

# A comparison of priorities and interests of practitioners and researchers

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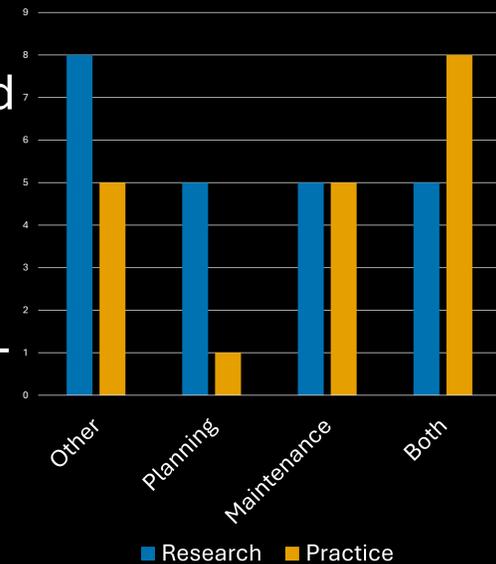


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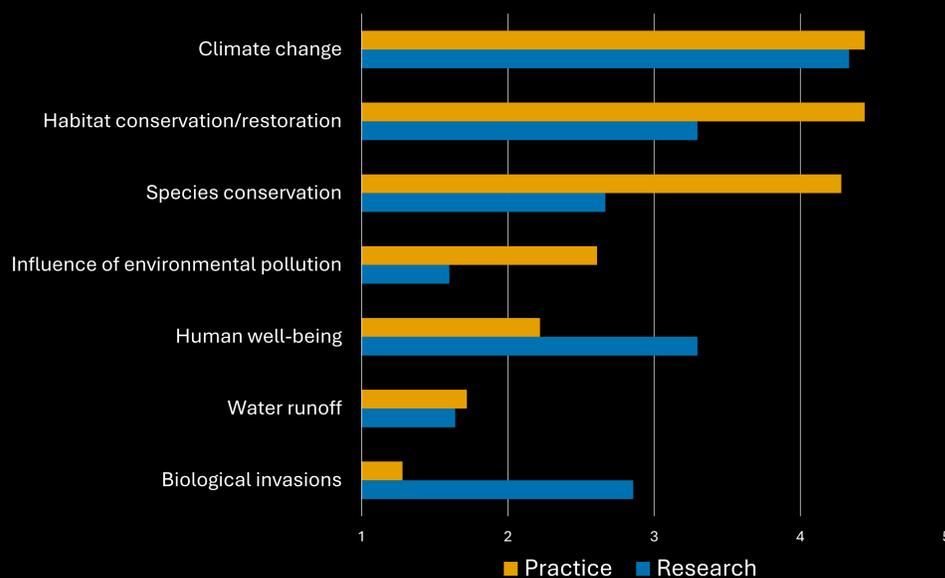
**Practitioners and scientists working with urban trees: not always same interests and priorities.**

**To address and investigate disparity: organized workshop at WSL (Nov. 2024). Questionnaire (based on Kunming-Montreal 2030 Global Biodiversity Targets).**

Participants from research and practice, from different fields (N = 42)



## Average relevance of topic categories



**Overlap – but also divide – in interests. Practitioners reported an urgent lack of information on suitable tree species for future global conditions.**

**Based on discussions: 70 burning research questions, vetted by practitioners working with urban trees. These are going beyond biodiversity, but urban biodiversity cannot be managed without considering other factors.**

## 70 Burning research questions for scientists and practitioners working with trees in urban green

### Optimal growing condition, management and care of trees

- How does tree diversity and soil conditions interact?
- How do we improve soil quality and liveability for trees?
- How does soil management influence soil structure (e.g., porosity) and soil biodiversity in urban environments?
- How does soil biodiversity affect tree growth conditions?
- Which aspects should be prioritised when assessing growing conditions, apart from the crown cover (e.g., soil, 3d structure, microhabitats)?
- How does irrigation management affect urban tree resilience and health, and how can green-blue infrastructure be used to source water in streetscapes?
- How can data on urban trees (e.g., inventories) be made more accessible and user-friendly for researchers and practitioners?
- Which arboricultural techniques and approaches can reconcile risk reduction and the preservation of ecologically valuable trees in cities?
- What tools (e.g., protocols, management plans) can be used by practitioners to determine the ecological importance of a tree?
- How can techniques for assessing tree stability be improved?
- What are the best pruning techniques (e.g., fracture cuts, crown cuts) to maintain healthy trees?
- How much tree root space (considering species, soil type, water retention, drainage, and site context) is necessary for strong and resilient trees?
- What is a suitable green-to-built ratio (examples: Santamour's or Melbourne recommendations) for optimizing provision of biodiversity and ecosystem services?
- Which measures (age, size, structure) of trees should be considered additionally to number of trees?

