

Prise en compte du changement climatique par les chercheurs et chercheuses de la gestion urbaine de l'eau

Climate Change awareness among urban water management researchers

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RÉSUMÉ

Le changement climatique modifie profondément les hypothèses sur lesquelles les infrastructures de gestion des eaux urbaines sont construites et gérées. Il n'est plus possible de se baser sur le passé pour envisager le futur, ce qui oblige à adapter les infrastructures aux conditions futures. Or, la communauté de chercheurs et chercheuses de gestion de l'eau urbaine ne s'est pas complètement emparée du sujet : il n'existe par exemple pas de groupe de recherche spécifique sur le sujet, et les modèles et approches actuellement utilisés pour le dimensionnement ou la gestion des infrastructures ne sont pas adaptés. Bien que le sujet du changement climatique soit particulièrement complexe, il est urgent d'y faire face et de développer des connaissances pour permettre aux populations urbaines de vivre correctement dans le futur. Pour comprendre les liens des chercheurs et chercheuses de la communauté avec les problématiques induites par le changement climatique, nous avons réalisé 24 entretiens semi-directifs d'environ une heure autour de leurs connaissances et utilisations des données liées au changement climatique. Le changement climatique apparaît comme un sujet très important pour les enquêtés, et ce depuis longtemps, néanmoins de nombreuses barrières empêchent sa prise en compte, autant dans l'organisation de la recherche que dans la recherche elle-même. Les entretiens ont permis de faire émerger des pistes et des suggestions pour rendre les données climatiques plus faciles à utiliser ou encourager le développement d'infrastructures vertes et bleues.

ABSTRACT

Climate change fundamentally alters the assumptions on which urban drainage infrastructure are designed and operated. We can no longer assume that the future will look like the past and therefore our infrastructure must be adapted to future conditions. Despite this urgency, the urban water management research community has not fully engaged on this issue. There is no dedicated research group on climate change adaptation, and conventional approaches and models currently used to design new or rehabilitate existing urban water infrastructure are increasingly unsuitable under a changed climate. Although climate change is a highly complex phenomena, development of new approaches and knowledge that will enable urban populations to live well in the future is vital. To understand how researchers in this community relate to climate change issues, we conducted 24 semi-structured interviews of about an hour, focusing on their understanding and use of climate-related data in current research. The study results revealed that climate change has long been considered a very important topic by all participants, but that many barriers prevent its integration, both in research organization and in the research itself. A few ideas and suggestions also emerged, such as making the relevant (climatic) data available and developing nature-based solutions and green infrastructure, and will be presented.

MOTS CLÉS

Climate change adaptation, interviews, modeling, research practices, urban drainage community

INTRODUCTION

Conventional urban drainage system design approaches focus on minimizing the probability of occurrence of hydraulic failures, based on historical datasets that assume stationary climate conditions. However, these datasets are no longer representative of the future rainfall and temperature patterns (Cook et al., 2017; Mailhot and Duchesne, 2010). Climate change (CC) has and will continue to alter the intensity, duration and frequency of extreme rainfall, drought, and urban heat (IPCC, 2021). For instance, a sewer system may have been designed for a hundred year lifetime based on restrictive hypothesis that were developed in the late 1950s (McPherson, 1958). It is critical therefore that urban drainage system modeling and design approaches must be adapted to account for current and projected future climate change, urbanization conditions, and to integrate potential grey-blue-green adaptation measures (Kourtis and Tsihrintzis, 2021). However, we are slow as a community to do so. One challenge is the uncertainty that climate change brings. For instance, there are large uncertainties in estimation of future greenhouse gas emissions (GHG), as they are dependent on qualitatively developed socio-economic scenarios such as sustainability (IPCC, 2021), and on national and global GHG reduction commitments. These factors may deeply impact the water socio-ecosystems and change the relationships between citizens, policymakers, researchers and professionals. In this context, defining a baseline status for hydrological modeling is challenging and highly uncertain.

