From theory to reality

Research gaps

16th May

The three witnesses discussed different approaches to gathering knowledge that can then be applied to improve our urban environments and people's relationship to nature, be it through advanced modelling approaches, the use of old knowledge in new settings or through public outreach campaigning.

Dr Scott Hosking is interested in energy resilience in a warming world according to the global Paris targets of 1.5 and 2°C and how the magnitude, frequency and duration of heatwaves will change in these scenarios as well as what this means for humans. Most climate models quickly surpass those temperature targets so there are not enough models for this scenario. However, at a city scale issues will be magnified and we do not know how cities will react to temperature spikes. There is a lack of ground-truthed data, such as that concerning change in energy over time, traffic flows, diurnal cycles, spatial-temporal variance in important weather variables (temperature, air quality, wind speed, humidity, etc.) and the built environment (solar shading, street canyons, etc.). A future step may be to use machine learning to improve climate model calibrations and combine heterogeneous datasets, but fundamentally we need to start designing specialised climate models to answer big questions about regional future climate extremes.

Gillian Petrokovsky outlined the multidisciplinary nature of the Oxford Martin School and her work in systemically reviewing evidence bases. Globally, developmental metrics are improving but this puts massive pressure on biomes, and there is a tension between forestry, agriculture and urban states. However, development and forestry have to operate together. The utilisation of older, silvacultural knowledge in new urban environments is an untapped resource. Currently there is too much focus on aesthetic concerns, whereas forestry offers an enormous vat of unanalysed and unstructured information that could be valuable for understanding how trees can be grown within cities in a way that improves or avoids adversely affecting human wellbeing. We need to create practical tools to understand and assess the value of trees and other ecosystem services in the built environment.

Dr David Cope of Kew Gardens emphasised the importance of diversity in the plant and fungi kingdoms for providing cultural, food and ecosystem services and as crucial for solving some of humanity's problems including climate change and antimicrobial resistance. Kew use their gardens and outreach activities to try and deepen the relationship between humanity and the natural world, which is vital for bringing the environmental agenda back to the political fore. Tackling this issue requires systems thinking and greater ambition, particularly with regards to future planning for cities. Can we imagine a resilient city that connects people to nature through infrastructure design and by placing ecosystem services at the forefront of planning? What are the mechanisms for achieving this at a more local level? Will industrial automation provide an opportunity to reimagine urban lifestyles? With regards to policy, how do we design interventions that incorporate experimentation and flexibility? Can cities globally be helped to take a different development pathway? Finally, how can a little botanic garden and its like make a real difference?

Wicked problems and questions generated by the open discussion

There is still a lack of data regarding urban environments. Even in well surveyed cities, such as Tokyo, it can be challenging to disentangle county-wide, city-scale and highly localised data, and there may not be a known baseline. The range of these scales is extremely challenging, and regional biases need to be reduced. Getting more data is a long-term process that must overcome logistical and funding difficulties.

How can we improve our existing green spaces in urban environments? It is important to understanding the wider, individualistic factors that influence people's relationship with nature and work with local communities. For

some, trees can be a renewable resource; for others they are a treasured memory. If people are not persuaded that change is something they want, it will not happen regardless of the evidence base behind the intervention. Long-term planning could make change gradual through the diversification of planting schemes and the age-structures of trees.

How can research compete with financial pressures? Local funding is being cut, so cheapness becomes a priority for local councils looking after the environment. It is important to encourage policymakers to make decisions based on transdisciplinary evidence rather than subjective aesthetic understandings of nature.

What are the best ways of improving people's relationship with nature? The false binary between cities and nature needs to be removed. Kew ran the Grow Wild programme, but it needs to be overlaid with socio-economic research to try and discern its impact. Differentiating communities is vital for engagement; people's connections to nature will be very different as children versus in old age. The former need schools to educate them about the environment properly and the latter could be engaged as volunteers in retirement. 'Edginess', or tapping into people's desire to do something different, may be a way of encouraging behavioural change by allowing disruptive perspectives to shine new light on a problem and reaching out to different actors.

Should smaller spaces be valorised? Working at a local level makes it easier to create experimental testbeds. Current environmental schemes tend to focus on large areas, but perhaps by focusing on smaller areas, such as individual streets, there can be greater engagement with communities.

Should data be public or private? There is huge future potential for big data to help us with problems ranging from knowing if we should have a solar panel on our roof or tracking the status of individual trees. A Wikipedia-model, with open data, may encourage more citizen science but this needs to be done with great caution too as societal problems will corrupt such datasets. Currently commercial enterprises like Google have the resources to curate some of this data, but there are issues with privacy and researchers getting access to data.

Witness profiles

Dr Scott Hosking
Climate Scientist in the Atmosphere, Ice and Climate team, British Antarctic Survey

Scott Hosking is a climate scientist at the British Antarctic Survey (BAS). He uses a combination of traditional and machine learning analysis techniques on data from climate models, satellite and in-situ observations to study dynamical and chemical atmospheric processes, bridging between global and local scales. The primary aims of his work are to identify and understand the key mechanisms that drive year-to-year climate variability over vulnerable regions, the changes in frequency and strength of extreme weather and climate events and reduce uncertainties in future climate projections. Part of his role at BAS is to seek out innovative ideas which may lead to new breakthroughs in research and new cross-sector partnerships. He provides a communication link between Cambridge scientists, the Directorate for Innovation and the other innovation champions here in BAS.

Dr Gillian Petrokovsky
James Martin Fellow in the Oxford Long-Term Ecology Lab, Department of Plant Sciences, University of Oxford

Gill's research focuses on the quality of evidence for science–policy dialogue and for constructing relevant research agendas. Her research aims to draw on experiences of sectors with existing systematic and evidence-informed approaches to examine the potential for establishing 'collaboration without walls' to prioritise and produce systematic reviews and improve the quality of the natural resources science that informs policy. Gill is currently leading a collaborative project co-ordinated by the Center for International Forestry Research (CIFOR), with its international partners – CATIE, CIRAD, ICRAF and IUFRO – to establish the Evidence-Based Forestry (EBF) Initiative. The Initiative, which started in 2012, reflects these institutions' leading roles in generating evidence for policy processes about forests and forestry, defined broadly in the contexts of landscapes and sustainable development.

Dr David Cope
Director of Strategy and External Affairs, Royal Botanical Gardens Kew, Policy Fellow, Centre for Science and Policy

David is Director of Strategy and External Affairs at Royal Botanic Gardens, Kew. In this role, he is responsible for having developed and now overseeing the implementation of their five year strategy 'Unlocking Why Plants and Fungi Matter', as well as leading on stakeholder relationships and governance. He joined Kew in 2013. David's role at Kew involves building the profile of Kew amongst key governmental and non-governmental stakeholders and opinion-formers. His aim is to ensure Kew is seen as a global plant and fungal science and conservation organisation, which engages the public with the importance of plants and fungi. Before joining Kew, David worked in various roles at the Department of Environment, Food and Rural Affairs (Defra) and the Home Office. Prior to that, he was an active scientist, researching the population dynamics of various animal species, with a view to understanding more about conservation and pest control.

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