



## NERC ENVIRONMENTAL RISKS TO INFRASTRUCTURE INNOVATION PROGRAMME. REVIEW OF PROGRAMME AND IMPACTS TO DATE



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Programme Coordinator  
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### 1. Background

The Environmental Risks to Infrastructure Innovation Programme (ERIIP) is a collaboration between the Natural Environment Research Council (NERC) and infrastructure owners, operators, policy-makers and regulators to enable the UK infrastructure sector to use environmental science to identify, quantify and manage environmental risks, such as those from extreme weather and climate change.

Through ERIIP, NERC are investing £5 million over 5 years to fund projects that take the outcomes of existing research and translate these into industry-relevant information, tools to help identify environmental risk, assess their impacts on infrastructure and develop solutions.

Infrastructure owners and operators, engineering consultants, contractors, insurers and investors, policy and civil society representatives, and regulators can join the Programme and become members of the Environmental Risks to Infrastructure Innovation Community (ERIIC). Current members of the Programme are:

- Arup
- Atkins
- EDF Energy
- Environment Agency
- High Speed 2
- HR Wallingford
- National Grid
- Network Rail
- Scottish Water
- Temple Group
- Translink NI
- Transport for London
- Transport Scotland
- Scottish and Southern Energy (SSE)
- UKWIR

This report brings together key figures on projects funded since 2014, the engagement with industry partners and subsequent impacts.

### 2. Projects funded to date

The Programme is open to a range of projects, from short term (3-6 month) feasibility studies, to longer-term, translational projects. The proposed projects must use existing science research (knowledge, data, models or skills) and translate this into outputs that meet the needs of the end user(s) (as opposed to generating new research outcomes).

The following types of innovation projects have been considered for funding:

- Syntheses and mapping of existing research in a particular area to aid and transfer knowledge to the industry
- Bringing together data from disparate sources (e.g. related to different environmental hazards, or environmental data with data on the engineering or economic impacts sourced from academia or project partners)
- Translation of existing data, knowledge, expertise into tools, solutions and approaches to meet a specific industry need
- Decision-support tools incorporating NERC data or knowledge
- Scenarios of environmental risks and their impacts on infrastructure
- Model synthesis, merging and manipulation to answer a specific challenge, need or issue.

Since 2014, **fifty-six collaborative projects** have been funded through the Programme. Case studies on the complete projects can be accessed at [CIRIA's NERC ERIIP webpage](#).

