



**Clean Air and
Urban Landscapes
Hub**

National **Environmental Science** Programme

Urban forest horizon scanning

Report of the workshop in Lund, Sweden

Clean Air and Urban Landscapes Hub

OCTOBER 2018

Judy Bush¹, Kes McCormick², Cathy Oke¹, Bernadette Kiss², Yuliya Voytenko Palgan², Björn Wickenberg²

¹ Clean Air and Urban Landscape Hub, The University of Melbourne

² International Institute for Industrial Environmental Economics, Lund University

This report contributes to milestone 34: *Report on future challenges and opportunities for urban green space in a changing environment*

Acknowledgements:

Grateful thanks to the International Institute for Industrial Environmental Economics, Lund University for hosting and supporting the workshop and to participants for attending the workshop and contributing to the vibrant and constructive process.

Thanks also to Dr Dave Kendal and Dr Catherine Elliot (University of Tasmania), and Dr Cristina Ramalho (University of Western Australia) who developed the workshop agenda and materials, and organised the Australian workshops.

About the Clean Air and Urban Landscapes Hub

The Clean Air and Urban Landscapes Hub (CAUL) is a consortium of four universities: the University of Melbourne, RMIT University, the University of Western Australia and the University of Wollongong. The CAUL Hub is funded under the National Environmental Science Program of the Australian Government's Department of the Environment. The task of the CAUL Hub is to undertake research to support environmental quality in our urban areas, especially in the areas of air quality, urban greening, liveability and biodiversity, and with a focus on applying research to develop practical solutions.

www.nespurban.edu.au

The Clean Air and Urban Landscapes Hub is funded by the Australian Government's National Environmental Science Program

1. Introduction

What will the urban forest in 2100 look like? What will be the key issues, threats and opportunities facing urban green spaces? Answering these questions was the focus of a ‘horizon scanning’ workshop held in Lund, Sweden on 10 October 2018, the fourth in a series of workshops organised by the Clean Air and Urban Landscapes (CAUL) Hub, as part of the *Urban Greening for Liveability and Biodiversity* research project. The previous 3 workshops were all held in Australian cities during 2018.

Changes to urban forests driven by climate change, demographic change and urbanisation processes have enormous implications for urban land managers and for our cities. There is currently little guidance to inform management specifics (such as in relation to plant selection, site amelioration) in a changing environment, to maintain and enhance provision of urban forests’ multifunctional benefits.

This *Urban forest horizon scanning* research aims to further the knowledge of the potential changes to species, resources and conditions facing future urban forests, through a horizon scanning exercise involving end-users and researchers from CAUL Hub and other institutions. This process canvasses a range of issues including changing climate, urban densification, demographic change, technological changes, water and waterways issues, biodiversity and human health and wellbeing. This project extends previous CAUL Hub research on climate change risks, particularly temperature vulnerabilities, to urban forest species. The workshop outcomes will contribute to improved understanding of the challenges facing urban forests in a changing environment, and inform research, policy and practitioner priorities to build capacity and effectiveness in urban forest management. ‘Urban forest’ is defined broadly: it includes trees, green spaces, gardens, urban ecological systems, and so on.

2. Background

Horizon scanning is a process for identifying strategic issues that will be important in the future. It is one of several approaches to foresight or future-oriented analysis and planning. Horizon scanning aims to identify emerging issues, that are currently barely visible, '*weak signals*' of potentially important future changes and shifts. Horizon scanning has been used in research, including for example to annually assess and identify issues in biodiversity conservation (Sutherland et al 2018). It has also been used by governments for policy and planning work (for example (Scottish Water 2016), and in business.

Horizon scanning processes define three different 'horizons' or time frames:

- Horizon 1: short term, current, becomes less important in the medium term
- Horizon 2: short-medium term, already in play, on the rise, however will peak in the medium term and become less important in the long term
- Horizon 3: long term, emerging, currently difficult to see or to confidently describe, analyse and understand.

