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Lonsdale, Kate, Coles, Tim, O'Hare, Paul , Douglas, Caitlin, Scott-Bottoms, Stephen, Kennedy-Asser, Alan, Rougé, Charles and Wagner, Corinna (2024) Learning from organisational embedding for climate resilience. In: Quantifying Climate Risk and Building Resilience in the UK. Palgrave Macmillan, Cham, pp. 43-59. ISBN 9783031397288 (hardcover); 9783031397295 (ebook)

**DOI:** [https://doi.org/10.1007/978-3-031-39729-5\\_4](https://doi.org/10.1007/978-3-031-39729-5_4)

**Publisher:** Palgrave Macmillan

**Version:** Published Version

**Downloaded from:** <https://e-space.mmu.ac.uk/633664/>

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## Learning from Organisational Embedding for Climate Resilience

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### Abstract

- This paper describes the UK Climate Resilience Programme (UKCR) Embedded Researcher (ER) scheme, in which 13 researchers were 'embedded' within 'host' organisations to undertake a research project of mutual interest.

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Findings are based on conversations with all UKCR embedded researchers and several hosts.

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S. Dessai et al. (eds.), *Quantifying Climate Risk and Building  
Resilience in the UK*,  
[https://doi.org/10.1007/978-3-031-39729-5\\_4](https://doi.org/10.1007/978-3-031-39729-5_4)

- There was considerable interest in the scheme from public, private and third sector organisations.
- The COVID-19 lockdowns limited the extent that ERs could physically work within their host organisation, but embedding and collaborative working was still achieved.
- ERs and hosts agreed that the approach enabled more fit-for-purpose outcomes than through traditional research or consultancy; future schemes could include ‘host’ staff spending time in research institutions to better understand the nature of academic knowledge production.
- Factors influencing effectiveness included the perception of being ‘on the inside’ of the organisation; the flexibility of the research workplan; the openness of the ER and host to learning; a facilitative and curious outlook; and the commitment to achieve mutually beneficial goals.

**Keywords** Embedding · Transdisciplinarity · Resilience · Research · Co-production

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## 1 INTRODUCTION

As the imperative for effective responses to our changing climate grows, so too do calls for more agile ways to bring climate-related information into decision-making, and allowing policy and practice to inform research directions and approaches [1, 2]. However, this is not straightforward—research must engage with a diversity of stakeholders and sectors and in a range of organisational settings. Spanning science, policy and practice requires careful brokering, convening and sense-making to ensure climate information fits organisational contexts, and reciprocally shapes ongoing production of knowledge [3–6].

Traditional climate science communication is often portrayed as the linear transmission of information and knowledge between ‘producers’ and ‘users’ [7]. In this chapter, we present the UKCR’s Embedded Researcher (ER) scheme as an alternative and reflect on its relative merits and achievements. By placing researchers within host organisations, the scheme acknowledges the importance of organisational contexts, with climate science as one of several sources of decision-relevant information needed. Novelty and research excellence emerge from shared development and discovery, ensuring information is ‘actionable’ and fit-for-use. An underlying premise is that more trusting researcher-host relationships evolve through immersion, as well as close, collaborative working towards a common purpose. This supports deeper exploration of constraints to action, resulting in significant and meaningful outcomes.

## 2 THE EMBEDDED RESEARCHER SCHEME

The scheme comprised two cohorts of researchers embedded for up to 12 months. Cohort 1 had a two-stage application process: following a call for hosts to propose research questions, UK Research and Innovation (UKRI)/Natural Environment Research Council (NERC) published the 20+ research ideas, inviting interested researchers to contact the host organisations to prepare a collaborative bid. Cohort 2 had a single-stage application process, whereby researchers were invited to develop projects directly in partnership with host organisations.

## 2.1 *Funded Projects and Outcomes*

The scheme had an enthusiastic response from 35 public, private and third sector organisations. Table 1 summarises the 13 projects funded, and the range of contexts and outcomes achieved. Feedback from hosts was positive, but inevitably some projects were more successful and collaborative than others. The factors that influenced this are addressed later in this paper.

