**Mayor of London’s Climate Resilience Review** **Submission: Imperial College London**

**Explanatory note:**

This response has been developed by Imperial colleagues from across the College’s expertise.   
  
In this submission, the full names of contributing researchers will appear at the beginning of their first answer and any subsequent answers will begin with their initials. A full list of contributors is included at the foot of the document.

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**Question 1: What challenges have climate impacts in London, like floods, extreme heat, droughts, and storms presented to your organisation/business/community?**

**Olivia Ashby**: Rising temperatures impact the cooling demands of our assets and have resulted in heavy strain on systems especially during the extreme heatwave last summer. Factoring in climate resilience at the design stage is challenging for new developments as recommended accreditation and benchmarks continue to evolve.

**Question 3: Does your organisation/business/community have a plan in place to manage climate risks? Has the plan changed your business model?**

**OA**: We stay up to date with relevant legislation (both current and future) to ensure that our assets are compliant today and will be going forward. For instance, we procure EPC reports to understand the environmental efficiency of our assets, and request EPC Plus reports for properties which we anticipate will require improvements to enhance this performance.

We recognise that real estate is central to climate change mitigation strategies and understand the importance of achieving carbon neutrality across the portfolio. We will therefore develop a net zero pathway which aligns with the College’s ambitions and the guidance provided by industry bodies such as the Principles for Responsible Investment.

**Question 7: What opportunities does climate adaptation and resilience in London present for the UK economy, businesses or communities? What is already working well? Please share any examples of success.**

**Jennifer Bird:** We welcome the recognition given to the value of green spaces and urban greening in The London Plan and the London Environment Strategy. The incorporation of blue (for example ponds, fountains or water gardens) and green (such as trees or green roofs) infrastructure into urban areas can help to provide cooling effects and reduce the urban heat island effect. Such green or blue space can provide a host of other benefits to society, including greenhouse gas mitigation, improved biodiversity, and improved mental and physical health of populations[[1]](#footnote-2)

We also welcome the ‘cooling hierarchy’ for major developments as set out in The London Plan. Mechanical cooling such as air conditioning can contribute to the urban heat island effect and increase heat exposure for those without access to mechanical cooling (typically the poorest in society have the least access to mechanical cooling)[[2]](#footnote-3).

**Ana Mijic**: It is very important to recognise the impact of climate change on water systems in London. Our recent study on Subregional Integrated Water Management Strategy for the GLA [ref]  has shown the implications for both high flows (flood risk), low flows (drought impacts) and water quality under the future climate change scenarios. This will be exacerbated by the pressures from new developments, which significantly alter the urban water cycle. A concept of water neutrality, that is introducing planning and water management options to offset the impacts of climate change and urban development from the perspective of water flow and quality, provides a framework to guide policy towards water stress reslience urban systems. In our work [ref] we have shown that water neutral strategies for London should include a combination of water-sensitive urban design options in both the new developments as well as for retroffting the existing homes.

**Question 8: What more could be done to support your organisation/business/community and/or sector to prepare for more extreme weather in London? What barriers do you face?**

**OA**: More guidance and resources on climate adaptation strategies would be beneficial. Barriers include financial constraints (e.g. payback period and risk of obsolescence with new technologies) and regulatory challenges for development (e.g. fire safety risks with innovative sustainable designs, potential for cladding repeat).

**Question 9: What more could local and/or national government, or the Mayor, do to support efforts to prepare for more extreme weather in London?**

**JB:** The health impacts of extreme heat events can be affected by the relative humidity[[3]](#footnote-4). This is because our ability to cool ourselves by sweating is affected by the level of humidity in the air; when humidity is high, a temperature which might otherwise have been ‘uncomfortable’ can become a risk to health[[4]](#footnote-5).

Changing the definition of a heat event to include relative humidity as well as temperature would help to improve protection against heat-related health impacts. The Italian Heat Health Prevention Plan in Lazio, Italy, is a good example of where relative humidity has been incorporated into risk metrics[[5]](#footnote-6).

We welcome measures that have been put in place to:

* reduce the potential for internal overheating in new developments,
* develop a communications protocol for Londoners in times of extreme heat (and cold) events, which will prioritise ‘at risk’ and ‘disadvantaged’ groups, and
* provision of H-SWEP guidance for London local authority rough sleeping lead officers.

Additional interventions that could help to reduce vulnerability include:

* increasing surveillance of people at risk through phone and home visits (for example elderly people, people with disabilities, people living alone and people with comorbidities),
* implementing workplace heat-response plans, especially for outdoor workers, whose work requires physical exertion.

**OA**:  Greater funding for STEM focused Universities could help to facilitate climate adaptation projects in regeneration areas, where there is already a high level of change and new infrastructure coming forward (e.g., OPDC, HS2, White City Innovation District). Developers should be incentivised to implement sustainable development practices through policies and regulations, for instance, a Creative Enterprise Zone but instead focused on climate resilience in areas where risk of climate impacts are high.