However, there is no consensus on methods and approaches for consideration of climate change aspects in current urban drainage research, which has led to use of multiple and ad-hoc approaches. For instance, it is possible to use downscaled outputs from global or regional climate models as a basis for modeling and design. However, use of this data brings uncertainties, biases, and other complexities. Moreover, the distance between the urban drainage and climate research communities makes it hard to resolve these issues. Other researchers may want to use a rule-of-thumb, such as applying a climate change factor of 1.3 to the observed rainfall to obtain conservative estimates of anticipated future climate change effect on rainfall extremes. Still, others propose that integrating blue-green infrastructure (BGI) into the drainage system can effectively offset changes in future rainfall (Mugume and Nakyanzi, 2024). However, recent modeling studies suggest that BGI will likely remain effective only for low-moderate rainfall events under changed climate conditions, with substantial residual flood risk remaining during extreme events (Webber et al. 2020).

This therefore highlights the necessity to develop a well-structured and logical approach for consideration of climate change impacts in urban drainage research. However, it is first needed to understand how researchers in all sub-fields of urban drainage approach climate change and adaptation. To do so, we launched an interview survey among the different working groups of the International Water Association (IWA). Our hypothesis is that climate change is known to be an important subject in urban water management, but is currently applied in a restrictive or ad-hoc way. We used a qualitative approach to explore how urban drainage scientists perceive CC stakes in their respective fields of research. Are these stakes producing new research objects or do they renew the context of well-established approaches and methods? At which stage of the research process are these stakes integrated? Is CC considered a politically sensitive subject or rather neutral? Does this theme lead researchers to engage more in operationalization, dissemination and communication practices? In this abstract, we will present the methods used, our sample characteristics and the key results of our survey. We will then discuss strategies to improve the consideration of CC in urban drainage research.

1 RESEARCH APPROACH

1.1 Interviewees

Between October 2024 and January 2026, we interviewed 24 water science researchers (8 women, 16 men) for 60 to 90 minutes by video call. These researchers were selected based on their engagement in the 9 Joint Committee on Urban Drainage working groups: Blue Green Infrastructure (BGI), Data & Models (DM), Emerging Contaminants (EC), Large Research Infrastructure in Urban Drainage (LRIUD), Real Time Control (RTC), Sewer Systems & Processes (SS&P), Urban Drainage Asset Management (UDAM), Urban Rainfall (UR), and Urban Streams (US). Before interviews, all participants received a form to collect their written informed consent to contribute to the study. Attention was given to vary career development stage and geographical location of the interviewees. The sample contains: 3 Early Career Researchers, 8 with intermediary positions, and 13 full professors or equivalents from France (4), UK (4) Sweden (3), Switzerland (3), Austria (2), Germany (1), Netherlands (1), Spain (1), South Africa (2), Australia (1), Canada (1) and China (1).

1.2 Interview questions

We used a semi-structured interview framework, revolving around two large themes: a) definitions and boundaries of climate change; b) climate change in their research topic. As an introduction, we ask researchers to present themselves and their research topic. In the first part of the interview, we discussed with them how they interpret CC, adaptation and mitigation and the influence of these notions in their work, based on their projects. In the second part, the interviewee is expected to give details on the importance of CC for their research, the evolution over time of this aspect in their work. We also inquire about the implications, obstacles and opportunities of CC in terms of interdisciplinary work, collaboration with water professionals or popularization. This qualitative open approach is important for us not to impose our own terms and let the interviewee explain with their own words how they deal with these complex issues.

1.3 Analysis methods

The interviews have been analyzed with a thematic approach (Campenhoudt et al., 2017). Using our question framework, a first classification was made to highlight convergence and divergence among researchers on the different topics. Cross-analysis sessions were organized with the entire team for bias check and pluralizing interpretations of our empiric materials.

2 PRELIMINARY RESULTS

The results presented in the following sections are based on the first 14 interviews conducted. The interview process is still ongoing and the data analysis is incomplete.