## 2.2 *A Note on Embedding During a Global Pandemic*

Cohort 1 started mid-pandemic (COVID-19). Through online working, attending meetings and sharing data was easy, but virtual working posed limits to the extent ERs could be fully embedded. For Cohort 2, a hybrid way of working was possible, allowing face-to-face meetings and events during spring and summer 2022. During the period of the scheme, online or hybrid working and ‘only travel if you have to’ advice became normal, inevitably changing expectations of embedding.

# 3 HOW DID RESEARCHERS AND HOSTS EXPERIENCE THE ER SCHEME?

Table 1 demonstrates the variety of organisational settings and projects under the UKCR ER scheme. The ER experience also varied, in terms of how embedded the researchers felt and how collaborative the work was. Remote working during the COVID-19 lockdown reduced opportunities for informal contact with colleagues, which made it harder for some to distinguish their work from consultancy or traditional research. Others reported feeling well-embedded, and that ‘moving online’ made joining meetings with senior colleagues and outside organisations easier.

In terms of added value, the ERs increased the capacity, impact and reach of hosts’ work, contributed new ideas and ways of working, and were able to take advantage of opportunities that arose, such as the drafting of the adaptation and resilience section of Manchester’s climate policy <https://www.manchesterclimate.com/framework-2020-25>. Some elements are indistinguishable from what could be achieved through traditional research or consultancy, such as giving advice on how to use probabilistic projections or providing additional ‘bandwidth’ to support ongoing work. The following quotes captured from hosts and ERs and

**Table 1** The details of the funded projects across the two cohorts

| <i>Host</i>   | <i>Academic institution</i>                     | <i>Project title and outcome</i>   | <i>Duration (intended)</i>                                  | <i>Academic status at start</i>        |
|---|---|--|---|--|
| <i>COHORT 1: (September 2020–December 2021)</i>                                 |   |  |   |  |
| Space4 Climate <sup>a</sup> with London Climate Change Partnership <sup>b</sup> | King's College London <sup>c</sup>              | <b>Climate Stress Testing</b><br><i>Outcome:</i> Brought together stakeholders in the UK food supply chain and the earth observation industry to improve the UK's food security  | 12 months<br>0.6 FTE<br>(later 0.4 FTE)                     | Research Associate                     |
| Environment Agency <sup>d</sup>   | Newcastle University <sup>e</sup>               | <b>Environment Agency Incident Response</b><br><i>Outcome:</i> Clearer characterisation and quantification of current Environment Agency flood and drought incident response activity, and capacity required for future climates   | 12 months<br>0.5 FTE  | Lecturer                               |
| Department for Education <sup>f</sup>   | University College London <sup>g</sup>          | <b>ARID</b><br><i>Outcome:</i> Enhanced characterisation, quantification and communication of climate-related school building asset management risks through developing adaptation pathways to rising heat stress  | 12 months<br>Full time                                      | Research Assistant<br>(Completing PhD) |
| Manchester Climate Change Agency <sup>h</sup>                                   | Manchester Metropolitan University <sup>i</sup> | <b>Manchester Climate Action</b><br><i>Outcome:</i> Established a baseline assessment of Manchester's climate risk, and a policy and action-planning framework to enable Manchester to adapt to and increase resilience to climate variability   | 12 months<br>0.8 FTE  | Senior Lecturer                        |
| Bristol City Council <sup>j</sup>   | University of Manchester <sup>k</sup>           | <b>Bristol Heat Resilience</b><br><i>Outcome:</i> Co-developed a Heat Vulnerability Index and a Heat Resilience Plan for Bristol to support the City Council in developing heat risk reduction strategies and increased resilience for citizens, communities and businesses <sup>l</sup> | 17 months<br>1.0 FTE<br>(with additional funding from host) | Researcher<br>(Completing PhD)         |

(continued)

