Engineering and Physical Sciences Research Council Doctoral Landscape Award

PROJECT TITLE: Cool Play – Assessing and Improving the Climate Resilience of Playgrounds

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Project details:

Background and motivation: Climate change is increasing the frequency and intensity of heat events, which has profound effects on children's lives [1]. Playgrounds are essential spaces for play; away from home they are the number one place that children in Britain play [2]. They support not only play but physical activity, social interaction, and healthy development. Playgrounds are often designed with limited attention to thermal comfort or climate resilience; surfaces such as rubber mats, asphalt, and metal play structures can reach extremely high temperatures, creating unsafe and unusable conditions [3]. Despite this, little empirical research has systematically measured microclimatic conditions on playgrounds or linked them to patterns of use. Evidence-based strategies to enhance resilience, particularly nature-based solutions such as tree planting, vegetated shading, and material choices, are urgently needed [4].

Vision and objectives: This project aims to generate new knowledge on the thermal performance of playgrounds and develop actionable solutions for playground designers, manufacturers, urban planners, and local authorities. Its objectives are:

1. To systematically characterise temperature, solar radiation, and surface heat dynamics in playgrounds under varying weather conditions.
2. To analyse playground use patterns (frequency, duration, user demographics) in relation to environmental conditions.
3. To identify and evaluate design interventions, especially nature-based solutions such as trees and vegetated shading, but also material substitutions and artificial shading.
4. To co-develop practical guidance with stakeholders (e.g., local authorities, schools, landscape architects) for climate-smart playground design.

Research programme and approaches: The project will employ a mixed-methods approach:

- Field measurements: Microclimatic sensors will record air temperature, surface temperature, humidity, and solar radiation across diverse playground settings. Data loggers and handheld infrared thermography will be used for fine-scale surface mapping [5].
- Behavioural observation: Systematic observation protocols will be applied to quantify playground use. Statistical modelling will link environmental parameters with user patterns, controlling for confounders.

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- Design interventions: Experimental modelling (e.g., ENVI-met simulations) and pilot interventions will test the impact of different design modifications on playground microclimates.
- Stakeholder engagement: Co-design workshops with local authorities, parents, and children will ensure solutions are practical, acceptable, and context-specific.

This project will contribute to climate adaptation research, with findings translated into planning guidelines, policy briefs, and design toolkits. Using mixed methods it will provide both theoretical insights and practical pathways to cooler, healthier, and more inclusive playgrounds.

References

[1] IPCC (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability.

[2] Dodd, H. F. et al. (2021). Children's play and independent mobility in 2020: results from the British Children's Play Survey. International journal of environmental research and public health, 18(8), 4334.

[3] Vanos, J.K. et al. (2016). Hot playgrounds and children's health: A multiscale analysis of surface temperatures in Arizona, USA. Landscape and Urban Planning, 146, 29–42

[4] Gill, S.E., et al. (2007). Adapting cities for climate change: The role of the green infrastructure. Built Environment, 33(1).

[5] Middel, A., et al. (2019). Micrometeorological determinants of pedestrian thermal exposure during record-breaking heat in Tempe, Arizona: Introducing the MaRTy observational platform. Science of the Total Environment, 687, 137-151.

Project specific entry requirements: Relevant previous research experience.

Potential PhD programme of study: PhD in Public Health (although could be different as appropriate)

Department: Public Health and Sport Sciences

Location: South Cloisters, St Luke's Campus

Please direct project specific enquiries to: Helen Dodd - h.dodd@exeter.ac.uk

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