore, a holistic soil sealing management approach includes compensation measures for existing sealed areas and their negative environmental impacts by unsealing unused or underused areas and greening roofs and walls. The protection of soil forms the basis of a holistic soil sealing management approach (Artmann, 2013b).

Besides analyzing what has to be steered, the questions of “who is steering” must be considered to take into account different views on soil sealing management. Using the example of Germany, the state is responsible for enacting the Federal Soil Protection Act, which has to be shaped by the federal states. The counties then need to specify the law or targets set by the states and function as a link between the states and the municipalities. These scales can be summarized for further analyses at the macroscale. The mesoscale includes authorities of the municipalities responsible for steering the sub-targets of a holistic soil sealing management approach. At the microscale, practitioners responsible for built-up development and design such as investors or landscape architects should be considered. Moreover, residents are important actors in soil sealing management. They influence sealing, for instance, by paving their gardens or in their choice of how (high or less densely built-up area) and where to live (urban fringe or urban core) (Artmann, 2013a).

In summary, in regard to this criterion, steering urban soil sealing can be considered a wicked problem since the management of soil sealing includes a large range of spatial sub-targets as well as actors. Hence, a method for evaluating responses of wicked problems needs first to conduct a detailed problem analysis investigating what needs to be managed and who is involved.

Wicked problems have no stopping rule

Because no unique and single definition of the problem can be formulated, there exists no ultimate solution for wicked problems. “The problem solving process ends when you run out of resources, such as time, money, or energy, not when some optimal or ‘final and correct’ solution emerges” (Conklin, 2006, p. 14). There is also no stopping rule because within an open systems framework, conditions can always change and are confronted with a range of driving and constraining system elements (Stewart et al., 2011).

For instance, the spatial development of urban soil sealing management is confronted with changing driving forces, which are coupled in particular with the process of urbanization. Antrop (2004) summarizes a range of studies on the cycle of urbanization and its impact on landscape change. These phases are described by (1) urbanization (increasing number of people moving to urban centers), (2) suburbanization (more people moving to the urban fringe, population numbers in the center decline),

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