**Table 1** (continued)

| <i>Host</i>   | <i>Academic institution</i>            | <i>Project title and outcome</i>  | <i>Duration (intended)</i> | <i>Academic status at start</i> |
|---|--|---|----------------------------|---------------------------------|
| Anglian Water <sup>m</sup>  | University of Sheffield <sup>n</sup>   | <b>Water Sector Resilience</b><br><i>Outcome:</i> Initiated a long-term collaboration to identify and address gaps in climate adaptation in water resource systems to support better system-level adaptation planning   | 12 months<br>0.5 FTE       | Lecturer                        |
| <i>COHORT 2: November 2021–October 2022 (and ongoing at time of writing)</i>              |  |   |                            |                                 |
| Leeds City Council <sup>o</sup> with Yorkshire and Humber Climate Commission <sup>p</sup> | University of Manchester <sup>q</sup>  | <b>Yorkshire Climate Action</b><br><i>Desired outcome:</i> Clarity on responsibility for implementing the Yorkshire and Humber Climate Commission's new Climate Action Plan in Leeds City Council, using performance to kick-start conversations with different service areas | 12 months<br>0.2 FTE       | Professor                       |
| City of London Corporation <sup>r</sup>   | British Geological Survey <sup>s</sup> | <b>London Climate Action</b><br><i>Desired outcome:</i> Improved understanding of how urban subsurface space can be used to deliver the City of London's Climate Action Strategy and improve climate resilience   | 12 months<br>0.5 FTE       | Researcher                      |
| JBA Consulting <sup>t</sup>   | Newcastle University <sup>u</sup>      | <b>Stochastic Simulation</b><br><i>Desired outcome:</i> Improved understanding and use of stochastic weather generators in applied UK climate resilience projects, with a focus on flood and water management   | 12 months<br>0.75 FTE      | Research Associate              |
| Climate Northern Ireland <sup>v</sup>   | University of Bristol <sup>w</sup>     | <b>Once Upon a Time</b><br><i>Desired outcome:</i> Improved two-way dialogue between rural/agriculture and academic/policy communities, leading to better understanding of climate risk and resilience options <sup>x</sup>   | 12 months<br>0.55 FTE      | Research Associate              |

(continued)

**Table 1** (continued)

| <i>Host</i>  | <i>Academic institution</i>            | <i>Project title and outcome</i>   | <i>Duration (intended)</i> | <i>Academic status at start</i> |
|--|--|--|----------------------------|---------------------------------|
| Time and Tide Bell <sup>y</sup>  | University of Exeter <sup>z</sup>      | <b>Time and Tide</b><br><i>Desired outcome:</i> Greater understanding of how Time and Tide Bells, specifically, and science-informed art more generally help communities become more resilient in the face of climate change and socioeconomic inequalities                    | 12 months<br>0.2 FTE       | Professor                       |
| Church of England <sup>aa</sup>  | University of Manchester <sup>ab</sup> | <b>Resilience for Churches</b><br><i>Desired outcome:</i> Enhanced community climate resilience and protection of Church of England's churches and other heritage buildings through the collation and dissemination of successful climate adaptation strategies already in use | 12 months<br>0.8 FTE       | Researcher<br>(Completing PhD)  |
| National Trust <sup>ac</sup> and Historic Environment Scotland <sup>ad</sup> | University of Exeter <sup>ac</sup>     | <b>Tourism Adaptation</b><br><i>Desired outcome:</i> Greater awareness of the potential impact of future climate change and scenarios on visitor business  | 12 months<br>0.4 FTE       | Professor                       |

