Resource requirements for ecosystem conservation and sustainable development

Supervisors: Dr. Rupert J. Myers (r.myers@imperial.ac.uk, https://www.imperial.ac.uk/people/r.myers), Department of Civil and Environmental Engineering; Alfred Gathorne-Hardy, University of Edinburgh (a.gathorne-hardy@ed.ac.uk).

Host department: Civil and Environmental Engineering

Sustainable development concerns the use of natural resources to satisfy human well-being, including for food, shelter, sanitation, heating, etc. Much research is ongoing to understand the resource implications of different development pathways. For example, through scenario analyses, it is well understood that achieving the Paris Agreement global temperature rise target of 1.5-2 °C will require a radical shift from fossil materials utilisation (fuels for energy, feedstock for chemicals) to minerals (metals for renewable energy technologies) and biomass (bio-derived chemicals, wood for buildings), putting pressure on resource supply. Here, scenario modelling goals have usually been to quantify the effects of decarbonisation measures (e.g. the energy system transition) on indicators of climate change e.g. atmospheric CO_2 concentration, global warming potential, sea level rise, biodiversity loss.

It is conceptually possible that environmental targets like the Paris Agreement can be achieved for many different states of the built environment, i.e. the cities and other urbanised regions where people live, and thus for human populations experiencing significantly different qualities of life. These states may vary, for example, based on the abundance and diversity of plants and animals that they can support via ‘nature-based solutions’ and ‘urban greening’ initiatives. On this topic, it is unclear both: (1) what the landscape of feasible (e.g. consistent with the Paris Agreement) implementations of these initiatives are, and (2) to what extent they can contribute to biodiversity gain in urban environments.

This PhD project will progress research previously conducted by the Myers group [1-2] that aims to understand the natural resources requirements for supporting biodiverse ecosystems and to what extent natural resources may be provided through nature-based solutions and urban greening to increase biodiversity in urban environments. A goal of this PhD project will be to quantify these resource requirements for a variety of desirable population units (i.e. networks of predators, prey, and plants within a biodiverse ecosystem), considering resource substitution, e.g. plants for food waste, and different habitat types.

The PhD student working on this project will be joining the Myers group, which contains ~10 postdocs and PhD students working on interdisciplinary topics in sustainable materials and the built environment. We are passionate about science and sustainability. We are seeking a student who shares similar values; is ambitious, inquisitive, creative, and independent; and will enjoy working at the exciting and fast-moving cutting edge of sustainability science, in one of the world’s top universities and locations for this area of research.

References:

1. Mason, A.R.; Gathorne-Hardy, A.; White, C.; Plancherel, Y.; Woods, J.; Myers, R.J. Resource requirements for ecosystem conservation: A combined industrial and natural ecology approach to quantifying natural capital use in nature. *Ecology and Evolution*, 2022, 12, e9132.

2. Mason, A.R.; Puchol-Salort, P.; Gathorne-Hardy, A.; Smith, B.M.; Myers, R.J. Local terrestrial biodiversity impacts in life cycle assessment: A case study of sedum roofs in London, UK, *Journal of Industrial Ecology*, 2024, 28, 496-511. https://doi.org/10.1111/jiec.13482

Academic requirements and experience

Required

- A good first class degree (or international equivalent) in a STEM subject, e.g., Environmental Engineering, Environmental Science, Physics, Biological Sciences, Ecology, Geography.
- Strong interest in sustainability and research.
- Excellent English communication skills.

How to apply

Applicants wishing to be considered for this opportunity should send the following application documents to Dr. Rupert J. Myers (r.myers@imperial.ac.uk):

1. Current CV including degree result and, if possible, class ranking

Application via the Imperial College Registry is not necessary at this stage.

Applications will be regularly reviewed until the position is filled.

Funding notes

Applicants interested in this project and seeking funding via scholarship schemes (see here: https://www.imperial.ac.uk/study/pg/fees-and-funding/scholarships/) or can self fund are welcome to apply.