2.1 Scoping climate issues for urban drainage research

The interviewees understand CC as a globally known and well-defined phenomenon. They spontaneously connect CC with *livability*, *extremes*, *adaptation*, *mitigation*, *resilience*, which regularly appear in projects' framing at different stage of research. However, some researchers consider that other definitions, such as *climatic extremes*, are much more complicated to define, but are really important in their work. One researcher in the field of water economics particularly insisted that *global change* is more heuristic than CC in their perspective to understand the intertwined phenomenon that may affect water services in the near future. Some researchers pointed out that climate change had led them to consider more indicators than just (extreme) precipitations, especially drought periods or extreme flow rates. Interviewees often value *adaptation* over *mitigation* in their research projects, since emissions linked to water services are not considered as impactful as other human activities. However, *adaptation* is not perceived as an easy challenge. For example, in the case of blue-green infrastructure, researchers need to inquire about the livability of the different plant and bacteria species they use. Comparatively, for sewage systems, some researchers are already working on the estimation of infrastructure or plants resilience. Temperature rises may also indirectly affect the organic matter degradation, resulting in increased risks of fecal contamination. Over time, interviewed researchers point that overall data production increase, so does the availability of this data. It implies a growing need to develop best practices in data collection, storage, analysis and provisioning. In that sense, CC may be an opportunity to do interdisciplinary research or obtain grants.

2.2 Issues identified for climate change consideration

Two issues (among others) which have emerged from the interviews are presented here as examples of the discussions during the interviews: the lack of interdisciplinarity and resistance to change.

2.2.1 Lack of inter- and transdisciplinarity

We define interdisciplinarity as collaboration between different scientific disciplines, and transdisciplinarity as collaboration not only among scientific disciplines but also with non-academic actors such as water managers, associations, and local authorities (Tejedor et al., 2018). Overall, there is a lack of inter- and transdisciplinary work among researchers, particularly between experimental and social sciences. Yet, CC affects and connects all disciplines. Working separately (in disciplinary "silos") makes it more difficult to address CC in all its complexity. Inter- and transdisciplinary approaches are increasingly recognized as essential, but they can be difficult to implement due to the way research is organized. For example, early-career researchers, who carry out much of the research, are encouraged to publish within their discipline, and laboratories are often divided along disciplinary lines.

2.2.2 Limits in changing practices

Some barriers to integrating CC into urban drainage science are linked to professional practices. Current practices lag behind climate realities: How should we generate future climate series? How can we provide effective simulation tools? How can we move from simple system sizing to understanding how stormwater systems actually function, and how often they might fail? Furthermore, there is a lack of scientific and operational feedback on “wrong practices,” such as design or maintenance errors. Finally, the impacts of CC on water quality, and vice versa, remain under-researched, even though this topic is of major importance.

2.3 How to improve climate change consideration?

An important finding is that CC is considered a significant issue by all interviewed researchers, even when it is not their central research topic. They actively seek to improve its integration by addressing the issues mentioned above. Several strategies are already being deployed to foster inter- and transdisciplinarity, such as joint responses to project calls, or co-supervision of PhD students from different disciplines. Coordination between urban drainage researchers is needed. Moreover, collaborations developed by organizations such as Graie in France also help to bridge the gap between academia and practitioners. Overall, several topics were identified as particularly important to tackle CC, such as ensuring water sufficiency (especially regarding quantity), making the relevant (climatic) data available, developing nature-based solutions and green infrastructure, and promoting broader training for all actors (engineers, hydrologists, and citizens).

3 CONCLUSION

We interviewed 24 urban drainage researchers on their understanding and consideration of climate change in their work. Climate change is globally well known and described, but its use remains limited by several issues such as data availability and computations limits for models, a lack of transdisciplinarity, or an inertia in practices changes. Strategies are proposed to overcome these barriers such as developing collaborations with mediators between researchers and practitioners. This project aims to produce a position paper based on these interviews. We remain open to new ideas and reflections. Our next steps will include broadening our research to encompass global change, comparing results with practitioners, and exploring potential differences between countries.

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