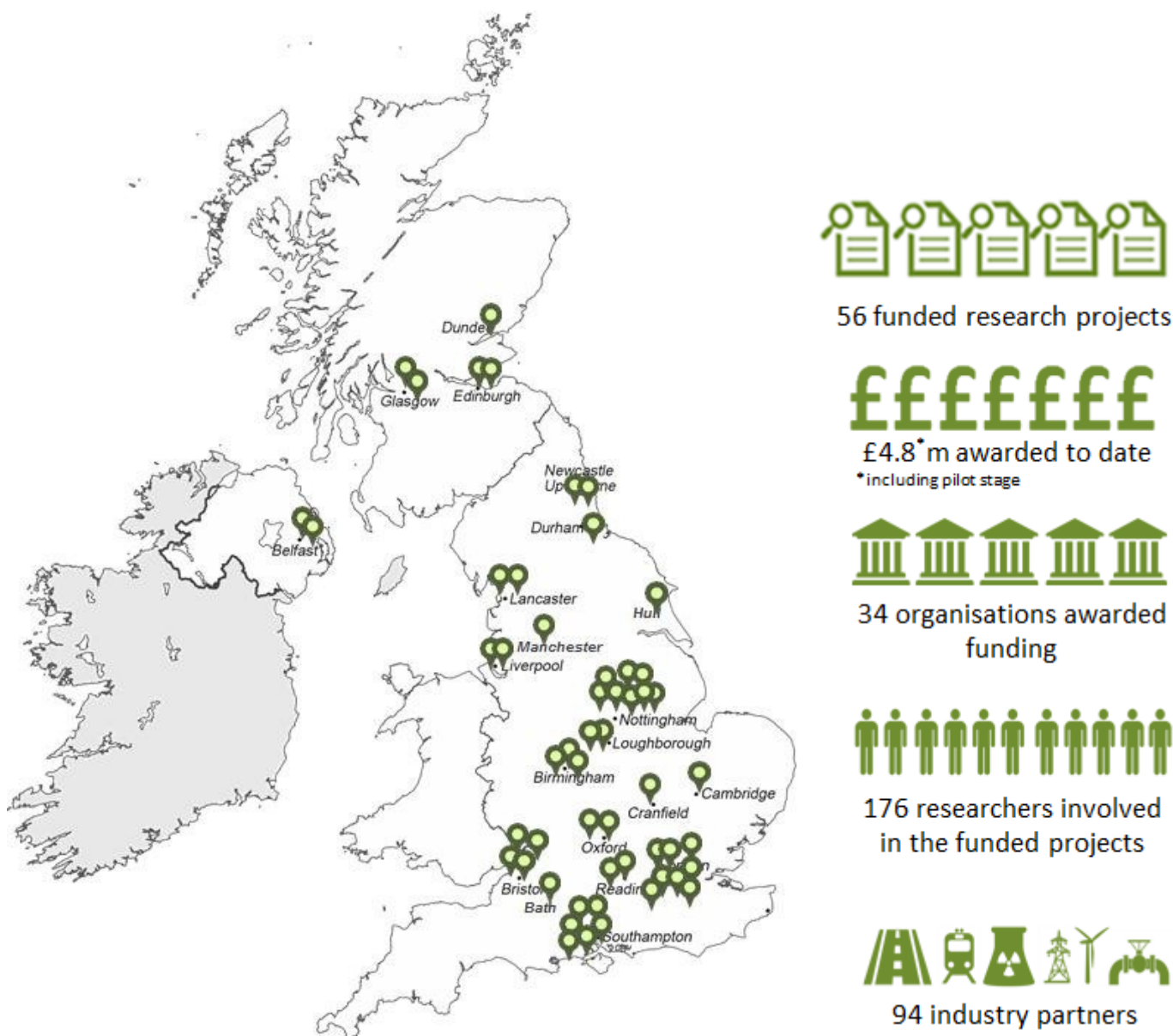


Figure 1: Geographic distribution of awarded Research Organisations across UK and key figures of awarded projects

	<b>Applicant/Grant Holder</b>	<b>Research Organisation</b>	<b>Title</b>	<b>Project partner(s)</b> <i>(ERIIC members in bold)</i>
<b>2014 Call (Pilot Call) – projects now complete</b>				
1	Dr Dina D'Ayala	University College London	Groundwater and Flood Risk in the London Rail Infrastructure Network: Building Resilience into Existing Masonry Infrastructure Assets	<b>Arup (Ove Arup and Partners Ltd) (UK), London Underground</b>
2	Professor Andrew Plater	University of Liverpool	Sandscaping for Mitigating Coastal Flood and Erosion Risk to Energy Infrastructure on Gravel Shorelines: a case study approach	The Crown Estate, NOC, Royal HaskoningDHV, <b>National Grid, Environment Agency</b> , Natural England, BGS
3	Dr Taku Fujiyama	University College London	Examining Risks of Coastal Flooding to Port Systems	Department for Transport, Dover Harbour Board
4	Dr Ana Mijic	Imperial College London	Improved techno-economic evaluation of Blue Green Solutions for managing flood risk to infrastructure	UK AECOM, <b>Environment Agency</b>
5	Dr Nevil Quinn	University of the West of England	Co-creating railway flood resilience: applying the science of blue-green-grey infrastructure	South Gloucestershire Council, <b>Network Rail Ltd</b> , Somerset County Council
6	Dr Christopher Jackson	NERC British Geological Survey	Assessing the risk of groundwater-induced sewer flooding to inform water and sewerage company investment planning	Thames Water Utilities Limited
7	Dr Simon Jude	Cranfield University	Vulnerability of proximal infrastructure to sand washout from burst water pipes and leaking sewers	Anglian Water Services Limited, BT, Lincolnshire County Council
8	Dr Rachel Dearden	NERC British Geological Survey	Modelling the geological factors in pipe failure for better infrastructure management	Yorkshire Water Services Ltd
9	Dr Lee Chapman	University of Birmingham	Dynamic heat risk management to reduce the costs of propagating hot weather delays on the railway network.	<b>Network Rail Ltd</b>
10	Dr Christian Wagner	University of Nottingham	Towards managing risk from climate change through comprehensive, inclusive and resilient UK infrastructure planning	Thames Estuary Partnership, Government of Western Australia, Horizon Digital Economy Research
11	Professor Douglas Crawford-Brown	University of Cambridge	Climate science support for robust decision making in wind energy investments and policies	Cambridge CleanTech Ltd, EVANCE ltd
12	Dr David Gunn	NERC British Geological Survey	Wind Turbine Foundation Ultrasonic Spectral Characterisation (WINSPEC)	E.ON New Build and Technology Ltd
13	Dr Jonathan Chambers	NERC British Geological Survey	The Proactive Infrastructure Monitoring and Evaluation (PRIME) System: Technology Demonstrator for Remote Monitoring of Transportation Earthworks	Canal & River Trust, <b>Network Rail Ltd</b> , Scottish Canals
14	Dr Huapeng Chen	University of Greenwich	Risk Based Performance Forecast of Flood Defences Affected by Changing Environments	<b>HR Wallingford Ltd</b>
15	Mr Jason Sadler	University of Southampton	A tool to improve prediction of real time environmental risk to UK rail infrastructure	Rail Safety and Standards Board (RSSB)
16	Dr George Blackburn	Lancaster University	Quantifying the risks of tree failure to guide proactive management and increase the resilience of electricity	Scottish Power Energy Networks