*Notes* <sup>a</sup><https://space4climate.com/>; <sup>b</sup><https://climatelondon.org/>; <sup>c</sup><https://www.kcl.ac.uk/>; <sup>d</sup><https://www.gov.uk/government/organisations/environment-agency>; <sup>e</sup><https://www.ncl.ac.uk/>; <sup>f</sup><https://www.gov.uk/government/organisations/department-for-education>; <sup>g</sup><https://www.ucl.ac.uk/>; <sup>h</sup><https://www.manchesterclimate.com/>; <sup>i</sup><https://www.mmu.ac.uk/>; <sup>j</sup><https://www.bristol.gov.uk/>; <sup>k</sup><https://www.manchester.ac.uk/>; <sup>l</sup><https://www.bristol.gov.uk/council-and-mayor/policies-plans-and-strategies/energy-and-environment/the-keep-bristol-cool-mapping-tool>; <sup>m</sup><https://www.anglianwater.co.uk/>; <sup>n</sup><https://www.sheffield.ac.uk/>; <sup>o</sup><https://www.leeds.gov.uk/>; <sup>p</sup><https://yorksa.nthumberlandclimate.org.uk/>; <sup>q</sup><https://www.manchester.ac.uk/>; <sup>r</sup><https://www.cityoflondon.gov.uk/>; <sup>s</sup><https://www.bgs.ac.uk/>; <sup>t</sup><https://www.jbaconsulting.com/>; <sup>u</sup><https://www.ncl.ac.uk/>; <sup>v</sup><https://climatenorthernireland.org.uk/>; <sup>w</sup><https://www.bristol.ac.uk/>; <sup>x</sup><https://ukcrp.shinyapps.io/AgricultureNI/>; <sup>y</sup><https://timeandtidebell.org/>; <sup>z</sup><https://www.exeter.ac.uk/>; <sup>aa</sup><https://www.churchofengland.org/>; <sup>ab</sup><https://www.manchester.ac.uk/>; <sup>ac</sup><https://www.nationaltrust.org.uk/>; <sup>ad</sup><https://www.historicenvironment.scot/>; <sup>ae</sup><https://www.exeter.ac.uk/>



hosts highlighted what made the UKCR ER approach unique—and thereby more impactful:

- Researchers gained a deeper understanding of the organisation.

Embedding gave me a more complete understanding of how the organisation works and what information they need to make decisions (e.g. sectors, geographic regions, level of detail). (ER)

All of the materials that he's [the ER] developing for us – and the workshops he's going to run – suit us because he's embedded enough to understand how to do them in a way that works in our slightly odd and complicated organisation. (Host)

- Through the extended collaboration, there was time to experiment and to revise.

Through exploring something together, we gained a first step in a new area with an array of challenges we need to overcome to move forward. This was quite a high-risk piece of work which would not have worked as a consultancy project. (Host)

- Researchers and hosts forged long-term relationships.

I had time to work with the host to identify operational gaps for future research. We identified two such gaps, leading to an Engineering and Physical Sciences Research Council (EPSRC) grant and an Industrial Cooperative Awards in Science & Technology (CASE) doctoral studentship. (ER)

This was a great way to establish a working relationship. I hope we will have many more collaborations with our ER. Some papers are planned and the conversation is certainly ongoing. (Host)

- Researchers were able to act as a catalyst.

This allows you to join up a whole bunch of people who are thinking, doing, or wanting to do things in their community. (ER)

- Researchers were able to develop a more meaningful dialogue with hosts.

Embedding is the way to get to what people want, which is action. Because you're in the inside there is less of a perceived barrier. You have more time to get feedback and think through what will work. (ER)

By listening to people, their identities, their concerns, and feeling part of it yourself, you want to avoid solutions that don't work, like a policy prescribed by someone who has no idea about that locality, or the people's lives in that locality. (ER)

- The scheme supported more effective communication and engagement.

I used to do a lot of public engagement. Embedding is just a totally different way of doing it - a better way. Now just getting up on a stage and giving a public talk seems like a waste of time. This is a much deeper way of engaging because you're part of it. (ER)

I have changed how I communicate. It used to be very one-directional. Good storytelling is patient, slow and takes time. And that's what embedding does. It is not standing up and giving a talk and answering questions at the end, and then going home. It is weeks of having conversations and eventually you get these 'aha!' moments. (ER)

- Links were forged across boundaries and between internal/external expertise and action.

We talk about interdisciplinarity, but this is beyond that. You're working across disciplines, and you're still doing researcher stuff, but you're also a facilitator, a convenor, a planner. And you're responding to whoever you're working with. (ER)

- Researchers gained new perspectives on the knowledge needed for decision-making.