Horizon scanning is intended to focus primarily on horizons 2 and 3. Key concepts in horizon scanning including '*weak signals*', the early warning signs of change, that are currently hard to discern; and '*wildcards*', the unexpected, on-off events with surprising outcomes, low probability but high impact. Horizon scanning for the urban forest may be informed by developments and shifts in one or several of the following themes:

- Political and financial: Global political change, democracy and participation, economic systems
- Ecological: Climate change, fire regimes, water availability, loss of biodiversity, species interactions
- Social: Cultural change, population growth and demographic shifts, education
- Technical: Genetic technologies, automation, big data, driverless cars, artificial intelligence

During 2018, urban forest horizon scanning workshops were held in three Australian cities, with an additional workshop in a non-Australian city (Lund) included for a comparative, non-Australian context. The Lund workshop provided an opportunity for applying the workshop methodology in a different urban context, and for gathering data from a European context, one in which urban forests and nature-based solutions are a key current research focus.

3. Workshop preparation and format

The horizon scanning workshop was hosted by the International Institute for Industrial Environmental Economics (IIIEE), Lund University on Wednesday 10 October 2018. The workshop was co-organised by IIIEE and CAUL Hub. The workshop process and data collection process has received ethics approval from the University of Tasmania (Ethics no H0017323).

Invitations for participation in the workshop were sent to city planners, landscape architects, sustainability experts, and academics from Sweden (Malmo and Lund region) and Denmark (Copenhagen), whose work focuses on green and blue infrastructure and social and political processes. Invitees were identified through the existing networks of the workshop organisers and snowballed through invited participants' recommendations. There were 17 participants, including the workshop organisers who also actively participated in the process and the discussions.

The workshop agenda is summarised in Table 1. The workshop was framed as an opportunity for participants to consider the following: *"Imagine the European urban forest in 2100. What do you wish you could tell urban forest managers and researchers in 2018?"*

Table 1 Horizon scanning workshop agenda

Activity	Description	Duration
Welcome		30 minutes
Introduction	Introduction to horizon scanning	10 minutes
Session 1	Brainstorming issues; group discussion of issues, clustering into political, environmental, social or technological categories	30 minutes
Session 2	Select issues for more detailed discussion and analysis; describe 2100 scenarios; drivers and triggers	60 minutes
Session 3	Backcast scenarios to current research and policy priorities	60 minutes
Concluding discussion	Reflections on the workshop process and the key issues and themes	30 minutes

Following the initial welcoming session in which participants introduced themselves, and the process of horizon scanning was presented, the workshop focused on small group discussions, with four groups formed and each group facilitated by a member of the workshop organising team (CAUL Hub and IIIEE researchers). Groups started by brainstorming potential issues, attempting to identify emerging issues, 'weak signals' and 'wildcards'. Participants were encouraged to identify both positive and negative issues, and to allow irrelevant or unrealistic issues to arise in an attempt to encourage creativity rather than stifle or hinder thinking. The brainstormed issues were written on 'post-it notes' (one idea per piece of paper). All brainstormed issues from all groups were then collected. Participants reviewed all the issues and grouped them into political and financial, ecological, social or technical categories.

The next session involved participants selecting the category of most interest to them, so that groups were formed associated with each of the categories. Groups discussed the range of issues associated with their chosen category, and spent time sorting the issues into subcategories. Each group then selected a small number of issues for discussion and focused analysis. For each issue discussed and analysed, a worksheet (Appendix 1) was completed. Discussion and analysis focused on describing the issue, assigning a risk rating (based on likelihood and effect) and creating a 2100 scenario for the issue. While most groups worked together to discuss and analyse the selected issues and fill in the worksheets, some participants worked individually on issues of interest.

The third session involved then 'backcasting' from the 2100 scenarios to identify current research and policy priorities that would promote more positive and mitigate negative aspects of the scenarios. The group facilitators' roles were to maintain group focus, and ensure discussions were documented. Group facilitators were briefed on their roles prior to the workshop to ensure they were well prepared and confident of the process, objectives and expectations.

The workshop concluded with a general discussion amongst all participants reviewing the process, issues discussed and next steps.

4. Results

During the first brainstorming session, 101 issues were identified. These were grouped into categories: 27 issues were classified as ‘political’; 26 as ‘ecological’; 30 as ‘social’ and 18 as ‘technological’. Of these, 15 issues were selected during session 2 for more detailed description and analysis (Table 2). Due to time limitations, three issues were selected for discussion by all but the ‘ecological’ group. The ecological group’s members selected six issues and then developed and analysed these individually.