			distribution networks.	
17	Professor John Wainwright	Durham University	Communicating And Visualizing Erosion-associated Risks To Infrastructure (CAVERTI)	Wear Rivers Trust
18	Professor Thorsten Wagener	University of Bristol	Quantification of risks to bridges from erosion and blockage: An elicitation of expert views	JBA Trust
19	Dr Dapeng Yu	Loughborough University	Evaluating the resilience of critical infrastructure for emergency response to extreme flood events in Leicester City	<b>Environment Agency</b> , Leicester Resilience Forum, Leicester City Council
20	Professor Jim Hall	University of Oxford	FoRUM - Flood risk: Building Infrastructure Resilience through better Understanding and Management choices	<b>Environment Agency</b> , AIR Worldwide, CH2M HILL UNITED KINGDOM, <b>HR Wallingford Ltd</b> , <b>Network Rail Ltd</b> , Thames Water Utilities Limited, JBA Trust
21	Dr Iain Jonathan Rae	University College London	Understanding the effects of space weather on water sector infrastructure	<b>Atkins Global</b>
22	Dr Jeremy Phillips	University of Bristol	Volcanic Ash Hazard to UK Nuclear Generating Facilities	<b>EDF Energy Nuclear Generation Ltd</b>
<b>2015 Call – projects underway</b>				
23	Dr Peter Talling	National Oceanography Centre	What threat do turbidity currents and submarine landslides pose to strategic submarine telecommunications cable infrastructure?	<b>Atkins Global</b> , Chevron Energy Technology Company, Flintshire Geoscience Limited, Global Marine Systems Limited, <b>HR Wallingford Ltd</b> , Long Haul and Submarine Systems, Ocean University of China, <b>Scottish Water</b> , Shell International Exploration & Produce, Victoria University of Wellington
24	Professor Richard Dawson	Newcastle University	Storm Risk Assessment of Interdependent Infrastructure Networks	<b>Arup (Ove Arup and Partners Ltd) (UK)</b> , <b>Atkins UK</b> , Northern Powergrid, <b>Scottish Water</b>
25	Professor Robert Nicholls	University of Southampton	Coastal landfill and shoreline management: implications for coastal adaptation infrastructure	East Solent Coastal Partnership, <b>Environment Agency</b> , New Forest District Council, Southern Coastal Group
26	Professor Jim Hall	University of Oxford	Multi-Hazard Resilience Estimation and Planning for Interdependent National Infrastructure Networks	<b>Arup (Ove Arup and Partners Ltd) (UK)</b> , Department for Transport, <b>HR Wallingford Ltd</b> , <b>High Speed Two HS2 Ltd</b> , JBA Trust, <b>Scottish Water</b>
27	Dr Jonathan Chambers	NERC British Geological Survey	The Proactive Infrastructure Monitoring and Evaluation (PRIME) System: Automating Decision-Support and Enabling Intelligent Earthworks Management	<b>Arup (Ove Arup and Partners Ltd) (UK)</b> , <b>Atkins Global</b> , Canal and River Trust, Geosense Ltd, <b>High Speed Two HS2 Ltd</b> , <b>ITM</b> , <b>National Grid Plc</b> , <b>Network Rail Ltd</b> , Rail Safety and Standards Board (RSSB), Scottish Canals, <b>Transport Scotland</b>

