Developing built environment policy for Australia's deadliest natural hazard, extreme heat

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A sociotechnical systems (STS) approach to understand bioclimatic urbanism

Built environment responses are effective at reducing heat-health risks, yet rarely implemented[1]. An STS method is used to identify and model bioclimatic design, a design process which considers both human comfort and local climatic factors[2], and its intersection with planning and urban design (bioclimatic urbanism).

Built environment and heat hazards

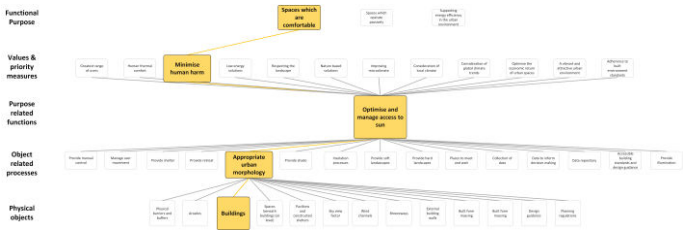
Extreme heat accounts for more deaths in Australia than all other natural hazards combined[3]. Urban design can reduce the health risks associated with extreme heat. These design solutions relate to surfaces' albedo (reflectivity), urban canopy cover, optimisation of air flow and reduction of solar exposure, however, such approaches are rarely a priority for implementation[4]. Urban planning, on the other hand, is responsible for ensuring that the built form is conducive to urban cooling, particularly through building heights, setbacks, and breeze corridors[5].

Urban systems methods

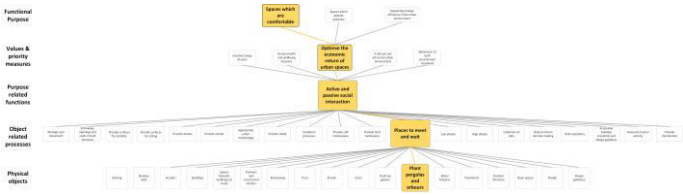
STS methods applied within urban systems can assist in unpacking the complexities of urban environments, providing practitioners with deeper understandings of the interdependent factors, inputs and outputs which make up cities and the elements within them[6]. Work Domain Analysis[7] is used to describe an archetype model of the system being investigated, bioclimatic urbanism.

An exploratory bioclimatic urbanism model

The functional purposes (top level) of the model establish it as one which fosters urban spaces which are comfortable and safe for human users (bio-), spaces which leverage the microclimate to operate in a passive manner (-climatic), and places the system in the domain of built environment, with considerations given to environment, social, economic factors in the public realm (urbanism). The purpose related functions (middle level) demonstrate the roles the system must perform, including the optimisation and management of microclimatic factors and typical public realm functions like interaction and wayfinding. Physical objects (bottom level) include resources, urban fixtures, building forms, natural assets, data and policy.



Example of means-ends connections from the purpose related function 'Optimise and manage access to sun'



Example of means-ends connections from the purpose related function 'Active and passive social interaction'

Next steps

In July 2023, validation workshops with built environment professionals in South East Queensland will be held to identify how the modelled elements interface with strategic policy and actors. This work is foundational for future research, which will analyse current and best practice planning and urban design policy for heat mitigation in urban climate modelling software (*ENVI-met*). This process will provide a rigorous, evidenced-based approach to the analysis and drafting of urban policy to ameliorate urban microclimates.

References

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Further information

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