### Tree species selection

- How to select and manage tree species planted in urban areas to maintain or increase tree species diversity and thus, overall biodiversity and ecosystem services?
- Which urban tree species and genotypes are particularly suitable for anticipated future climate conditions?
- What criteria should guide the selection of tree species to ensure optimal growth and maximum resilience considering specific urban conditions (climate, soil, pollution, safety requirements)?
- How to identify native and resilient species for urban sites?
- Do similar traits in non-native and native trees support similar biotic interactions?
- Can similar functional traits be used to select alternative tree species to native tree species while being adapted to the urban environment?
- What is the potential of urban trees to support biodiversity of associated organisms?
- What is the impact of genetic variation of trees on resilience to abiotic and biotic disturbances in urban environments?
- How to weigh different priorities to select the most suitable urban tree species for planting?
  - Ecosystem services
  - Ecosystem disservices
  - Biotic resistance
  - Abiotic resistance
  - Resilience to current and future stressors
  - Functional traits
  - Cultural preferences or traditions
  - Temporal trends and future projections
  - Aesthetic and structural characteristics of trees
  - Susceptibility or resistance to (future) invasive pests and pathogens
  - Provision of autochthonous biodiversity
  - Pruning tolerance
  - Production of allergenic pollen

### Global change and environmental pollution

- What is the future distribution of pests and diseases (change in biogeographical zones) due to climate change?
- How can we predict the future range and impact of (native and non-native) pests and diseases?
- To what extent is the planting season influenced by climate change?
- What interactions exist between tree health and environmental pollution?
- How do trees mitigate the effects of climate change and environmental pollution?
- How does the mitigation of environmental pollution by trees influence urban biodiversity?
- How do organisms associated with trees (e.g., phyllosphere bacteria that degrade atmospheric pollutants) influence environmental pollution?

### Urban Tree-Associated Biodiversity and Spatial Dynamics

- Which biodiversity indicators can be used to assess and monitor biodiversity status in urban environments, in relation to urban trees?
- What can we learn about the biodiversity associated with trees in urban environments (e.g., species, functional roles, patterns of presence and distribution on trees)?
- How do land sharing (e.g., sparse trees in the urban matrix) and land sparing (e.g., urban parks and forests and densely built areas) influence:
  - taxonomical, functional and phylogenetic diversity?
  - spatio-temporal population dynamics of different organism groups?
  - provision of ecosystem services (regulating, provisioning and cultural)?
- How does seasonality or phenology affect biodiversity of different organism groups (insects, birds, others) associated with urban trees with regards to:
  - mortality and source/sink dynamics?
  - pollination levels?
  - migration in and out of the city?
- Which ecological theories (e.g., island biogeography, Single large or several small 'SLOSS') can be applied in an urban context and in which aspects should these be adapted?
- How to cover the need for long-term ecological monitoring?
- How do we achieve research over multiple cities for more generalizable findings?
- How can we ensure the presence of all tree development stages in urban environments?
- What is the effect of spatial interconnectivity of (blue) green habitats on movement and dispersal of (invasive) pests and native biodiversity?
- How does spatial interconnectivity of trees influence source-sink dynamics of (local) biodiversity or (invasive) pests?
- How does new habitat (e.g., facade greening) affect spatial interconnectivity of tree habitat for biodiversity?
- How does spatial connectivity of trees in different life stages (e.g. old "habitat trees") influence biodiversity?
- How to incorporate the different functions of trees in habitat and species conservation in regard to small-scales vs large-scale measures?

### Urban planning to support trees and human well-being

- How can urban planning guide the urbanization process to achieve both goals of preserving urban trees and enhancing human well-being?
- What is the correlation between biodiversity provision and human well-being?
- What is the ratio of urbanisation (examples: 3-30-300 rule, Santamour's or Melbourne recommendations) that would allow urban trees to optimally provide for biodiversity and human well-being?
- How can urban planning ensure that sufficient tree root space (species, soil, and context-specific) is ensured for strong and resilient trees?
- How to communicate with the public on trade-offs (e.g. parking lots and lawns vs urban trees)?
- Should cities support the maintenance of private trees when aligned with city goals?
- How to avoid processes of urban green gentrification and ensure environmental justice in urban areas?
- How to develop very long term (decadal, decennial...) urban tree management?
- How do tree roots influence underground infrastructure, and how to reconcile both in the limited space?
- What is the difference in evaporative cooling between tree species?
- What is the effect of 3d structure of urban green on:
  - human well-being?
  - evaporative cooling?
  - pollution mitigation?
- How to include multiculturalism (different cultural background and therefore perception) in planting trees?
- How to mediate results in exacerbating potential inequalities (more trees, more tree management)?
- How can management be fairly distributed between trees and neighbourhoods, so that people and trees benefit?

### Ecosystem services of trees in urban environments

- How does tree management/pruning affect the provision of ecosystem services?
- How do pests affect the provision of ecosystem services?
- The role of cooling of 3D structure of trees?
- How do species composition and urban forest attributes (e.g., age distribution, longevity, regeneration, and mortality rates) affect the provision of ecosystem services?
- How can urban forests be managed to ensure a sustainable and targeted flow of ecosystem services?
- How can we develop a tree management strategy with an integrated approach that includes both risk reduction and biodiversity protection?
- How can management interventions be designed to avoid oversimplification of tree structure and the resulting loss of ecological value, even when aiming to reduce costs?

### Knowledge transfer/exchange

- How to diversify tree species composition without relying on lists for the most commonly planted tree species?
- Urban green and forest systems are often linked: How can knowledge be exchanged between urban forest researchers, urban green managers and rural forest managers?
- How can knowledge on which tree species/genotype to plant be disseminated from research to planning and practice and vice versa?
- How can awareness about the importance of urban green conservation be raised among practitioners in construction and road maintenance?
- How can knowledge about non-native and invasive species (e.g., definitions, identity, and impact) be transferred to arboriculturists, and how can this knowledge support the incorporation of novel species assemblages?
- How can small cities that often do not have capacity to employ urban green experts implement current knowledge on tree selection and placement?