28	Dr David Jaroszweski	University of Birmingham	Weather-induced single point of failure assessment methodology for railways	<b>Network Rail Ltd</b>
29	Dr Taku Fujiyama	University College London	Toolkit to improve resilience of critical ports and dependent national supply chain systems against extreme sea level rise (storm surge) events	<b>Network Rail Ltd</b> , Department for Transport, <b>Atkins Global, Arup (Ove Arup and Partners Ltd) (UK)</b> , ABP (Associated British Ports)
30	Dr George Blackburn	Lancaster University	Delivering resilient power, road and rail networks by translating a tree failure risk model for multi-sector applications.	<b>Atkins Global</b> , BlueSky International Limited, Scottish Power, Energy Networks, <b>Scottish Water</b> , <b>Transport Scotland</b> , UK Power Networks
31	Dr Sean Wilkinson	Newcastle University	Real-time assessments of wind related damage to electricity infrastructure Societal Theme Sustainability	Energy Networks Association, Western Power Distribution, <b>National Grid Plc</b>
32	Dr Simon Mudd	University of Edinburgh	Software for quantifying shallow landslide hazards to transportation infrastructure under changing climate and forest management	Coffey Geotechnics, Forest Research, Forestry Commission Scotland, <b>Network Rail Ltd, Transport Scotland</b>
33	Dr David Hughes	Queen's University of Belfast	InSAR for geotechnical infrastructure: enabling stakeholders to remotely assess environmental risk and resilience. (joint with NE/N012852/1, Dr Francesca Cigna, BGS)	Department of Enterprise, Trade, Investment NI, <b>Translink</b> , Transport NI
34	Dr Francesca Cigna	NERC British Geological Survey	InSAR for geotechnical infrastructure: enabling stakeholders to remotely assess environmental risk and resilience. (joint with NE/N013018/1, Dr David Hughes, Queen's University of Belfast)	Department of Enterprise, Trade, Investment NI, <b>Translink</b> , Transport NI
35	Dr Andrew Tye	NERC British Geological Survey	Environmental influences in pipe corrosion (EPiC)	<b>Scottish Water</b> , Welsh Water (Dwr Cymru), Yorkshire Water
36	Dr Sue Dawson	University of Dundee	Assessing the risk to the coastal and rural road network in Scotland due to the effects of storms and extreme rainfall events	<b>Transport Scotland</b>
37	Dr Dapeng Yu	Loughborough University	Piloting a real-time surface water flood risk mapping service within ResilienceDirect to support local emergency decision-making	<b>Atkins Global</b> , Cabinet Office, Department for Communities and Local Gov, <b>Environment Agency</b> , Leicester City Council, Leicester Resilience Forum, Met Office, <b>Transport Scotland</b>
<b>2016 Call - projects underway</b>				
38	Jonathan Chambers	NERC British Geological Survey	The Proactive Infrastructure Monitoring and Evaluation System (PRIME): Enabling Intelligent Earthworks Management	<b>Arup (Ove Arup and Partners Ltd) (UK)</b> , Canal and Rivers Trust, <b>Environment Agency</b> , Geosense Ltd, Highways England, <b>High Speed Two HS2 Ltd</b> , ITM, Kier Construction Ltd, <b>Atkins Ltd</b> ,