It's a humbling experience, the recognition that there is whole set of other types of knowledge, experience and wisdom out there. (ER)

I used to think there was very little information on impacts in Northern Ireland. Now, after a year of meeting lots of people, actually there's so much knowledge out there. (ER)

I'm not as quick to go down a scientific rabbit hole and lose sight of 'what do we actually do to solve this?'. I've realised that often tiny, tiny details in the scientific research are not that necessary. (ER)

## 4 WHAT HELPED AND WHAT HINDERED IN ACHIEVING EFFECTIVE OUTCOMES?

Despite the variation between host institution and context, several common themes emerged from conversations<sup>1</sup> about factors that supported/constrained embedding and collaboration in the ER projects.

<sup>1</sup> Embedded researchers in both cohorts had on-boarding conversations with UKCR Champion Kate Lonsdale (the lead author of this paper) and periodic cohort meetings to share progress and discuss what was going well and less well, including the extent to which they were able to embed in their host organisations.

### 4.1 *Being ‘on the Inside’ of the Organisation*

Understanding how their project connected to the wider work of their team (or organisation) helped ERs to see how their project would add value. It also allowed host colleagues to see how they could support the research. The time needed for ERs to understand a different organisational culture, motivation and ways of working was sometimes underestimated, however.

#### *What Helped*

Sorting logistics (IT, access to data platforms, HR responsibilities) before the ER was in post; providing an organisational email so they were seen as part of the organisation (both internally and externally); and scheduling time with colleagues from the outset to understand the ‘big picture’ context of the work (with space for informal conversations).

#### *What Hindered*

Delays in accessing IT systems and data platforms; ERs feeling isolated and unsure how to contribute; and key host staff moving on, thereby losing the context and champion for the project.

### 4.2 *Flexibility in the Research Workplan*

The process benefitted from being seen as (at least partially) flexible and part of an ongoing enquiry into what had relevance in the problem context. This means not fixating too soon on specific outputs, milestones and timelines, but ‘holding them lightly’, to be explored as part of a process of mutual learning. Attitudes varied as to how fixed the initial work plan was across the UKCR ER projects; some were concerned about the barrier to future funding if named outputs were not achieved, while others focused on the ultimate goal, assuming that the workplan to achieve it was flexible and an essential part of any collaboration. One ER suggested that collaboratively defining the key questions has value in itself, and particularly valuable if it lays the groundwork for long-term collaboration.

*What Helped*

Conversation throughout, from initial scoping to final evaluation; and periodically reflecting on actual progress (compared with what had been expected) and the reason for any discrepancies.

*What Hindered*

Concerns about the workplan being ‘fixed’ before the work commenced, with inadequate understanding of the host context.

### 4.3 *Openness to Learning on Both Sides*

Both hosts and ERs need to be open to continued learning, as supported by the ongoing comparison between ‘expectation’ and ‘what emerges’ referred to above. So much of our practical knowledge is tacit, or even unacknowledged and out of our awareness. What seems obvious to the ER may be news to the organisation and vice versa. One ER, for example, reportedly underestimated the extent to which their host understood climate risk, causing a significant revision of the outputs. By allowing time to digest and talk through a problem, outlooks can be gently challenged, connections nurtured and ‘aha’ moments cultivated—especially when aspects that are only obvious to one side are revealed.

*What Helped*

Seeing discussions about changes to the workplan or an output as an important aspect of ensuring that the work remains fit-for-purpose; and recognition that there is not always best practice to follow, but that emerging and promising practice is understood and strengthened through dialogue and integrating different types of knowledge.

*What Hindered*

Pressure for the researcher to have answers before they have had time to understand the context; and pressure to take action before the relevant knowledge is integrated.

#### *4.4 Seniority and Length of Service Are Less Important Than Personality and Outlook*

The question “Are early career researchers (ECRs) better suited to this or can researchers at any career stage embed?” was discussed throughout the scheme. Some hosts particularly enjoyed working with someone at an early stage in their career, but others wondered, given the fixed funding available, would fewer days of a more senior academic be of greater value? One ER weighed up the options an ECR could fully embed within an organisation and create high-quality outputs. Conversely, they could be so concerned with developing their academic career that this shapes the focus of the work and they prioritise writing articles over spending the time to truly work for their host. Equally, a more senior person may be more ‘set in their ways’, used to advising and less good at listening, which might result in poorer outputs. They could have the experience and job security to focus on delivering high-quality outputs with the host.