Table 2 Urban forest issues selected for detailed analysis at the workshop

Political and financial	<ul style="list-style-type: none"> • Justice and equity • Regulation of green space • Systems of production, value, ownership
Ecological	<ul style="list-style-type: none"> • Ecosystem disservices • Multifunctionality • Ecological knowledge, simulation and data • Virtual nature • Biodiversity loss • Pollution reduction
Social	<ul style="list-style-type: none"> • Dirty cities (unsealed cities) • Food forest • Under-used nature
Technological	<ul style="list-style-type: none"> • Virtual nature • Transportation transition • Tech or artificial nature

For each of these issues, the scale and scope of the issue, 2100 scenarios (both positive and negative) and associated drivers and triggers were discussed and documented on the worksheet template (Appendix 1). Based on the 2100 scenarios, consideration then turned to backcasting to today’s research and policy needs to prepare for these issues. The key scenario elements, drivers, triggers and backcast policy and research needs from across all issues are summarised in Table 3.

The drivers and triggers of change that were identified by workshop participants included the high profile, already visible issues of climate change, urbanisation processes and demographic shifts, particularly related to ageing and migration. Other drivers and triggers of change related to social and economic pressures driven by inequity, exclusion and uneven economic growth, as well as the development of new economic systems and business models for sharing and circularity. Technological innovation and availability was also identified, as well as a tendency towards optimism in technologies’ ability to address a wide range of issues.

Participants created and described scenarios both positive and negative, tending towards either utopian or dystopian visions for the future in 2100. Scenarios envisaged transitions in transport modes that would result in freeing up urban space for more nature; increasing area of permeable surfaces, resulting in environmental and health benefits; and increased collaboration and power of marginalised voices in decision-making processes, including those of more-than-human actors such as plants and animals, reflecting pluralistic values, equity and justice. Participants also imagined a future of decreased biodiversity and ecosystem services; stressed trees growing in increasingly difficult conditions resulting in production of higher levels of volatile organic compounds (VOCs), contributing to worsening air pollution; and increasingly unequal distribution of urban forests, correlated with income levels. The existence and impacts of virtual nature, artificial nature and ‘fake’ nature arose across a number of categories (technical and ecological, and to a lesser degree social) and were framed as both positive and negative scenarios.

Table 3 Snapshot of scenarios, drivers and triggers, and backcasting to current policy and research priorities

2100 scenarios: positive	<ul style="list-style-type: none"> • increased quality of urban forests that benefits all • increased power of marginalised voices in decision-making processes including more-than-human, reflecting pluralistic values, equity and justice • transitions in transport modes result in freeing up urban space for green spaces • virtual nature allows more people to have contact with some form of nature • collaboration and new ways of working enabling more use of local expertise • social cohesion, inclusion, reconnecting people to nature and to food origins • increasing permeable surfaces, resulting in environmental and health benefits
2100 scenarios: negative	<ul style="list-style-type: none"> • extremely unequal distribution of urban forests, correlated with income levels • decreased biodiversity and ecosystem services • narrowing down species selection based on ecosystem services optimisation, without multifunctional aspects • less contact and experience of real nature • trees growing in stressed conditions increasing their production of VOCs contributing to worsening air pollution • with increasing reliance on virtual nature, associated reduced provision of ecosystem services by real nature
Drivers/ triggers	<ul style="list-style-type: none"> • urbanisation; lack of space in urban areas • climate change • social inequality, consumption and uneven economic growth and benefits • lack of inclusion of vulnerable and diverse voices (nonhuman) in decision making • new business models for sharing • availability of new technology; • optimism in technologies' ability to address a wide range of issues • demographic shifts: ageing, migration • knowledge of links between nature and health
Backcasting: policy/ management needs	<ul style="list-style-type: none"> • integration in the planning process, working across disciplines and siloes • longer time perspectives in planning and management • planning urban forests for access, quality, multi-functional use • rethinking how we use space in cities • promoting the provision of values and benefits of green space, rather than focusing on specific forms of green space • investment frameworks to co-create and finance for pluralistic needs and values • working with commons • long term stewardship models • public participation, inclusive governance supporting multifunctional values • planting urban forest more strategically to avoid disservices
Backcasting: research needs	<ul style="list-style-type: none"> • integrated and multidisciplinary research • Baseline data, indicators, particularly for equity, moving beyond anthropocentrism • global approaches to urban forest regulation and governance. What can we do within current frameworks, where are the gaps and opportunities? • scenarios to investigate different use of space in cities • implications of virtual nature; comparison of benefits of real and virtual nature • studies on climate change adaptation and mitigation • combined effect of climate change parameters on tree growth and functionality • empirical studies on species suitability • species interactions and resulting impacts on vegetation growth and health • tools/approaches for long-term community engagement