**AM**: Our recent study on Subregional Integrated Water Management Strategy for the GLA[[6]](#footnote-7)  has shown the value of using integrated modelling to understand the implications for creating water systems resilience to climate change and development. The evidence enabled the GLA to establish implications of planning and water management decisions by a range of stakeholders, including Local Authorities, water companies and the regulators (Environment Agency), which emphasised the need for stronger coordination and collaboration. Models such as Water Systems Integration Modelling framework[[7]](#footnote-8) used in the GLA study can provide such evidence, while the interactions between the physical and social systems can be analysed using the network theory [ref], which is currently under development for the London case study.

**Question 10: Is there a policy idea, and/or infrastructure investment(s), that will help us prepare for climate impacts in London that you think we should consider as part of the review?**

**OA**: Consider incentivising green building certifications/climate resilient design for new developments in London to offset the additional costs associated, e.g., reduced CIL (Community Infrastructure Levy). Some level of trade off or access to government funding will be needed to ensure schemes remain viable (very challenging/impossible environment given construction costs, building safety regs and affordable housing requirements).

**Rafaele Della Croce**: It is important to draw lessons from international examples. For example, in a recent paper the Centre for Climate Finance and Investment at Imperial (through its Singapore Green Finance Centre) looked at [urban adaptation in Singapore](https://www.singaporegreenfinance.com/wp-content/uploads/2023/02/Are-Markets-Interested-in-Adapting-to-Climate.pdf).

In fact, Singapore has an ambitious urban adaptation approach that is widely considered exemplary among capital cities throughout the world]. It has been successful in particular in developing a whole of government approach to adaptation which sets a clear transition pathway to a climate-adapted city. Singapore has a suite of government adaptation and climate financing initiatives in play that are rarely seen, or at least reported, in other cities. Singapore has set out the cities’ adaptation needs, and the Government has committed S$110 billion to adapting the city out to 2050. This funding commitment is on top of generous funding in the previous decade of its ambitious water sensitive urban design (WSUD) programme and activities to tackle rising sea levels. A sense of urgency in tackling both climate mitigation and adaptation in tandem has been widely communicated from the top down in the City State.

**Question 11: Are there any other implications of the physical impacts of climate change that the Review should consider?**

**AM**: While the typical water management studies that analyse impacts of climate change focus on the aspects of changes in flood and drought risk, it is very important to also analyse implications for river water quality, in particular in the context of recent debate on the pollution from the Combined Sewer Overflows (CSO), which we analysed at a systems level[[8]](#footnote-9) and fertiliser use that we simulated using an integrated modelling[[9]](#footnote-10). Climate change will increase the surface runoff that will create a pressure on already stressed urban water infrastructure, likely increasing the likelihood of CSO spills. At the same time, more prolonged droughts, combined with the increased pressures from the extensive development and land use change, will have a negative effect on the rivers’ capacity to dilute the incoming pollution. Our study on Subregional Integrated Water Management Strategy for the GLA showed that in London, proposed upgrades of the Wastewater Treatments Works in the Lea Valley will contribute to only partial removal of phosphorus, as a large portion of the pollution is coming into the system from the upstream rural land.

**OA**: The IPO is working with the Environmental Research Group on an air quality monitoring project in North Acton. The Review could therefore explore the relationship between transportation and climate change, both the impact that polluting emissions released by road vehicles has on air quality, as well as the consequence of climate change on infrastructure e.g., weakening roadway materials.

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**Further information:**

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1. <https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/Integrating-green-and-blue-spaces-into-our-cities---Making-it-happen-.pdf> [↑](#footnote-ref-2)
2. <https://www.sciencedirect.com/science/article/pii/S0959378021000789> [↑](#footnote-ref-3)
3. <https://link.springer.com/article/10.1007/s40572-022-00386-0> [↑](#footnote-ref-4)
4. <https://www.nature.com/articles/s41612-023-00346-x> [↑](#footnote-ref-5)
5. <http://medcof.aemet.es/images/doc_events/medcof7/docMedcof7/presentaciones/MedCOF7_DeDonato_SSRL.pdf> [↑](#footnote-ref-6)
6. <https://scholar.google.co.uk/citations?view_op=view_citation&hl=en&user=jna5Be4AAAAJ&sortby=pubdate&citation_for_view=jna5Be4AAAAJ:j8SEvjWlNXcC> [↑](#footnote-ref-7)
7. <https://www.sciencedirect.com/science/article/pii/S2210670722006655> [↑](#footnote-ref-8)
8. <https://www.ciwem.org/policy-reports/storm-overflows> [↑](#footnote-ref-9)
9. <https://scholar.google.co.uk/citations?view_op=view_citation&hl=en&user=jna5Be4AAAAJ&cstart=20&pagesize=80&sortby=pubdate&citation_for_view=jna5Be4AAAAJ:wbdj-CoPYUoC> [↑](#footnote-ref-10)