Reflecting on the range of embedded researchers and the outcomes achieved, the relationship between the level of seniority and the project outcome proved inconclusive. Overall, the UKCR ER experience suggests that personality, skills and outlook are a better guide to impact than career stage.

##### *What Helped*

An ER taking a facilitative, person- and situation-centred approach; and an ER that is skilled in listening, making connections, seeing opportunities to achieve common goals and checking for relevance.

##### *What Hindered*

An ER imposing their own research agenda; an ER overly concerned with academic career progression; a lack of curiosity about the wider system from the ER’s perspective; and an ER with poor communication, teamwork and convening skills.

#### *4.5 Adequate Commitment from ER and Host*

The extent to which hosts actively engaged with the process varied considerably, which was in part linked to the host’s investment in the research question. Cohort 1 ERs (particularly ECRs with less established

networks) valued the two-stage application process (where they could respond to a list of host-identified research needs) and some ERs made clear that they would welcome more mechanisms for practitioners to advertise research needs. This was largely lost for Cohort 2, with the onus on researchers to forge their own connections.

Collaborative hosts found that the ER approach was more time-consuming than traditional research but resulted in more useful outputs. Not all hosts appreciated that for the embedding approach to work well, they needed to be actively engaged throughout the research process—from bid writing to evaluation. The UKCR approach could learn from other embedding approaches, such as FRACTAL [<https://www.fractal.org.za/>] to develop memorandums of understanding (MOUs) at the start, to clarify expectations, roles and responsibilities of all sides of an ER project.

Few ERs were able to commit full-time to the host setting, largely because of existing teaching commitments. Clearly, ringfencing days for embedding helped, although working from home during lockdown made this differentiation harder.

#### *What Helped*

Clear host understanding of, and commitment, to the scheme; ongoing conversations about expectations; and ERs ringfencing sufficient time without other distractions.

#### *What Hindered*

Blurring of time-boundaries between competing demands; burnout; working from home; and additional family commitments.

## 5 CONCLUSIONS

The boundary-spanning challenge that the ER projects were intended to accomplish is not one of a simple transfer of knowledge from academic producers to decision-making users, but about building connections between different sources of knowledge, the people (and organisations) who produce and hold this knowledge, and their decision-making processes. To work well, this requires research questions of importance to both host and researcher; it also requires upfront and ongoing dialogue about goals, drivers and outputs, alongside a mutual openness

to change plans to accommodate emerging insights and identify more fit-for-purpose outputs that align the different professional, academic and personal contexts of those involved.

The approach worked when it focussed on ‘what matters’ for the organisation, at a scale that made sense. Adaptation is context specific—organisations need support to explore tentative areas of interest, to understand the implications of headline climate messages for core business, to identify and trial new approaches, and to develop action plans and strategies. Across the 13 projects, the ER scheme provided tailored, human–human support, helping hosts to explore how to respond to climate risk in ways that felt meaningful. In the future, the scheme could be extended to enable organisational staff to embed in academic institutions, to better understand academic knowledge production.

The embedding approach is not a panacea for all circumstances and not the only way to span policy–practice–science boundaries. To work well, it requires a commitment of time, goodwill, flexibility and an openness to learning and ‘not knowing’ on both sides that can seem counter-cultural in some organisations—including academia where there is pressure to be ‘an expert’.

Being an ER means not having ‘the answer’ but working with others to pool knowledge and experience to produce something that is fit-for-purpose. ERs contextualise their academic knowledge through listening and understanding organisational constraints and incentives. This requires working with others to balance the big picture and the detail, to critically reflect on what has value, to unlearn previous assumptions and to be willing to change course to achieve the most appropriate outcome as new insight emerges. The skills needed to do this well are not yet commonly taught or valued in academia and deserve to be better appreciated and incentivised if we are to address the ongoing disconnect between climate information and adaptation action and ultimately achieve societal climate resilience.



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