THE NETWORK THAT CANNOT FAIL

A Doctrine for the Next Decade

A Decade of Evidence, Experience, and the Case for a Resilient Highway Network

TWO THOUSAND VOICES

What the Sector Said — and What Must Happen Next

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This document draws on the direct testimony of highway Directors from across all four nations, gathered through the UKRLG regional workshop programme 2025–26.

England • Scotland • Wales • Northern Ireland

June 2026

To the Sector

This note is authored by John A. Lamb in his capacity as Chair of the Adaptation, Biodiversity and Climate Resilience Board and UK Representative on the PIARC World Disaster Management Committee.

All UKRLG Board Chairs have reviewed and commented; three of those six sit as members of the ABC Board, making it uniquely placed to draw together perspectives across the full breadth of UKRLG's work.

The note has been shaped through that collective engagement. It does not constitute a formal position of the ABC Board or UKRLG and has not been submitted for Board approval; the analysis, judgements and recommendations reflect the author's own insight.

It is offered as a practitioner contribution to the development of highway best practice, grounded in three decades of operational leadership and national resilience policy.

The frameworks, evidence and arguments in this document are offered freely to the highways sector. There are no intellectual property claims. The invitation is simple: read it, engage with it, build on it. This is the sector's own evidence, returned to the sector — to inform immediate policy, to ground the doctrine the next decade requires, and to make the case, wherever it needs to be made, that the local highway network is a strategic national asset that cannot be allowed to fail.

Acknowledgements

The author gratefully acknowledges the many contributions that shaped this note.

Technical and research contributions

Dr Hugh Deeming's research — including the 2021 report commissioned by DfT and the 2025 retrospective commissioned by UKRLG — provides the evidential foundation on which this note builds. The contribution of Dr Will Lang, the Met Office, the British Geological Survey and Mining Remediation Authority underpins the technical foundation of the work, while Local Partnerships helped shape the workshop programme.

The Department for Transport's funding of the regional resilience workshop programme made the gathering of over two thousand individual contributions possible. This note would not exist without that investment.

Special thanks are due to Holly Singleton of Brasenose College, Oxford, who eschewed the use of AI and worked meticulously through more than 2,000 contributions collected across the workshop programme with diligence and analytical precision, ensuring that the sector's evidence was represented with care and fidelity. She did this voluntarily and without payment.

Purpose and Doctrinal Context

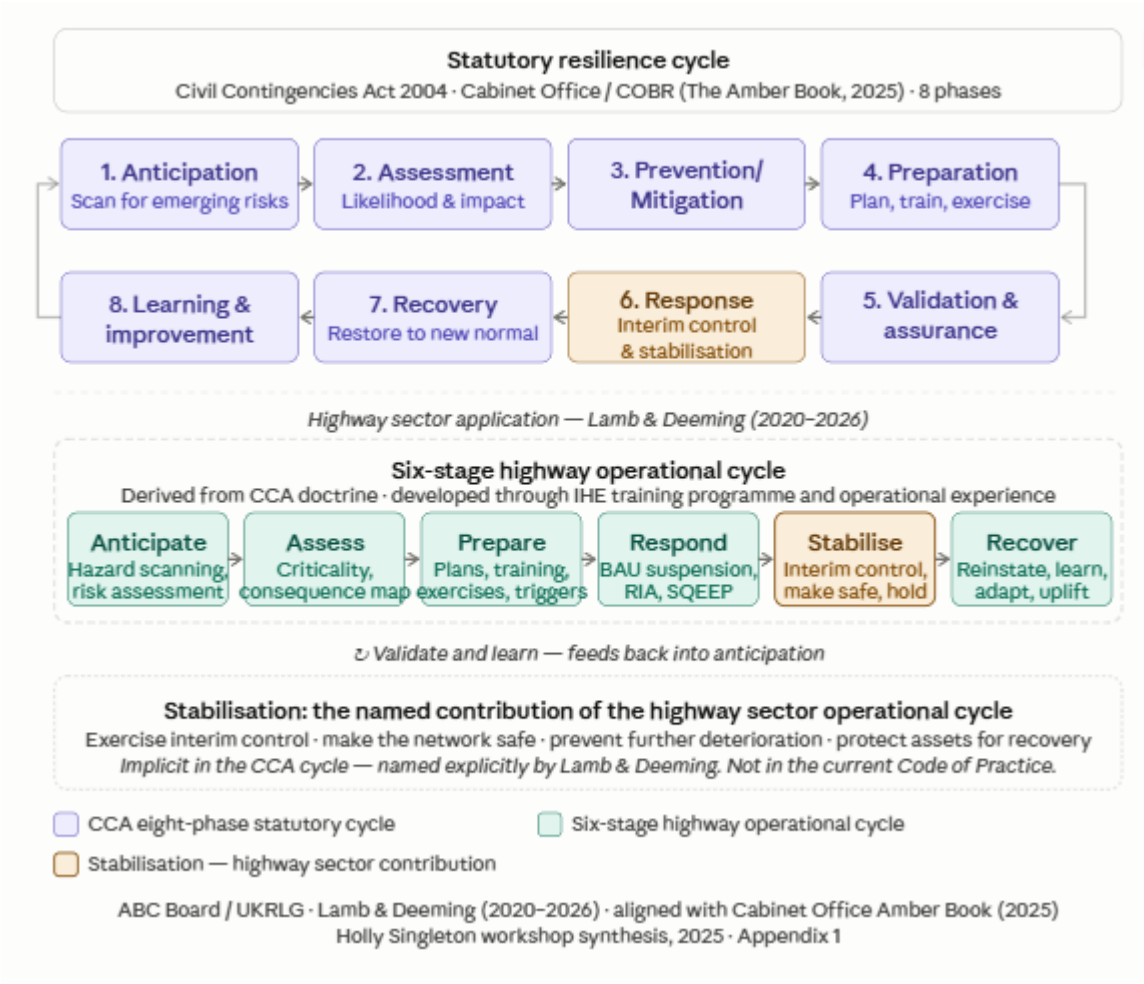
0.1 This note has a long-term purpose. It is published in the backdrop of the 2026 review of the *Code of Practice for Well-Maintained Highways* — and that review must listen to what follows. But this note is not defined by that consultation. The evidence it draws on predates it. The doctrine it sets out will outlast it. The call it makes is addressed to the next decade, not the next submission deadline.

0.2 The purpose is fourfold: to establish the doctrinal foundation within which highway resilience policy must sit; to present the evidence the sector has generated; to identify the structural gaps that national policy must now close; and to call on the sector to engage — with the current review, and with the longer-term work that must follow regardless of how that review concludes.

0.3 The Civil Contingencies Act 2004 designates Local Highway Authorities as Category 1 responders. That designation is not ceremonial. It places seven statutory duties on every LHA — to assess risk, maintain plans, warn the public, share information, provide business continuity, and cooperate and share information with other responders. The statutory doctrine that flows from that designation is the eight-phase Resilience Cycle, from Anticipation through to Learning and Improvement, as set out in the Cabinet Office's statutory doctrine *Emergency Preparedness* and restated in *The Amber Book* (COBR, 2025). Highway resilience policy must reflect this framework. This note argues for that alignment — and sets out what must be done to achieve it.

0.4 For the highway sector, those eight phases have a practical operational expression in a six-stage cycle — developed through the IHE Highways Network Resilience Emergency Management training programme and validated through operational experience including Storm Eva (2015), FloodEx22 (2022), and the pioneer council exercise programme — that makes Stabilisation an explicit, named, phase between Response and Recovery. This is not a departure from the statutory framework. It is its operational realisation for a sector that manages linear infrastructure across communities that depend on it as a lifeline. Stabilisation — exercising interim control, making the network safe, preventing further deterioration — is where bridges are saved or lost. Where despite the structural loss of Elland Bridge and others, six bridges in Calderdale were held. The sector's governance framework should adopt, name, and practice this phase.

