

Improving climate resilience in the urban environment: Enhancing the uptake and use of building-scale to city-scale decision support models by policymakers and industry

Summary

The ARCC network aims to develop and exchange knowledge and evidence to inform policy and practice. It covers a host of EPSRC funded research projects focused on adaptation to changes in the built environment and infrastructure. There are currently 37 completed or ongoing projects hosted on the ARCC website, which provides a focal point for knowledge exchange, information and engagement opportunities, and engages with a wide range of stakeholders.

The funded projects all include dissemination plans, including some which explicitly aim to provide models, visualisation tools, or data for stakeholder use. However, difficulties in the accessibility and readiness of outputs for industry integration or application by stakeholders means that many tools and research outputs do not transition from the academic sphere to potential end users. Researchers themselves have highlighted issues surrounding the usefulness of the data they provide, including whether decision makers can fully understand, interpret, and use data in the manner it is provided; and how outputs will fit to the specific needs of stakeholders involved in complex decision making processes.

As such, the ARCC projects have the potential for much greater policy and practice application beyond their current impact and ongoing stakeholder interest. A desktop review of the 37 ARCC projects was undertaken with a key focus on projects aimed at the building- to city-scale, and which explicitly highlight the development and provision of models and data to inform policy and practice. Table 1 highlights some of the *emerging barriers* identified from an academic perspective, at different stages of a research project, that can restrict the wider usability and application of project outputs.

Based on the desktop review 12 ARCC projects were highlighted to be considered in further detail. Six of these projects, focused on building to city scale, were selected as case studies to facilitate a more detailed analysis of research limitations and barriers to dissemination and uptake of outputs; to explore and test potential options to enhance dissemination and engage with stakeholders, and re-evaluate the proposed options. These findings, alongside information gathered through researcher and stakeholder interviews and workshops, will be used to provide guidance to help inform and support research projects in developing clear and practical strategies to design, enhance, and manage the future uptake of outputs. The ARCADIA project will be used as a core case study on which to test and trial guidance with stakeholders, alongside selected projects which are still to be completed and could benefit from consideration of the current barriers and emerging principles. Figure 1 highlights some of the *emerging principles* identified, which could be incorporated at different stages of a research project.

Table 1: Potential barriers restricting the provision and uptake of ARCC project models and data

Proposal Design Stage	Research Stage	Project Completion Stage	Post-Project Completion
Projects with clearly defined data outputs in an industry standard format have proven more successful at delivering impact. Multi-data, multi-model projects are less explicit on how final outputs will be produced for uptake by industry and/or stakeholders	Stakeholder groups often provide expert advice, but there is limited interaction with relevant personnel who would work with data/models as well as core stakeholders.	Lack of clear, stakeholder relevant, documentation on what models/data outputs have been provided and how they could be utilised.	Need to ensure longevity of outputs. If websites are to be lost when project funding completes there should be a clear plan to archive information and data, or for continued management and updates beyond the project.
There can be discord between proposed data outputs and type/format of stakeholder/industry data sets/standards	Academic advances can provide more detailed data, e.g. probabilistic data. However, such data may not be easily usable by stakeholders.	Online models, tools and datasets do not materialise, or are not freely/easily available/useable. Data not provided in useable formats	Broken links and tools available online not working correctly and not maintained.
Planned stakeholder engagement and pathway to impact often focused on providing information, rather than two-way engagement and working.	Providing multiple data files can be a significant step forward, but can also present complexity where clarity is needed.	Models are still in prototype stages, or data is a proxy and cannot be used to inform policy decisions.	Inconsistencies in results across different projects can cause confusion and provide a barrier to action and uptake.
The focus is often on the policy relevance, with less connection to practice – i.e. how outputs could be used in practice to inform and support decisions being made and adaptation strategies being implemented on the ground.	Data becomes available over a range of time-frames. In some cases, outputs may take years depending on the project length. This can be incompatible with the needs of stakeholders, changing staff and priority areas.	Limited guidance so users can understand and select the most relevant files for their needs, and understand differences if different files are used by others.	Stakeholders may not have the computational and staff resources required to incorporate models, data, or results.
To satisfy expectations of multiple stakeholder’s researchers need to have clearly defined policy questions to inform. However, an output of research is often the understanding of complex systems and framing policy questions. As such, these are not always possible to clearly define at the outset.	Keeping stakeholders involved and engaged through the model development process can be difficult due to the long timeframe of development for models and time until visible outputs are available.	At final dissemination events the focus is often on the empirical and scientific evidence, rather than the stakeholders’ specific needs, how they could use outputs, and what this would mean for their practices.	May be limited demand for outputs generated. For example, scientific advances may be beyond what is possible in practical and policy terms, and issues linked to the perceived robustness and added value of using new data.
Methods/novel aspects may be proposed based on data that exists but requires sharing and collaboration from private and/or public stakeholders. This may be initially proposed but not possible further down the line; data content/format may differ to what was expected; full data sets may not be provided; and data may not be the “best” available but the most accessible.	Researchers may complete a certain model/data component of the project and leave the project before the end. This can reduce the ability to evaluate and analyse at a later stage how outputs can be used by stakeholders, and to provide ongoing technical advice.	Due to complexity in modelling researchers often provide results to address specific questions but at this stage further re-analysis is very difficult and requires expert knowledge and ability to use models/tools.	Models or data outputs require expert knowledge to use and interpret, and cannot be used independently by stakeholders.

Figure 1: Emerging principles which could be incorporated to help facilitate the provision and uptake of ARCC project models and data

