Potential Avoidance of Carbon Emissions through Research (PACER) Framework

	Impact sector and boundary	Scale of impact	Implementation success risk	Dependencies on other factors
Narrative approach	What sectors will be users of the research, or impacted by the research once it is fully implemented?	Causal chain from areas of direct and indirect impact to greenhouse gas effects	Does implementation align with other sector drivers?	Is the carbon emission reduction linked to external factors such as electricity source composition?
	Does the research impact a stand-alone mechanism / interaction within this sector or does it have multiple points of impact?	Can the direct and indirect impacts be quantified? How does this compare to the baseline?	Does implementation require behavioural change or shifting of norms?	Could the emission reduction be reduced due to other drivers?
	What is the area of influence and what is outside this sphere?	What is the certainty that the predicted reduction will materialise?	Is there political / organisational motivation to support the shift to adoption?	
	Outline the actions and impacts resulting from implementation of the intervention?	What is the size of the market? UK or International?	Are there potential rebound effects that should be considered?	
Semi-quantitative approach	Define actions and impacts. Including the scale of impact and time-sensitivity	Estimate of the companies / installations / locations which could benefit? Determine risk factors which could limit materialisation of predicted carbon emission impacts	Define risk factors for 'softer' transition points not being realised Explore potential for implementation leading to wider consequences	Is there a time-frame beyond which predictions become less certain?
Quantitative approach	Determine emission factors and assumptions required to enable calculation of carbon emissions over time for each action and impact	Determine range of uncertainty within scenarios and incorporate into assessment	Incorporate risk factors into scenario development and exploration	Is there a temporal factor to incorporate into the assessment to generate emission reductions over time, incorporating scenarios and externalities?

Remember: This is an assessment of potential avoidance. It should be considered separate to carbon accounting reporting mechanisms and it is not a metric of carbon reduction performance.

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Acknowledgements
Developed by **C-DICE**, this Framework is a collaboration between **Loughborough University** and **University of Birmingham,** to help researchers assess potential carbon emissions of their research projects.

The development and application of the Framework is documented in the following paper:
Assessing avoided carbon impacts: introducing the Potential Avoidance of Carbon Emissions through Research (PACER) Framework available at:
https://doi.org/10.1080/17583004.2026.2682834

Guidance on how to use the Framework is also supported by a toolkit available at:
Online training resources – C-DICE

Application of this Framework should use the citation for either the published article or toolkit available through the above links.

For further information please contact us: research.academy@mailbox.lboro.ac.uk

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