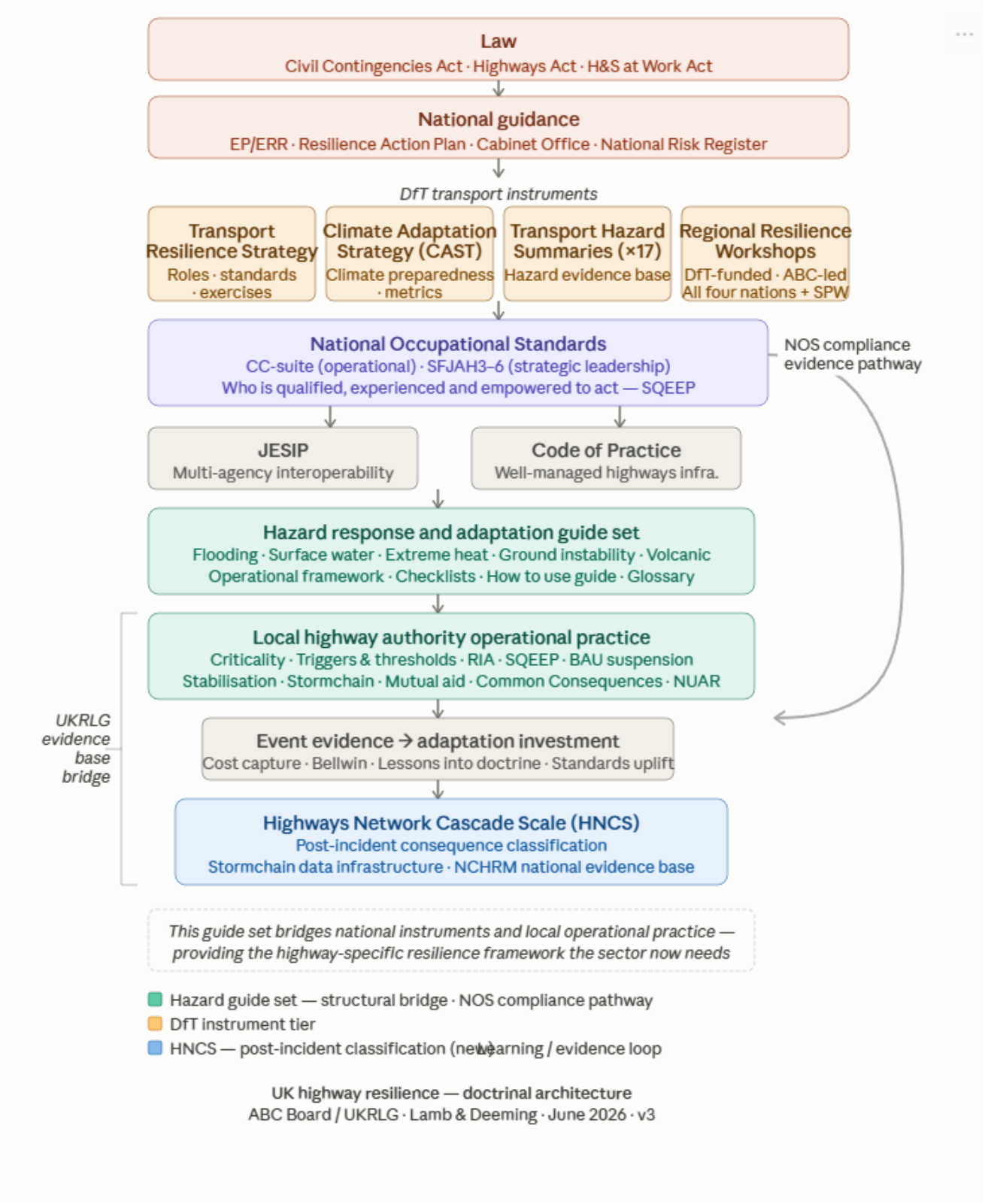
0.5 The evidence behind this note comes from more than 2,000 individual contributions gathered across twelve workshops — drawing on the testimony of over 200 highway directors and senior practitioners from across all four nations of the United Kingdom. That evidence was structured around five themes that practitioners recognise from their daily experience: Anticipation, Adaptation, Preparation, Response (inc. Stabilisation activity) and Recovery. It was synthesised by Holly Singleton of Brasenose College, Oxford, who worked through every contribution with diligence and without payment. Her synthesis is reproduced unchanged in Appendix 1 — because the sector's voice deserves to be heard as it was given, not filtered through doctrine. The doctrinal analysis in this note draws on that evidence and places it within the statutory framework the sector is already obligated to work within.



CCA eight-phase statutory cycle and six-stage highway operational cycle — drawn from Lamb & Deeming (2020–2026)

0.6 The diagram above shows the relationship between the two frameworks. The eight-phase statutory cycle is the legal foundation. The six-stage operational cycle is the highway sector's application of that doctrine, with Stabilisation named and placed where it belongs — between Response and Recovery — and with a continuous learning loop that feeds experience back into anticipation.

Below is the doctrinal architecture that shows how this body of work, developed by the author in his capacity as Chair of the ABC Board and reviewed and engaged with by all six UKRLG Board Chairs, sits within this framework.



[Image: UK highway resilience — doctrinal architecture, Lamb, June 2026]

1. The Evidence and Who Gathered It

1.1 The workshops at the heart of this note were funded by the Department for Transport and led by UKRLG's ABC Board across all four nations of the United Kingdom in 2025–26. Twelve regional events engaged directors and senior practitioners from every one of the UK's 200-plus Local Highway Authorities. Input from the Met Office, British Geological Survey and Local Partnerships was invaluable. The involvement of SCOTS, CSS Wales, ADEPT and LGTAG made attendance strong. The work of East Riding of Yorkshire as an embryonic centre of excellence for highways resilience supports their ambition of becoming a truly resilient highways service 24/7/365.

1.2 The final workshop — Northern Ireland, 25 March 2026 — has now concluded. The author's enduring thanks go to Dr Hugh Deeming for his support and forbearance in this ground-breaking work. The complete evidence base is assembled for the first time in this note.

1.3 The evidence was synthesised by Holly Singleton of Brasenose College, Oxford, who worked voluntarily and without payment through more than 2,000 individual contributions from those workshops with diligence and analytical precision. The workshops were structured around five themes — Anticipation, Adaptation, Preparation, Response and Recovery — and her task was to work systematically through every contribution, code it within that structure, surface the sub-themes, and produce a synthesis that is both faithful to what practitioners said and useful to those who must act on it. The result is Appendix 1 to this note, reproduced unchanged. It deserves to be read in full.

1.4 A word on scope. This note is deliberately focused on the acute end of the climate challenge — extreme events, response doctrine, and the governance frameworks that either hold or fail when a network comes under serious pressure. It does not attempt to resolve the deeper and in many respects harder question of long-term adaptation: which assets across a £400 billion-plus network need to change, in what order, and against what scale of hazard intensity. That question remains largely unasked, let alone answered. It deserves a national programme of work in its own right, properly commissioned and properly resourced. This note cannot fill that void. It does not try to.

1.5 The author brings something different to this note: three decades of operational leadership, strategic direction and national policy work across highways and transport. As Chief Officer in Calderdale the author lost six bridges during Storm Eva on Boxing Day 2015 — and saved six others through expedited stabilisation — a defining experience that shaped everything that followed. As then-President of LGTAG the original Lessons from Extreme Weather Emergencies report was co-commissioned with DfT. The Foreword to the UKRLG's 2025 Emergency Preparedness, Response and Recovery retrospective was written by the author. The author was appointed UK Representative to the PIARC World Disaster Management Committee and led the 2025–26 national programme of Regional Resilience Workshops and served as the highways sector representative on the Climate Security National Foresight Group (CSNFG). That accumulated experience — operational, strategic, academic, and acutely personal — is what this note brings to the evidence.

