ICUD-0360 Urban water research in an urban living lab setting – How does it work?

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Summary
To address the complex challenges that cities are facing, e.g. increasing demands on sustainability and liveability, different forms of urban governance, e.g. Urban Living Labs (ULL) are emerging. The purpose of this paper is to describe some key learning points from an ULL research setting, since there is little guidance on how ULL research is done in practice. Key learning points include that an ULL setting can be well suited for addressing complex societal challenges; that since the research is conducted based on user needs, the research has to be open for learning and exploration in any direction; and that the need for adequate communication within an ULL should not be underestimated.

Keywords
urban living lab, stormwater, management, planning

Introduction
In response to the multi-dimensional challenges facing cities, e.g. increasing demands on sustainability and liveability, different forms of urban governance including Urban Living Labs (ULL) are being developed and tested. An ULL is a forum for innovation that integrates users, other stakeholders, and expertise from several academic disciplines, to co-create, test and evaluate new goods, services, processes, and creative solutions in real time and real context (JPI 2012). The Living Lab (LL) concept has previously been used mainly when developing services in the IT sector (Ståhlbröst & Holst 2013). Yet, the LL concept is emerging also in other research settings, where cooperation among actors from different disciplines, and adoption of innovative solutions, is needed and encouraged (Voytenko \textit{et al.} 2016). Still, there is little guidance on how research in ULL settings is conducted in practice. Accordingly, the purpose of this paper is to describe some key learning points from an ULL research setting.

Methods and Materials
The Green/Blue Cities project was conducted in an ULL setting in Kiruna, Sweden, where practitioners and a cross-disciplinary international team of researchers joined forces to develop innovative solutions. An action research approach was followed (Robson 2011) as researchers together with municipal officers collaborated in finding solutions to challenges identified by the municipality.

Results and Discussion
Kiruna faces significant challenges due to the necessity to re-locate the city centre because of mining activities. Simultaneously, this creates great opportunities, as a completely new urban water management concept has to be developed and implemented. Accordingly, the aim of Green/Blue cities was to develop knowledge and tools to, e.g. increase the utilization of green infrastructure for
6.7 Collaboration amongst stakeholders

stormwater management, in addition to traditional piped networks, in New Kiruna. Green/Blue Cities was conducted in an ULL setting. An ULL is based on **users and other stakeholders being co-creators** in the innovation process; **is located where the process takes place**; brings together **expertise from several academic disciplines**; involves **partners from outside of academia**; and is by design **open for learning and exploration** in any direction (JPI 2012). Co-creation in an ULL has to be based on good relationships among the participants. Several in-depth workshops were held in Kiruna with participation from all research disciplines and officials from several municipal units, to create a common understanding, knowledge transfer, provide feedback, and development according to Kiruna’s needs. Regular communication between the parties occurred via face-to-face meetings. To keep the work effort of the practitioners at an acceptable level, these were complemented with a large number of telephone calls/meetings and e-mail. During these workshops and meetings, the municipality expressed innovation needs. Based on those needs, the researchers developed a rough draft or solution, which was presented to the municipality, and thereafter altered based on their views. For instance, Kiruna expressed the need for a water mirror in the new city centre, since the old city centre is located next to a lake, whereas there is no natural lake close to New Kiruna. Although this work/delivery was not included in the original project plan, researchers performed a thorough multidimensional landscape system analysis. A lot of the information needed for the analyses was provided by the municipality.

![Fig. 1. Suitable green infrastructure for New Kiruna under different rain events (Bacchin et al. 2017)](image)

The results showed that, because of too little surface water from the surroundings, a water mirror would not be feasible. This was communicated and presented in face-to-face meetings with municipal officials, and a report (van Timmeren et al. 2014). Yet, researchers conducted additional, extensive analyses and hydrological modelling, which led to the suggestion of alternative green infrastructure solutions that would function, see Fig. 1. These results served as the basis for the green street design that the municipality included in the development plan for New Kiruna. The above process is summarized in Fig. 2.
Fig. 2. The Research and Innovation Process in an Urban Living Lab

Conclusions
The ULL research setting was well suited for the complex challenges addressed in Green/Blue Cities. Yet, the need for adequate communication in an ULL must not be underestimated. Communication is a challenge within any organisation, but especially in a research setting with a cross-disciplinary team of researchers and municipal officials from several different departments, who do not share the same terminology, and are located in different countries. Also, it took a lot of communication to sort out differences in expectations, e.g. that it takes rather long time to produce research results compared to consultant work. Even so, working in an ULL setting can be really rewarding, both for users and researchers. In this case, Kiruna City received research results based on their expressed needs, which could be directly implemented in, e.g. the development plans for New Kiruna, and the researchers got other research outputs as well, e.g. publications.

Acknowledgement
Thanks to JPI UrbanEurope, ALICE, VINNOVA, Formas, FFG, NWO, Kiruna City & TVAB.

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