5. Discussion

The workshop generated some interesting discussions on both possible and unlikely futures. Participants seemed to enjoy the process and to appreciate the opportunities the process provided to meet others working in allied areas, to think about research proposals, brainstorm ideas, and take time out of day-to-day tasks to reflect on larger themes. The workshop process highlighted however the substantial challenge for participants in imagining distant, uncertain futures, and the difficulties of shifting the area of focus from present-day issues and tasks to future possibilities. This section of the report discusses some of the issues and opportunities related to the process for horizon scanning, as well as the key issues discussed. The final section of the report highlights the research and policy priorities identified to prepare for the imagined 2100 scenarios.

The brainstorming session at the beginning of the workshop provided the opportunity to start to imagine and scan for emerging issues. Several participants reflected that this session was enjoyable and they would have liked it to be of longer duration. Some participants suggested that the session was too short because it took time to mentally shift from current, day-to-day issues to a future focus. Some participants proposed that more active prompting from workshop organisers may have fostered a stronger focus on ‘weak signals’ rather than well-supported and confidently predicted futures.

The challenge of imagining a distant and uncertain future was experienced by most participants throughout the workshop. Despite the enthusiasm amongst participants, there was still a great difficulty to think into the future. For some this difficulty seemed to be linked to a reluctance or aversion to thinking in unrealistic or unlikely ways. For these participants, it appeared difficult to shift from a focus on the present, current best practice, existing issues and actions which are already in place today. While there may be value for some participants in discussing these practices, this created a hurdle for those groups in attempting to imagine and describe scenarios for 2100, particularly if current-focused participants continued to return discussions to the present. For one group, it was helpful when the discussion was stimulated by one of the participants identifying “crazy” ideas, after which other group members took that as encouragement to turn their minds to more radical visions.

The process for identifying emerging issues and then selecting issues for more detailed analysis varied between groups and between participants. For some, the process focused on identifying emerging threats and dystopian futures (for example ‘ecosystem disservices’), while for others, the process centred on imagining opportunities, utopian visions and positive responses to current urban challenges (for example ‘dirty cities’). As such, scenarios tended to cluster around dystopian or utopian visions, rather than reflecting the complexities of the issues that included both positive and negative aspects.

During the concluding discussion of the workshop, participants reflected on the difficulty of horizon scanning and imagining uncertain futures, and proposed a range of mechanisms and approaches that may assist in fostering the ability to think and imagine the future and ‘jolting’ participants to go beyond present day concerns. These suggestions included both a focus on the future, by watching or reading science fiction; and a focus on the past: what’s changed over the past 100 years, and can this help us to think about what might change over the next 100 years. There was the suggestion that bringing in a sense of the past might provoke discussions to travel back in time, and then forward in time. There were also suggestions of including a greater diversity of participants to foster creativity, including artists and historians, and using different communication and workshop tools including drawing (sketching) scenarios and utilising modelling tools such as agent based modelling, and virtual reality tools to visualise other futures. Some proposed including children in the process.

During the concluding discussion, participants also reviewed the process of grouping brainstormed issues into political, ecological, social or technical categories. Some suggested that while this

grouping made sense from an organisational perspective, this grouping was problematic because many issues span more than one category. Furthermore, allocating issues to one category or another could serve to obscure the complexity of issues, and the associated complexity of necessary responses. Some questioned whether this might reinforce current ways of thinking and reduce the capacity for a complex systems approach. Other potential groupings were discussed such as socio-technical and social-ecological systems groupings, or even grouping issues based on their different visions for the future: utopian, dystopian, eco-centric, tech-centric.