1.6 That evidence base is a four-nations picture. In Wales, the Welsh Government commissioned a strategic review — Storm Proofing Wales (SPW) — authored by Dr. Hugh Deeming, producing three formal deliverables and ten recommendations that map directly onto what this note calls for. In Northern Ireland, the final workshop gave direct practitioner insight into an emergency management architecture that differs from GB but faces identical hazard pressures; Hugh recently attended a major exercise in N. Ireland, continuing that engagement. In Scotland, ongoing dialogue with SCOTS reflects the same pattern of concern. The same problems appear regardless of jurisdiction. That is not repetition; it is corroboration. When four nations independently arrive at the same diagnosis, the diagnosis is almost certainly correct.

1.7 This note provides the strategic and doctrinal layer that connects the sector's evidence to the policy decisions that must now be made.

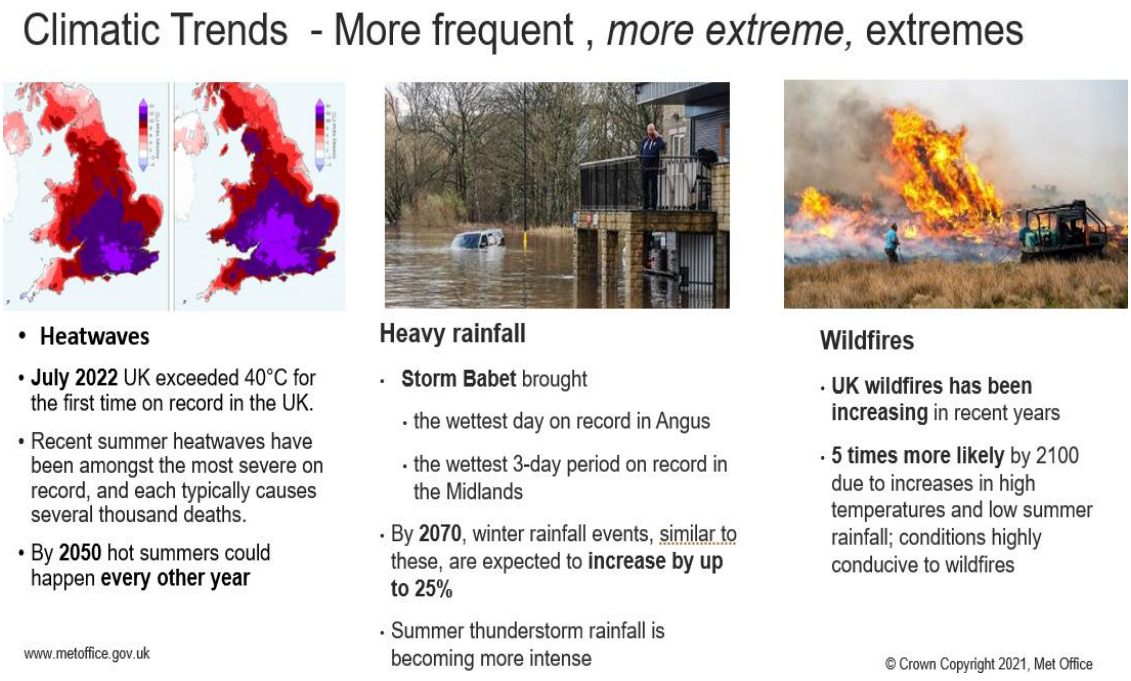
2. What the Sector Told Us: Evidence Across the Resilience Cycle

2.1 The workshops used five accessible themes that map onto the statutory resilience cycle and reflect how practitioners experience their work. What follows draws on the synthesis and places it in the context of the operational and policy realities that the workshops themselves cannot fully surface. The practitioner testimony is in Appendix 1, unchanged. This section adds the strategic layer.

Anticipation

2.2 The sector's relationship with hazard anticipation is still primarily reactive. Decisions are triggered by what has just happened, not by what is coming. Winter hazards are the exception — the preset trigger model for snow and ice works precisely because it has been codified, trained and exercised over decades. The question the workshops posed, and which this note presses, is why that model does not extend to the full hazard range, and where clear best practice and appropriate case studies exist to support it.

2.3 The scale of what the sector now faces was made plain at the workshops themselves. Met Office Chief Meteorologist Dr Will Lang, and Met Office colleagues, attended the UKRLG national workshop programme. On 16 August 2020, 240mm of rainfall fell in just a few hours at East Wretham, Norfolk. Of all UK rainfall events exceeding 200mm recorded since 1961, almost half have occurred within the last decade. Storm Éowyn on 24 January 2025 was the first occasion on which all of Ireland was simultaneously covered by Red warnings. Much of Ireland shut down. The first-ever emergency mobile alert for Northern Ireland was issued. Thirty per cent of Northern Irish households lost power. It was the worst storm experienced there since at least Boxing Day 1998.



2.4 Dr Lang's evidence transforms the risk landscape structurally, not statistically. Local extreme hourly precipitation does not intensify gradually with warming, but through periods of rapid intensification followed by pauses. Extreme years with high numbers of extreme rainfall events cluster — posing specific challenges for adaptation planning. Projections from the Met Office and peer-reviewed science indicate that extreme downpours could be approximately four times more frequent by the 2070s under higher warming trajectories, with increases in the north of the UK potentially reaching ten times current frequency. Crucially, these findings do not depend on any

single emissions scenario — the non-linear relationship between warming and precipitation extremes is robust across the range of plausible futures. Some high-end extremes — 40°C+ heatwaves, severe wildfire outbreaks, 200mm-plus rainfall events — are already possible now, before further warming has occurred. The question is not whether these events will happen. It is whether the sector will be ready when they do.

2.5 Storm Desmond in 2015 delivered 341mm of rain in 24 hours in parts of Cumbria. UK Government in 2016 advised planning for events equivalent to Storm Desmond plus up to 30 per cent — so for Cumbria, that would constitute up to 443mm in a single day. This 30 per cent increase in rain should not, however, be understood simply as representing a 30 per cent increase in impact. Once drainage and network capacity are exceeded, additional rainfall drives disproportionate, non-linear increases in flooding, damage, and network failure. Locations that have never flooded before, becoming vulnerable. Multiple assets fail simultaneously. Historic asset performance against previous events has not been systematically evidenced and is no longer a reliable guide to capability against higher-intensity events.

2.6 Risk assessment within the sector remains predominantly single hazard focused. Practitioners know that hazards compound — that a network weakened by summer drought is more vulnerable to flash floods and autumn storms. The assessment frameworks, the funding decisions, and the planning assumptions have not yet caught up with that knowledge; crucially, current priorities are maintenance not resilience.

Adaptation

2.7 The workshops revealed a sector that understands adaptation conceptually but has not yet embedded it structurally. Finance is the dominant constraint. Preventative maintenance budgets have been cut. The result is a sector that spends more, after events, than it would have spent to prevent them.

2.8 Planning must be recalibrated. Most authorities, if pressed, still plan implicitly for a demanding but ultimately manageable event. That baseline is no longer sufficient. The scale of disruption now being experienced across Europe — Belgium and Germany (2021), Valencia (2024), Storm Éowyn (2025) — illustrate the reasonable worst-case effects the sector needs to design for. The question is not whether such events will occur on UK networks, but whether authorities will be prepared when they do.

2.9 The shift the sector needs is not primarily technical. It is conceptual: from asking what has failed, to asking who cannot get through, and what happens to them if they cannot. FEMA's community lifelines concept — which has been introduced to highway directors across all four nations — makes the point with clarity: transport is not simply one of eight community lifelines as an afterthought. It is the enabler of all the others. When the road closes, the ambulance stops, the carer cannot reach their client, the supply chain breaks.

2.10 The cascade chains from highway failure are specific and sequential: a bridge collapses, utilities are severed, the emergency vehicle is rerouted by 25 miles, the school closes, the utilities team cannot reach the failing substation, the supply chain reroutes through an unsuitable lane and compounds the problem. The sector's governance framework must address this chain, not just the bridge.

Highways as Lifelines: adapted from FEMA (2023)

Preparation

2.11 Mutual aid was the most consistently raised theme across all preparation discussions. The concept is well understood. The practice is fragmented, informal, and largely dependent on personal relationships. That is not a stable basis for national resilience. Neighbours facing the same event cannot provide mutual aid to each other. Agreements need to reach further — across regions, and across river catchments and climate zones. Contracts were not designed with mutual aid mobilisation in mind. Cost recovery arrangements are unclear.

2.12 Community preparedness was consistently underutilised. The public, given the right tools and information, can contribute meaningfully to resilience. Social media is a genuine asset. But the sector's approach to public communication remains predominantly reactive and event driven.

Response

2.13 The governance of response is unclear in ways that matter. Who holds decision-making authority when an event escalates? Where does the highway authority sit in relation to the Strategic and Tactical Coordinating Groups? The sector is a Category 1 responder, but it does not always behave or position itself as one. Teams are getting smaller. The capacity for sustained response — not just the first 24 hours, but for days and weeks of prolonged operation — is genuinely constrained. Shared situational awareness across boundaries depends on individual relationships rather than structured systems.

Recovery

2.14 Recovery is expensive, long, poorly planned for, and with wider consequences for other planned — often safety-critical — works. Business continuity plans exist but most are designed around hours and days rather than months and years. The Bellwin scheme — the primary mechanism for emergency cost recovery — is widely regarded as inaccessible. The 2 per cent spend threshold before it activates is too high for many authorities. Post-event debriefs happen, but lessons learned do not consistently translate into changed practice.

3. Ten Questions Every Highway Authority Must Answer

3.1 These questions span the full resilience cycle. They are not aspirational. They are the minimum standard of preparedness that any authority facing an escalating event should be able to demonstrate. The evidence of winter 2025–26, and of twelve workshops across four nations, shows that many authorities cannot yet answer them clearly. The sector's governance framework is the instrument to change that.

- Do we know which hazards matter most locally — and have we looked beyond the ones that affected us last time?
- Do we understand where the network is vulnerable — and where vulnerability is growing, not just where it has already failed?
- Do we have clear triggers, thresholds and escalation arrangements — or do we make those decisions under pressure, when it is already too late?
- Can we maintain situational awareness and undertake Rapid Impact Assessment during an event — or are we managing by exception, responding reactively to what we happen to hear about?
- Do our contracts, workforce and delivery models support sustained response — or do they support a normal working week?
- Can we suspend or reprioritise business as usual when needed — and do our people know they are empowered to make that call?
- Do we collaborate actively with our neighbours — including those we would never normally ask for help, because the event we face will affect them too?
- Do we use learning from events to improve future preparedness — or do we write the debrief report, file it, and move on?
- Can we demonstrate, to a standard a Coroner would recognise, that we assessed foreseeable consequences and acted proportionately?
- Can we justify adaptation investment based on evidence of experienced impacts and/or projected vulnerabilities — not condition, not historical cost, and not who argues most loudly?

4. The Doctrine the Highways Sector Is Missing: Suspension of Business as Usual

4.1 The sector already understands preset triggers. For winter service, the freezing point of water activates a response automatically. Resources are pre-positioned, staff know their roles, and the decision to act does not wait for an instruction. That model works because winter service has been codified, trained and exercised over decades. The same principle must now apply to the full hazard range.

4.2 The moment an event escalates beyond normal operational response — when maintaining routine services would actively constrain the authority's ability to manage the incident — is the moment 'Business as Usual' must be formally and defensibly suspended. This is not a new idea. The Civil Contingencies Act 2004 places a duty on local authorities to continue providing critical functions during a disruptive challenge. Section 41 of the Highways Act 1980 imposes a non-delegable duty to maintain the highway. The tension between those duties — between maintaining BAU service levels and redirecting resources to emergency response — is precisely what a Suspension of BAU doctrine resolves.

4.3 The author managed this reality directly. On Boxing Day 2015 six bridges were lost in Calderdale in a single day. But six others were saved. The ones that were saved were saved not by luck but by decision: the SQEEP decision made under pressure; contractors and DLO mobilised through the night; and the temporary traffic management held for weeks while structural surveys were completed. Those bridges did not create major impacts because stabilisation was treated as an operational priority, not an afterthought. The sector's governance framework is silent on stabilisation as a distinct, planned capability. That silence is a gap the sector cannot afford.

Image: Elland Bridge, Calderdale — reconstruction following Storm Eva, Boxing Day 2015. © John Lamb

4.4 A bridge is never just a bridge. Visible in the image above are the water mains, electricity cables, drainage pipes and telecommunications conduits the structure was carrying — all severed when the bridge was lost. Bridge owners typically know services are present; they rarely know their

criticality. If service providers could share that information confidentially with bridge owners, it would transform how we prioritise adaptation, maintenance and mitigation — assessing the vulnerability and criticality of the structure, the route, and the co-located services in concert.

4.5 Stabilisation (exercise interim control, make safe, prevent secondary consequences) is not simply an extension of response. It is a deliberate activity focused on making the network safe, maintaining critical connectivity, and preventing further deterioration where full repair is not immediately achievable. Early intervention to hold an asset in a stable condition can significantly reduce the scale, cost and disruption of permanent repair.

4.6 An effective Suspension of BAU doctrine requires: pre-agreed trigger points linked to hazard severity, capacity and consequence — not improvised under pressure; clear empowerment to activate those triggers at the appropriate level, including out of hours; shared situational awareness with neighbouring authorities so that suspension in one area does not create additional demand elsewhere; a structured and deliberate return-to-BAU process; and integration with multi-agency arrangements so that the Strategic Coordinating Group is informed when an authority moves into emergency operating mode and back out again.

4.7 The Suspension of BAU doctrine is not a proposal. It has been developed, published for consultation, and is available for immediate adoption. The UKRLG ABC Board published the Suspension of Business-as-Usual Highway Services framework in June 2026 — a document grounded in operational practice, piloted in Calderdale during Winter 2025–26, and designed for adoption and adaptation by every Local Highway Authority. The sector now has the instrument. The task is to embed it.

Consultation of the Suspension of Business as Usual is now invited.

5. Who Does What: Roles, Competence, and the Training That Must Be Delivered

5.1 The highway sector activates a remarkable breadth of roles during a major incident. From frontline operatives conducting Rapid Impact Assessment in the field, through operations managers making mobilisation decisions, incident managers building the common operating picture, directors managing the political and strategic interface, and chief executives making decisions about mutual aid and Bellwin — every level of the organisation has a distinct function and a distinct relationship to the emergency management framework. Most of these roles do not carry an explicit emergency response identity. That is precisely the problem.

5.2 The National Occupational Standards framework for emergency resilience — both the civil contingencies suite of operational standards and the strategic leadership standards now in development — must reflect operational reality. Together, those standards no longer simply ask whether practitioners can manage an incident, but whether they can govern resilience as a long-term strategic function: with strategic foresight, systemic and chronic risk stewardship, the fiduciary and economic case for resilience investment, and cross-sector strategic planning. The sector's governance framework must align with this competency structure. A governance framework that does not reference the strategic resilience competency framework it sits alongside is an opportunity missed.

5.3 Sector contributions to this Cabinet Office work are welcomed, and the author is the Highway sector voice on this important work.

The Training That Exists and Has Never Been Delivered at Scale

5.4 DfT invested in developing a Professional Diploma in Transport Network Resilience with the Institute of Highway Engineers, designed and delivered by Dr Hugh Deeming and the author. The course was beta tested in January 2020 with experienced senior highways officers. The feedback was outstanding. Two weeks after attending, one participant found themselves managing the multi-agency response to Storm Dennis — and reported that the course had given them the shared language, the conceptual framework, and the confidence to operate at Gold level. In March 2020, Covid-19 suspended the rollout. The course has never been delivered at scale.

5.5 The content exists. The evidence of its value is on the record. Two developments now provide the institutional context for its revival: Storm Proofing Wales (SPW) calls explicitly for this kind of provision, and the forthcoming development of the Transport Resilience Academy offers precisely the institutional home in which a refreshed, accredited all-hazards training programme for highway professionals could sit. This is not a gap that requires invention. It requires a decision.

6. What This Body of Work Exposes: Gaps the Sector Must Now Close

Digital Situational Awareness

6.1 DfT has committed to developing and deploying digital twin technologies across the transport resilience cycle. The economic case has been made: a September 2024 analysis commissioned by DfT and delivered by Arup, Connected Places Catapult and Digital Twin Hub quantified combined benefits approaching £860m in present value terms, with integrated incident and emergency management as the top priority use case. DfT has since procured the Crisis Resilience Digital Twin (CRDT) — explicitly designed to model transport emergencies, cascade effects, and real-time situational awareness. The architecture will exist.

6.2 Beyond the national programme, the West Midlands Combined Authority's Climate Risk and Vulnerability Assessment demonstrates what integrated digital situational awareness looks like at combined authority level — combining climate hazard data, socio-economic vulnerability, and network criticality into spatial risk scores at 100-metre grid resolution. Northern Ireland is developing a province-wide highways digital twin that will integrate asset condition, network criticality, and emergency response planning into a single operational platform. These are not aspirations. They are live programmes.

6.3 The sector's governance framework must be written with that expectation embedded. A framework designed around the absence of digital situational awareness and planning capability will be obsolete before it is implemented. Rapid Impact Assessment, shared situational awareness, and common operating picture capability are not optional enhancements — they are core requirements of effective emergency response. Digital tools including RIA platforms are already in operational deployment and demonstrate that this capability exists in the sector now, not in the future.

Vulnerability Mapping

6.4 The workshops raised vulnerability as a consistent concern. The West Midlands Combined Authority's CRVA model shows what good looks like. The Scottish 'Vault' and the National Underground Asset Register (NUAR) provide the foundational data layer on buried infrastructure, including the illustration of critical interdependencies between the drainage systems and buried utilities that sit beneath every highway network. The case for integrating surface network vulnerability scoring alongside NUAR data to better understand their combined hazard exposure, vulnerability, and criticality, is direct and practical. The sector's governance framework should require vulnerability and criticality assessment as a structured, documented activity — not leave it to local discretion.

Legal Accountability and the Duty to Act on Foreseen Consequences

6.5 A recent Coroner's inquest has clarified the standard of care the sector must now meet. In *Record of Inquest: Philip Marco* (DR No: 01802-2023, Liverpool & Wirral Coroner's Court, 2025), Senior Coroner Rebello applied a foreseeability test to Liverpool City Council's decision-making: not only whether the road was inspected, but whether the authority knew — or should have known — of the risk, and whether it took proportionate action in response. The finding was that the authority had sufficient information to foresee the risk to life and did not act on it adequately. Risk, in this context, means Impact × Likelihood — where Impact = (Damage × Consequences) × Duration of effect. An authority that holds risk data and does not act on it proportionately is not managing consequences after the fact; it is failing to discharge a foreseen risk before harm occurs. Liverpool is an uncomfortable lesson. It is not, however, a lesson that applies only to Liverpool. Every highway authority that holds inspection records, vulnerability data, or NUAR information about a known hazard is now on notice.

6.6 The implications for every highway director reading this note are direct. An authority that holds risk data — from RIA, from vulnerability mapping, from NUAR, from asset condition records — and does not act on it proportionately is now in a materially different legal position than one that lacks the data. The Highways Network Criticality Scale argument is the same argument in analytical form: if the risk was foreseeable, the authority must demonstrate it assessed that risk and responded accordingly. The sector's governance framework should provide the structure that makes that demonstration possible — and consistent across all 200-plus LHAs.

6.7 This is not a marginal consideration. It is the reason why risk-based planning, structured RIA, and documented decision-making are not optional enhancements but professional and legal necessities. Every director reading this note should ask: if something similar happened on my network tomorrow, could the authority demonstrate that it had assessed the risk, documented the reasoning, and acted proportionately? If the answer is uncertain, the sector's governance framework is the instrument that should make it certain.

The Post-Event Evidence Gap: Corporate Memory and the Cost of Forgetting

6.8 The sector has a habit of cracking on. An event happens, the teams respond magnificently, the damage is repaired as far as resources allow — and then, because there are potholes to fill and budgets to manage and the next crisis is already forming, the lessons are not written down, the costs are not aggregated, and the consequence is not communicated upward in a form that generates a structural response.

6.9 This is not carelessness. The Climate Security National Foresight Group — on which the author served as the highways sector representative until its conclusion — has documented through peer-reviewed analysis that this pattern is a structural feature of organisations under resource pressure. Normalcy and optimistic biases, the dissipation of institutional memory when experienced practitioners retire or move on, and the absence of scaling mechanisms all contribute to a sector that rediscovers the same problems after each major event rather than building on what the last one taught.

6.10 The absence of a structured post-event impact classification is felt most acutely when authorities seek emergency funding. Bids compete on the basis of who presents most forcefully, not who demonstrates most rigorously. That is not a robust basis for Treasury decision-making on infrastructure investment. It is not a robust basis for adaptation planning. And it is not fair to the authorities that manage their post-event evidence well, but who lack the advocacy infrastructure of others.

6.11 The Highways Disaster Impact Scale — currently in development and available for sector engagement — addresses this gap directly. A consistent, comparable, post-incident classification framework, populated through structured RIA data, it is designed to translate operational consequence into a language that finance directors, Treasury officials and national policymakers can engage with. Post-event consequence analysis should become a standard practice across the sector. The author invites colleagues to engage with this work as it develops: just as the UK is leading globally on Rapid Impact Assessment, there is the potential to establish a new and globally consistent framing of criticality — one built from practitioner evidence, not imposed from outside it

Cross-Boundary Governance and Mutual Aid

6.12 When a storm affects multiple authorities simultaneously, the current governance structure has no mechanism for coordinating BAU suspension across boundaries, prioritising mutual aid requests, or presenting a unified picture to national government. There is no highways equivalent of the mutual aid frameworks that exist in fire, policing, and energy — no pre-agreed mobilisation protocols, no national register of available assets, no cost recovery framework that gives both requesting and providing authorities the confidence to commit. Mutual aid must be addressed as a structural requirement, not a voluntary arrangement that depends on goodwill and pre-existing relationships.

Contractor Integration

6.13 Contractors are activated during every major event but carry no formal emergency competency requirement, operate under contracts not designed for emergency mobilisation, have no legal indemnity framework for mutual aid deployment, and face significant uncertainty about cost recovery. The history is instructive: during Storm Eva in Calderdale, contractors were held to standard contract rates when national assets were being deployed; the ability to deploy was delayed by months. In subsequent major events, authorities have found themselves unable to commission their term contractor for significant stabilisation work because that function had not been specified in procurement. These are not exceptional failures. They are structural, and they are preventable.

The Exercising Gap

6.14 FloodEx22 in November 2022 remains the last occasion on which the highway sector was tested against clearly highways-focussed objectives in a regional multi-agency exercise. It was hard to deliver: engagement was opt-in, significant numbers of councils withdrew closer to the date, and National Highways withdrew entirely. No comparable exercise has been planned or delivered since. The sector has not been tested in a comparable regional exercise since. The case for a structured, multi-year national exercising programme — coordinated across highway authorities and partner agencies — has only grown stronger since FloodEx22, even as the institutional appetite to commission one has yet to be matched by delivery. An exercising programme, which tests only those authorities that choose to engage produces an illusion of preparedness, not the reality.

SQUEEP Highway Resilience Training: The Course That Must Be Delivered

6.15 The DfT-funded Professional Diploma in Transport Network Resilience exists. The content is produced. The evidence of its value is on record. The National Resilience Academy provides the institutional framework. Storm Proofing Wales (due June 2026) provides the political mandate in one nation. The sector needs an explicit commitment to a national all-hazards training programme for highway professionals — and a timeline for delivering it.

Emergency Funding Reform

6.16 The Bellwin scheme is not fit for purpose. The 2 per cent spend threshold before it activates is too high for many authorities, particularly those facing frequent but individually sub-threshold events: i.e., the compounding effect of sequential events is not considered in the Bellwin formula. The process is slow. The workshops were unanimous on this. What is needed is a reserve of no-questions-asked emergency contingency funding accessible quickly, without the current bidding and priority allocation process. The Highways Network Criticality Scale provides, for the first time, the mechanism that makes the case for that funding on the basis of evidence rather than advocacy.

The Public as an Underutilised Asset

6.17 Across all five workshop themes, the public was consistently identified as an underused resource in hazard anticipation, preparation, and resilience. Communities that are informed, engaged and empowered can take meaningful action before and during events. Community engagement must be addressed as a resilience requirement. The public are not merely the recipients of the highway service. They are participants in the resilience system. That reframing is both practically important and politically powerful.

6.18 Following the 2012 Calderdale flooding, DEFRA, the Environment Agency and the local council worked together to train and deploy a network of flood wardens. When Storm Eva struck on Boxing Day 2015 — three years later — those wardens were ready. They closed roads as floodwater rose, using pre-positioned equipment: cones, barriers, and high-visibility kit deployed before the event, not scrambled in its aftermath. No lives were lost in those communities. The wardens did not prevent the flooding. But they managed its consequences at the moment that mattered — and they did so because the investment in community preparedness had been made, quietly, years before it was needed. That is what community resilience looks like in practice.

7. The Cost of Not Acting

7.1 The gaps identified in the preceding section each carry a quantifiable liability sitting unacknowledged in every authority's risk register. The cascade chains from highway failure are specific and sequential: a bridge collapses, utilities are severed, the emergency vehicle is rerouted by 25 miles, the school closes, the utilities team cannot reach the failing substation, the supply chain reroutes through an unsuitable lane and compounds the problem. The sector's governance framework must address this chain, not just the bridge.

An Unquantified Liability

7.2 Leicestershire County Council spent several millions in unplanned highway expenditure in the winter of 2024–25. It is not an outlier. It is what the absence of structured preparedness costs, repeatedly, in ways that never appear in a single line of any authority's accounts because the costs are distributed, delayed, and absorbed into other budgets. The argument for resilience investment does not rest on proving what was avoided. It rests on the recorded cost of not being ready. Every Local Highway Authority should be required to quantify and name its cost of non-resilience — not as an accounting exercise, but as a prioritisation tool. An authority that can make that case — in terms of actual emergency expenditure, community severance consequence, or unmitigated mutual aid liability — can make the case for resilience investment in language that elected members and finance directors can act on.

A Reporting Obligation and a Doctrinal Standard

7.3 The fourth round of the Adaptation Reporting Power — ARP4 — under the Climate Change Act 2008 requires relevant bodies to report on climate risks and the actions they are taking. A highway authority that has not quantified its resilience gaps or tested its response capability cannot produce a meaningful ARP4 return. The ARP4 standard should not be treated as a threshold only reporting authorities need to reach. It should be the baseline every Local Highway Authority works to, regardless of current reporting scope. Authorities not yet designated are not exempt from the underlying obligation — they are simply not yet required to demonstrate it publicly. Every LHA should be able to answer four questions with evidence: What are your highest-consequence network vulnerabilities? What triggers suspension of BAU? What mutual aid agreements are tested? What did the last severe weather season cost?

The Sector's Own Verdict

7.4 This is the consistent verdict of the sector itself, surfaced through twelve workshops across four nations and more than two thousand contributions. The sector understands the problem and the consequence of inaction. What it requires is consistent, agreed and credible guidance — and it requires it at pace.

> "There is no shortage of goodwill in this sector, and no shortage of evidence. What is missing is agreed, credible guidance that practitioners can act on with confidence. The cascade consequences are understood. We are behind where we need to be, and the pace of change in the hazard environment means we cannot afford a slow answer." —
>
> *Fellow UKRLG Board Chair, contributing to this note*

8. What Must Happen Next

8.1 This is a collaborative opportunity, not an adversarial one. The workshops demonstrated that DfT, devolved administrations, local highway authorities, the Natural Hazard Partnership and the sector's professional bodies share a common understanding of the challenge and a common commitment to meeting it. The leadership of Mitesh Solanki as CIHT President has provided visibility, leadership and drive. The ICE President, David Porter, will lead the autumn 2026 ICE Conference with significant resilience content. The sector's governance framework is the instrument through which that shared commitment becomes consistent national practice.

8.2 Six things are needed — each to be embedded within a dedicated resilience strand in the sector's governance architecture:

— Suspension of Business as Usual as adopted doctrine. The sBAU framework is published and available. The call is now for adoption: trigger frameworks, empowerment of SQEEP-qualified officers, Stabilisation as a named phase, governance arrangements, and a structured return-to-BAU process embedded in every LHA.

— An all-hazards principle as foundational. The common consequences / common capability principle as the starting point, not a supplementary consideration. The eight-phase statutory resilience cycle as the framework the sector's governance is explicitly aligned with.

— Contractor governance addressed as a resilience requirement. Competency expectations, model contract provisions for emergency mobilisation and mutual aid, and clear cost recovery arrangements — addressed in governance frameworks, not deferred to individual procurement decisions.

— Alignment with the national strategic leadership competency standards. The sector's governance framework and the competency framework must be coherent. Alignment with *Uniform & Holistic Approaches to Resilience: Climate Change and Other Hazards* (PIARC, 2023) as the international standard the sector should demonstrate coherence with.

— A specific, funded and time-bound commitment to the development of a revised Code of Practice and the underpinning documents on climate resilience and adaptation that must accompany it: the operational framework, the hazard-specific guidance, and the workforce competency standards. Specific in scope, clear in status, confirmed in funding, fixed to a delivery date. A commitment that is general in scope and undefined in timeline does not close the gap.

— A national training and exercising commitment. Explicit expectation of LHA participation in national exercising, and delivery of the all-hazards training programme for highway professionals that DfT helped create, that Covid prevented from reaching its potential, and that the UK Resilience Academy could now deliver

8.3 The sector has done the work. Twelve workshops across four nations. Two thousand-plus contributions from practitioners who manage these events for a living. The Met Office Chief Meteorologist presenting the evidence of what is already happening and what is coming. A Coroner's finding that clarifies the legal standard every authority must now meet. A body of work — the guide set, the operational framework, the Highways Network Criticality Scale, the NOS submission, SPW — that has been built over years and is ready to be used.

8.4 The invitation of this note is direct: read it, engage with the sector's governance review, and join the work of the ABC Board in making the case for a framework that reflects the sector's statutory duties, the evidence the sector has generated, and the doctrine that will protect communities when the next major event arrives. It will arrive. The question is whether we will be ready.

8.5 This work cannot be outsourced. The resilience of local highway networks is understood by those who manage them — directors, engineers, emergency planners, and operatives who are still in the operating environment, making decisions under pressure, learning from events as they happen. No consultancy, however capable, holds that knowledge. It lives in the sector.

8.6 The work does not end here. Working across all four nations and with the UKRLG Steering Group, the programme of work will be properly defined and commissioned — shaped by the sector, not prescribed from outside it. What emerges should reflect the lived experience of those still working in it. That is the only basis on which it will be credible, durable, and fit for purpose.

8.7 This document is built to last. The evidence it draws on, the doctrine it sets out, and the framework it proposes will remain relevant beyond any single consultation window. The invitation is open-ended: engage directly with UKRLG and the ABC Board, bring your authority's experience to the table, become a future leader of this work.

But there is also an immediate ask. The consultation on the Code of Practice for Well-Maintained Highways is open now. Use it. Add your voice to the two thousand already gathered from workshops across all four nations. If you have lived through a severe weather event, managed a road closure at midnight, made a call about BAU suspension with incomplete information — that experience belongs in this process. The sector has the evidence. The Code is the moment to use it

John

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June 2026

One further observation — offered here by the author, not as a synthesis of what the workshops produced.

At the close of each workshop, after the evidence had been gathered and the sector's voice recorded, the author delivered a prepared and consistent closing address. Every room, across all four nations, heard the same message — measured, strategic, and deliberately given: an invitation to look beyond the climate and resilience argument to something bigger, and in the current geopolitical moment, something more urgent. It was not on slides. It was not in the workshop notes. That was intentional.

The network you manage is not only a public service asset and a climate resilience challenge. In the current geopolitical environment, it is a national security asset. It is already in national plans. The capability those plans assume has not been built.

The author is engaged with government on this dimension separately. Further insight will be shared through appropriate channels.

The sector should be ready for that conversation. The doctrine in this note is its foundation.

Appendix 1: Findings from the UKRLG Highways Workshop Series 2025

The following synthesis was produced by Holly Singleton, recent graduate of Brasenose College, Oxford, who worked voluntarily and without payment through more than 2,000 contributions gathered across twelve regional workshops in 2025. The workshops were structured around five themes — Anticipation, Adaptation, Preparedness, Response and Recovery. This synthesis is reproduced here unchanged and in full. It is the sector's testimony. The doctrinal analysis in the main body of this note draws on it but does not alter it.

Anticipation, Adaptation, Preparedness, Response, and Recovery in a UK Hazard Landscape

Findings from the UKRLG Highways Workshop Series 2025 — Holly Singleton

Overview

Organisations responsible for highway maintenance, infrastructure, and public services in the UK are operating under increasing risk from natural hazards, including flooding, storms, and landslides. Whilst awareness of the growing risk to UK highways from natural hazards is increasing, current systems remain largely reactive and are constrained by multiple factors. In 2025, the UKRLG undertook a series of workshops with professionals operating in relevant sectors in order to expose key operational risks now and in the future under climate change. Notes were taken from small group discussions on the five key themes. Further analysis reveals several subthemes conveying key problem areas in how the sector responds to current and future disaster risk.

Anticipation

Anticipation of hazards is still largely reactive, and primarily triggered by recent events as opposed to long-term proactive planning. This mindset is reinforced by funding frameworks where resources are more easily secured in the aftermath of a hazard event. Risk assessments are primarily single-hazard focused and urgently need to be incorporated into multi-hazard assessments. Warning fatigue, uncertainty and disconnection between operational plans and forecasts are recurring concerns. Clear and simple language is needed to communicate specific risks. Uncertainty can bring an over-cautious approach and risk early mistimed de-escalation. Data is needed to build the business case for funding, and AI was mentioned as a potential tool. Stronger governance is needed to get the right people with the right information to the right place at the right time.

Adaptation

Finance is a large constraint on adaptation. With limited budgets, local authorities cannot maintain existing infrastructure, let alone spend additional amounts on adaptation. Preventative maintenance budgets have been cut, and funding remains largely reactive. There is a need for an integrated multi-year budget for prevention. Infrastructure is ageing, and the drainage ecosystem in particular contains many faults and risks across a variety of stakeholders. There is a need to name and shame in order to expose faulty assets. Technology offers opportunities: virtual incident rooms have worked well; One Network could be improved for intense events; better data sharing and rapid impact assessment tools are available. Water came up recurrently — road drainage risks, gully cleaning backlogs, kerb design.

Preparedness

Mutual aid was highly mentioned. Arrangements should be written into contracts; pre-agreements with authorities should itemise which assets are available for sharing. Mutual aid agreements should reach beyond immediate neighbours, as neighbours may be facing the same event. Operational preparedness — inspections, equipment, plans, drills — is conceptually well understood but inconsistently practised. Community preparedness was highlighted as a key area for improvement. Governance of preparatory action is key: hierarchies of command must be established before events occur. Data plays a key role; central repositories to collect known impacts are valuable. Contracts, costs and supply chain management must be addressed in advance. Concerns were noted regarding the safety of operatives during hazard events.

Response

There is uncertainty around government engagement models and who holds decision-making authority during events. Mutual aid is again identified as important but constrained by lack of resources, management and coordination. Team size is shrinking; there is an urgent need to increase capacity and the number of suitably qualified and empowered practitioners. Internal communications are not good but better than external communications. A common operating picture is critical — pulling from a single source of truth is essential. Social media is increasingly an asset. Consistent, clear messaging that engages the local community is necessary.

Recovery

Public and political expectations need to be managed through communication. Recovery is expensive and often takes funding away from other projects. The Bellwin scheme is not fit for purpose due to the 2% spend requirement. Business continuity plans are in place but many focus on hours and days rather than months. Recovery can take years and is hindered by legal issues, police investigations, hidden damage, workforce fatigue and dissipating energy. Post-event debriefs across authorities are necessary, as are community debriefs. Knowledge sharing is key. The question of who is responsible for collating lessons learned centrally was consistently raised. Shortening the lag time between event and lessons learned would be beneficial.

Conclusions

The key subthemes of data, governance, collaboration, communication, technology and funding come up repeatedly across all five themes. A sector-wide shift to anticipatory and multi-hazard resilience is needed imminently. Improvements in any one area should have cascading positive impacts across other areas. The following opportunities for change were identified:

1. **Communication and Collaboration**
   - Mutual aid systems to be set up and streamlined; accessible cross-sectoral and cross-border communication platforms developed.
   - Multistakeholder groups and communication platforms created in peacetime, ready to be operationalised when necessary.
2. **Data Systems**
   - Innovation in data systems to solve the challenges of volume, velocity and veracity.
   - Widespread uptake of RIA software accessible by multiple groups, updating in real time.
   - Publicised maps of key assets and hazard locations.
3. **Governance**
   - Clear information on chains of command and hierarchies.
   - Streamlining of decision-making structures.

4. **Warning Systems**
   - Equal weighting on summer and winter forecasting.
   - Transform single-hazard risk assessments to incorporate a multi-hazard focus.
   - Innovation in warnings to include more detail and best practice guidance on appropriate action under each warning level.
5. **The Public**
   - The public are currently underutilised assets in hazard anticipation, preparation and overall resilience. Improving outreach and education should empower residents to assist responders and enact preparedness measures. Social media is a useful tool for outreach.

Systemic change is needed in the sector to proactively anticipate and manage risk. A sector-wide shift to anticipatory and multi-hazard resilience is needed imminently. This will require transformations in cross-sectoral collaboration mechanisms, data handling, and organisational policy. The categories of anticipation, adaptation, preparation, response and recovery are not discrete — improvements in any area should have cascading positive impacts across others. Urgent change in all areas and at all scales is needed.

Holly Singleton | Brasenose College, Oxford | UKRLG workshop synthesis, 2025 | Produced voluntarily

Appendix 2: Glossary of Terms, Concepts and Abbreviations

This glossary supports consistent understanding of the terminology used throughout this note and the wider body of work to which it relates.

Part A — Core Concepts

Adaptation Long-term changes to assets, services, operational arrangements or investment approaches intended to reduce future climate risk and build resilience. Includes both physical interventions and organisational change.

Adaptive Capacity The ability of an organisation, service or network to adjust to changing conditions, respond effectively to disruption, and continue to improve resilience over time.

All-Hazards Approach A framework that addresses the full range of credible hazards — flooding, extreme heat, storms, ground instability, and others — through common planning, common capability, and common consequences assessment, rather than treating each hazard as a separate planning problem.

Anticipation The stage of the resilience cycle focused on recognising credible risk early and mobilising capability before impacts escalate. Includes monitoring forecasts, applying triggers and thresholds, pre-positioning resources, and activating response arrangements.

Bellwin Scheme The government emergency financial assistance scheme for local authorities in England & Wales facing exceptional, unforeseeable expenditure as a result of emergency events. Widely identified in the workshops as inaccessible and not fit for purpose in its current form.

Business as Usual (BAU) The normal operational service level of a highway authority. Suspension of BAU is the formal, defensible decision to redirect resources from routine maintenance and service delivery to emergency response when an event escalates beyond normal operational capacity. See also Suspension of BAU Doctrine.

Category 1 Responder An organisation designated under the Civil Contingencies Act 2004 as bearing the full suite of civil protection duties, including emergency planning, business continuity management, and warning and informing the public. All Local Highway Authorities are Category 1 responders.

Category 2 Responder An organisation that bears reduced duties under the Civil Contingencies Act 2004 — co-operation and information sharing — and which supports Category 1 responders during emergencies.

Cascading Failure A sequence of failures in which the disruption of an asset or system triggers further failures in dependent or adjacent assets and systems. Community severance — where the loss of a single bridge or route isolates a community from services — is a characteristic cascading consequence in the highway network context.

Common Consequences / Common Contingencies Framework A framework for analysing the consequences shared across different hazard types and the contingency capabilities required to address them, regardless of the specific hazard trigger. Supports the all-hazards approach.

Common Operating Picture A shared, real-time situational awareness picture used by multiple organisations or functions during an incident. Essential for coordinated multi-agency response. See also Stormchain and Rapid Impact Assessment.

Community Lifelines The FEMA framework that identifies the essential services — safety and security, food, water and shelter, health and medical, energy, communications, transportation, and hazardous materials — whose continuity is critical to community wellbeing during and after a disaster. Transport is the enabler of all other lifelines.

Community Severance The isolation of a community from essential services, emergency access, or economic activity as a result of highway network disruption. Particularly acute for communities dependent on a single route or structure.

Consequence-Led Thinking A planning approach that reframes the question of resilience from what asset has failed to who cannot get through, and what happens to them. Shifts the unit of assessment from asset condition to human and economic impact.

Digital Twin A digital representation of a physical asset, network or system that enables real-time monitoring, simulation, and decision support. The DfT-commissioned economic analysis (Arup / Connected Places Catapult / Digital Twin Hub, 2024) identified integrated incident and emergency management as the priority use case, with combined benefits approaching £860m in present value terms.

Highways Network Criticality Scale A structured and comparable post-incident classification framework for the highway sector, enabling defensible comparison of event severity across authorities, hazard types, and time. Currently in development; sector engagement invited.

Impact Understood through the formula: Impact = (Damage x Consequences) x Duration of effect

Rapid Impact Assessment (RIA) The structured, evidence-based assessment of damage to highway assets and the consequences of that damage for the network and community, conducted during or immediately after a hazard event. Provides the situational awareness necessary for prioritisation, resource mobilisation, and mutual aid.

Resilience Cycle The seven-stage operational cycle — Anticipate, Assess, Prevent, Prepare, Respond, Stabilise, recover — that forms the backbone of the IHE/DfT training programme for highway network resilience management. The Stabilise stage, which sits between Respond and Recover, is explicitly named in this cycle.

Risk Measure of the significance of a potential event in terms of its assessed likelihood and impact

Stabilisation The operational phase between Respond and Recover in the resilience cycle. Its purpose is to make assets and the network safe, maintain critical connectivity, and prevent further deterioration where full repair is not immediately achievable. A key objective is to protect assets and reduce long-term repair cost through early intervention.

Storm Desmond +30% The planning standard advised by UK Government in 2016, requiring highway authorities to test their resilience against rainfall events equivalent to Storm Desmond (341mm in 24 hours, Cumbria, December 2015) plus up to 30 per cent — approaching 390mm in a single day. The impact is non-linear: once drainage and network capacity are exceeded, additional rainfall drives disproportionate increases in flooding, damage and network failure.

Suspension of BAU Doctrine The operational doctrine under which a highway authority formally and defensibly suspends routine service delivery to redirect resources to emergency response. Published by the UKRLG ABC Board, May 2026.

Vulnerability and Criticality Assessment A structured, evidence-based assessment of where the highway is most exposed to hazard impacts and where disruption would have the greatest consequence for communities and dependent services.

Part B — Operational and Emergency Response Terminology

Bellwin Scheme See Part A above. Note applies to England & Wales. Different mechanisms apply in Scotland and Northern Ireland

Business Continuity Plan (BCP) A plan setting out how an organisation will continue to deliver critical functions during and after a disruptive event. Highway authority BCPs are widely designed around hours and days; the workshops identified the need for plans designed around months and years.

Gold / Silver / Bronze Command The three-tier local authority command structure for emergency response. Gold provides strategic direction (feeds into multi-agency Strategic Coordinating Group, SCG); Silver provides tactical coordination (feeds into multi-agency Tactical Coordinating Group, TCG); Bronze provides operational delivery on the ground.

JESIP (Joint Emergency Services Interoperability Programme) The framework and five principles — co-location, communication, coordination, joint understanding of risk, and shared situational awareness — that underpin effective multi-agency emergency response. JESIP training is not consistently delivered across the highway sector.

Local Resilience Forum (LRF) A multi-agency forum bringing together Category 1 and Category 2 responders within a defined geographic area (typically a police force boundary) to coordinate emergency planning and preparation.

Major Incident An event or situation with a range of serious consequences requiring special arrangements to be implemented by one or more emergency responder agencies.

Mutual Aid The arrangement by which one organisation provides resources — personnel, plant, specialist capability — to support another during or after an emergency event. NB. Current highway mutual aid frameworks are informal and tend to be relationship-dependent; the sector lacks the formalised mutual aid governance that exists in fire, policing, and energy.

Stormchain The world's first integrated emergency management tool for highway Rapid Impact Assessment, co-founded by John A. Lamb and Dr Hugh Deeming. Government-supported and independently evidenced. Provides field-based asset inspection, dynamic situational awareness, automatic situation reports, and evidential records for Bellwin claims and recovery funding applications.

Strategic Coordinating Group (SCG) The multi-agency group providing strategic leadership during a major incident. Sometimes referred to as Gold Group.

Tactical Coordinating Group (TCG) The multi-agency group providing tactical coordination during a major incident. Sometimes referred to as Silver Group.

Part C — Abbreviations and Acronyms

ABC Board	Adaptation, Biodiversity and Climate Resilience Board (part of UKRLG)
ADEPT	Association of Directors of Environment, Economy, Planning and Transport
ARP4	Fourth round of the Adaptation Reporting Power (Climate Change Act 2008)
BAU	Business as Usual
BGS	British Geological Survey
BCP	Business Continuity Plan
CCA	Civil Contingencies Act 2004
CCRA	Climate Change Risk Assessment
CIHT	Chartered Institution of Highways and Transportation
COBR	Cabinet Office Briefing Room
CRDT	Crisis Resilience Digital Twin (DfT programme)
CRVA	Climate Risk and Vulnerability Assessment
CSS Wales	Chief Officers of Highways, Transportation and Infrastructure Wales
DfT	Department for Transport
DLO	Direct Labour Organisation
EA	Environment Agency
FEMA	Federal Emergency Management Agency (United States)
IHE	Institute of Highway Engineers
JESIP	Joint Emergency Services Interoperability Programme
LHA	Local Highway Authority
LGTAG	Local Government Technical Advisers Group
LRF	Local Resilience Forum
MACA	Military Aid to Civil Authorities
NOS	National Occupational Standards
NUAR	National Underground Asset Register
PIARC	World Road Association — Permanent International Association of Road Congresses
RIA	Rapid Impact Assessment
SCG	Strategic Coordinating Group
SCOTS	Society of Chief Officers of Transportation in Scotland
SitRep	Situation Report
SPW	Storm Proofing Wales
SQEEP	Suitably Qualified, Experienced and Empowered Practitioner
TCG	Tactical Coordinating Group
UKRLG	UK Roads Leadership Group
VOST	Virtual Operations Support Team