				<b>National Grid Plc, Network Rail Ltd, Rail Safety and Standards Board (RSSB), Scottish Canals, Transport Scotland</b>
39	Erica Hendy	University of Bristol	Predictive jellyfish bloom dispersal maps for UK coastal electricity generating facilities	<b>EDF Energy Plc, Scottish Salmon Producers Organisation, Scottish and Southern Energy SSE plc</b>
40	Ivan Haigh	University of Southampton	E-Rise: Earliest detection of sea-level rise accelerations to inform lead time to upgrade/replace coastal flood defense infrastructure.	<b>Environmental Agency, EDF Energy Plc, HR Wallingford Ltd</b>
41	Mike Clare	National Oceanography Centre	New field-scale calibration for turbidity current impact modelling	Shell International, <b>HR Wallingford Ltd</b> , Chevron Energy Technology Company, Victoria University of Wellington, Imperial College London
42	Richard David Williams	University of Glasgow	Decision support framework to incorporate river bank stability in pipeline crossing risk assessment	<b>Scottish Water</b>
43	Lee Chapman	University of Birmingham	Reducing the ice hazard on smart motorways	Highways England, Exactrak, <b>Transport Scotland</b>
44	Helen Dacre	University of Reading	Protecting airspace infrastructure: A tool for calculating along-flight volcanic ash dosage	Civil Aviation Authority, British Airways Plc
45	Kevin Horsburgh	National Oceanography Centre	Synthesising Unprecedented Coastal Conditions: Extreme Storm Surges (SUCCESS)	<b>Environment Agency, EDF Energy Plc</b>
<b>2017 Call - projects underway</b>				
46	Daniele Zonta	University of Strathclyde	Early warning decision support system for the management of underwater scour risk for road and railway bridges	<b>Transport Scotland, Network Rail Ltd, SEPA, Arup (Ove Arup and Partners Ltd) (UK)</b>
47	Keith Andrew Ryden	University of Surrey	Single Event Effects in Ground Level Infrastructure	<b>EDF Energy Plc, Atkins</b>
48	Donald Telfer Monteith	NERC Centre for Ecology and Hydrology	FREEDOM: Forecasting Risk to upland water treatment assets from the Environmental Exacerbation of Dissolved Organic Matter levels.	<b>Scottish Water</b>
49	Shane Donohue	Queen's University of Belfast	Seismic imaging for improving flood defence management	<b>Environment Agency, Canal &amp; River Trust, Northern Ireland Water/Aecom, RSK Challenge</b>
50	Gustavo Adolfo de Almeida	University of Southampton	Debris Effects on Bridge resilience and Flooding	<b>Network Rail Ltd, Environment Agency</b>
51	Thomas James Coulthard	University of Hull	Combination Hazard of Extreme rainfall, storm Surge & high Tide on estuarine infrastructure (CHEST)	<b>Environment Agency, Network Rail Ltd, Welsh Water, EDF Energy Plc</b>
52	Biagio Forte	University of Bath	Space weather disruptions to satellite navigation and telecommunications: ionospheric scintillation	<b>EDF Energy Plc, Atkins</b>

53	Pablo Ballesteros Perez	University of Reading	Weather-wise: working with the weather to improve construction productivity	Costain
54	Jian Guo Zhou	Manchester Metropolitan University	Quantitative Assessment Tool for Wind Effect on Wave Overtopping Seawalls	Royal HaskoningDHV, <b>HR Wallingford, Environment Agency, EDF Energy Plc</b> , Torbay Council
55	Simon Frederick Tett	University of Edinburgh	Playing Games to Understand Multiple Hazards and Risk from Climate Change on Interdependent Infrastructure.	<b>Transport Scotland, Scottish Water</b> , SGN, SEPA, Inverclyde Council, National Centre for Resilience, Climate Ready Clyde, Adaptation Scotland/SNIFFER
56	Donya Hajializadeh	Anglia Ruskin University	RV-DSS: An industry-friendly resilience-based interdependency assessment tool - case study North Argyll	<b>Transport Scotland, Scottish Water, Scottish and Southern Energy SSE Plc, Atkins, Arup (Ove Arup and Partners Ltd) (UK)</b>