Of the key issues identified and discussed, there were a number that arose and were discussed across more than one category. Variations of hybrid or 'unreal' nature, including virtual nature (digital images), artificial nature (green roofs and walls) and fake nature (plastic trees) were examined within technological as well as social and ecological categories. Discussions included considerations of how other natures might provide opportunities for people with limited mobility to still connect with and benefit from nature experiences, yet there was also discussion on the degree to which other natures would provide the same quantity and quality of benefits to people and uncertainty about the health benefits of contact with 'unreal' nature. While there is some existing research in this area, there are many aspects and mechanisms of human-nature relationships still to be understood. Associated with discussions on hybrid or 'unreal' natures were also questions and concerns related to loss of contact, connection and knowledge of nature, of species and species interactions.

With 2100 scenarios of urban change associated with urban densification and expansion, as well as social changes associated with engaging with digital tools and virtual realities, participants discussed the potential both for overuse of urban green spaces (increasing urban populations and shrinking spaces allocated to urban forests in cities) and alternatively for underuse of urban green spaces (as people retreat indoors and increasingly depend on virtual experiences and digital connections). Both scenarios are informed by participants' current experiences and research, and point to the challenges for developing policy responses to address provision of urban green spaces, as well as the importance of further research on the benefits of contact and connection with urban nature.

6. Conclusions, research and policy priorities

The workshop generated active and engaged discussions amongst participants on future scenarios for urban forests, threats and opportunities, as well as key priorities for current research and policy to better prepare for uncertain futures. The workshop created a forum for researchers and policy makers to meet and discuss interests, ideas, and opportunities, as well as opportunities for further collaboration as part of potential transdisciplinary and integrated research and project implementation.

The key research and policy priorities were focused on better preparing us now to be able to meet the challenges and opportunities associated with the scenarios for the urban forest in 2100. Priorities spanned issues and themes from technological, psychological and social, ecological and governance domains, and highlighted the importance of integrated and multidisciplinary approaches in both research and in policy and management. Approaches to community engagement were highlighted as priorities for both research and policy.

Key research priorities discussed across several groups and themes included:

- implications of virtual nature; comparison of benefits (social, mental and physical health) of real and virtual nature
- development of social and ecological indicators and baseline data
- global review of approaches to urban forest regulation and governance
- continued studies on climate change adaptation and mitigation, including the combined effect of different climate change parameters on tree growth and functionality, and empirical studies on species suitability
- approaches to community engagement
- transdisciplinary research approaches that include practitioners, or practice-oriented research

Key policy and management priorities included:

- integration in the planning process, to facilitate working across disciplines and siloes
- longer time perspectives in planning and management
- planning urban forests for access, quality and multifunctional use
- investment frameworks to co-create and finance for pluralistic needs and values
- public participation, inclusive governance structures and stewardship models that support and embrace multifunctional values; approaches to community engagement

These priorities can inform ongoing efforts in urban forest research and management, and provide tangible outcomes from the horizon scanning workshop.

7. References

- Scottish Water, 2016, Horizon scanning Report 2016, Scottish Water, accessed from <https://www.yourwater.scot/static/Horizon-Scanning-Report-supporting-document.pdf>
- Sutherland, WJ, Butchart, SHM, Connor, B, Culshaw, C, Dicks, LV, Dinsdale, J, Doran, H, Entwistle, AC, Fleishman, E, Gibbons, DW, Jiang, Z, Keim, B, Roux, XL, Lickorish, FA, Markillie, P, Monk, KA, Mortimer, D, Pearce-Higgins, JW, Peck, LS, Pretty, J, Seymour, CL, Spalding, MD, Tonneijck, FH & Gleave, RA, 2018, A 2018 horizon scan of emerging issues for global conservation and biological diversity, *Trends in Ecology and Evolution*, vol. 33, no. 1, pp. 47-58.

8. Appendix Worksheet template

Big Picture Theme:

Urban Forest Issue:

Brief description of possible effects:

Scale/scope of issue:

		Likelihood				
		Likely				Unlikely
Effect	Very large					
	Medium					
	Small					

2100 scenarios: desirable and undesirable aspects

Drivers/triggers of the issue:

Existing information/research on the issue:

Research and policy needs: backcasting next steps to avoid undesirable and promote more desirable futures: What could we do to prepare for, mitigate or work towards?

POLICY/MANAGEMENT:

RESEARCH:
