Institute and Faculty of Actuaries

Resilience study scoping consultation

IFoA response to National Infrastructure Commission

5 April 2019

About the Institute and Faculty of Actuaries

The Institute and Faculty of Actuaries (IFoA) is a royal chartered, not-for-profit, professional body. We represent and regulate over 32,000 actuaries worldwide, and oversee their education at all stages of qualification and development throughout their careers.

We strive to act in the public interest by speaking out on issues where actuaries have the expertise to provide analysis and insight on public policy issues. To fulfil the requirements of our Charter, the IFoA maintains a Public Affairs function, which represents the views of the profession to Government, policymakers, regulators and other stakeholders, in order to shape public policy.

Actuarial science is founded on mathematical and statistical techniques used in insurance, pension fund management, investment and increasingly in other areas where actionable insight needs to be obtained from data. Actuaries provide commercial, financial and prudential advice on the management of assets and liabilities, particularly over the long term, and this long term view is reflected in our approach to analysing policy developments. A rigorous examination system, programme of continuous professional development and a professional code of conduct supports high standards and reflects the significant role of the profession in society.

Institute and Faculty of Actuaries

Mr Matt Crossman
Resilience Study Consultation
National Infrastructure Commission
Finlaison House
15-17 Furnival Street
London EC4A 1AB

5 April 2019

Dear Mr Crossman,

IFoA response to NIC Resilience study scoping consultation

The Institute and Faculty of Actuaries (IFoA) welcomes the opportunity to respond to the National Infrastructure Commission's Resilience scoping study consultation. Our response reflects the views of the IFoA's Finance & Investment Board and Risk Management Board, together with those of our Infrastructure Working Party.

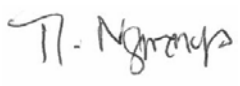
The IFoA welcomed the announcement of the first National Infrastructure Assessment (NIA) as a much-wanted long-term assessment of the country's infrastructure needs that would be "joined up", would seek to achieve political consensus, and would reduce uncertainty for infrastructure investors. We are pleased that the next NIA will be enhanced by material on the vital subject of resilience, reflecting the views of stakeholders in response to this consultation.

Actuaries' work on infrastructure projects is mainly carried out from the perspective of project investors or lenders, for insurance companies, pension funds, investment firms and ratings agencies. A small number of actuaries also work for infrastructure projects directly, or for their suppliers or advisers. The profession also has a long-standing joint working party with the Institution of Civil Engineers on the risks in infrastructure projects, as evidenced by this response.

Reflecting this actuarial expertise, we have focused on the first two consultation questions and omitted those on cross-sector interdependencies.

If you would like to discuss any of the points raised in this response in more detail, please contact Matthew Levine, Policy Manager (matthew.levine@actuaries.org.uk).

Yours sincerely,



Marjorie Ngwenya
Immediate Past President, Institute and Faculty of Actuaries

Q1: What are the key questions that the next National Infrastructure Assessment should answer about resilience?

In infrastructure projects it may sometimes be necessary to incur an extra capital cost to achieve increased resilience. Whether the extra cost is appropriate will depend on the severity of the consequences of a failure of the project – the greater the consequences for society, the more justification there may be for the extra spending. However, seeking to spend more to achieve greater resilience could make the difference between a project passing or failing tests of financial viability. Sometimes it may be possible to build options into the design of the asset and delay spending money on increasing resilience until the nature of an emerging risk becomes clearer.

The IFoA acknowledges that judgement will always be necessary in making such decisions. **It would be extremely helpful if the National Infrastructure Assessment (NIA) could help sponsors consider their options about investing in resilience in the context of their individual projects**. The NIA could include evidence and analysis based on the results of the NIC's resilience study, including examples of where resilience has effectively been built into infrastructure and why it was successful, and conversely where it has failed and why. The NIA could also provide clarity on how resilience can be measured, how its financial costs can be weighed against quality of life impacts, and how to prioritise those impacts. Meaningful resilience measures are grounded in potential variations from a base case, so it is important that the base case is comprehensive, including all key parameters and assumptions.

The **timescales** for which it is desirable to build in resilience need to be carefully considered. For example, is it worth spending extra money now, to mitigate a threat that is not expected to occur in the next 20 years but is thought to have a significant chance of occurring in the following 30 years? Or, is spending the money now potentially a bad use of resources, since the asset may well be overwhelmed by new threats that could arise in the next 20 years?

The NIA could also include material that will **help project development teams to respond to important questions from those making decisions on developing or sponsoring the project**. Examples of such questions include:

- Does the project development process allow sufficient time and access to others' experiences to achieve a reasonable degree of resilience?
- Has there been a sufficiently imaginative exploration of a wide range of possible scenarios throughout the asset's expected lifetime? Are the usage forecasts as soundly-based as possible, including changes in the future of work arising from increasing use of artificial intelligence?
- What are the main risks which could threaten the continuance of the project during commissioning, construction and after the asset comes into operation? Does the length of the development and construction phase bring added risks due to unexpected developments? How vulnerable is the project to financiers or construction firms backing out?
- How long is it likely to be before these risks become quite likely to materialise? Are there early warning indicators which will be able to detect this?
- What steps are being recommended to mitigate these risks as far as possible?
- Have all avenues for achieving greater resilience, including those at no significant extra cost, been fully explored?
- Will it be recommended that extra capital should be spent in order to provide greater resilience and, if so, what is the justification for doing so? Can this extra cost be justified if it results in greater public spending?

Q2: On the basis of your response to question 1, what issues should be prioritised in the resilience study?

To help sponsors, we suggest **the study should identify different kinds of resilience and key project risks, and assess the ways in which each form of resilience can mitigate each of these risks**. Some forms of resilience may also allow opportunities to be taken, for example adaptability.

In work carried out with the Institution of Civil Engineers, we have identified the following broad categories of resilience, all of which can be built in to a project from the outset to a greater or lesser extent:

1. Disaster recovery - The ability for an asset to return to its previous state after a disaster, without substantial further expenditure. An example would be the use of fire-resistant materials in the construction, or the installation of back-up generators.
2. Strength to withstand more extreme conditions - Assets could be made stronger and more likely to survive e.g. storms which become more severe over time. We note that building for expected worsening of storms during the design life is not resilience but base case design. Resilience is building for (even) more future severity than we expect.
3. Future expansion - The scope to expand in order to meet unforeseen increased demand. An example is designing metros in megacities, where future required capacity is very uncertain. It may be good practice to build in high capacity from the outset as building only modest capacity could cause serious problems if future expansion is needed while maintaining operations.
4. New legal requirements – Even if there is no immediate likelihood of such changes, for example on safety or protection of the environment, it may be worthwhile for the designers of a project to go beyond current legal requirements. Otherwise, there could be unanticipated extra cost, such as the extensive and expensive safety requirements imposed on the Channel Tunnel after the project was agreed.
5. Adaptability - Designing an asset so that it can quite easily be converted to an alternative use if necessary. For example a hospital or prison could be designed with the aim that it might eventually have to be converted to an outpatient clinic or rehabilitation centre.
6. Flexibility – Designing for a degree of flexibility in an asset's use, without much extra cost. This could include designing for major maintenance or asset replacement while maintaining operations.

We have also identified some of the main downside risks which can be mitigated by resilience measures:

1. Irreparable damage to physical structures due to natural events or mistakes in construction.
2. Premature obsolescence due to e.g. technological developments or changing customer expectations, which cannot be accommodated within the structures, or not without prohibitive cost.
3. Increased competition from external developments which mean that the structure or service is no longer used to the extent originally envisaged.
4. Over-forecasting of usage, meaning that the asset is not financially, socially or environmentally viable once it comes into operation.
5. Under-forecasting of usage, meaning that in order to meet demand, further substantial expenditure is required which might have been much less had the asset been designed originally on the basis of correct forecasts.
6. Changing social needs which mean that the asset is no longer needed. For example, a hospital may not be required if more people can be treated at home.
7. Risks associated with third parties, for example contractor bankruptcies or investors pulling out before construction is complete.

Achieving maximum resilience is a highly desirable goal, subject to the concerns we have mentioned about justifying capital spending. We therefore recommend that **decision-makers should always be required to address resilience specifically and report on it**, when a project is authorised to proceed.