Institute and Faculty of Actuaries

National Infrastructure Assessment consultation

IFoA response to the National Infrastructure Commission

5 August 2016

National Infrastructure Commission: The National Infrastructure Assessment – Process and Methodology – A Consultation

About the Institute and Faculty of Actuaries

The Institute and Faculty of Actuaries (IFoA) is the chartered professional body for actuaries in the United Kingdom. Actuaries' training is founded on mathematical and statistical techniques used in insurance, pension fund management and investment and then builds the management skills associated with the application of these techniques. Actuaries can provide commercial, financial and prudential advice on the management of a business's assets and liabilities, especially where long term management and planning are critical to success. A majority of actuaries work for insurance companies or pension funds but they also advise individuals and offer comment on social and public interest issues.

Actuaries and infrastructure

Actuaries are skilled in quantitative risk and finance, two areas which are important for developing infrastructure projects and investing in them.

Actuaries' work on infrastructure projects is mainly carried out from the perspective of investors or lenders to projects, for insurance companies, pension funds, investment firms and ratings agencies. A small number of actuaries also work for infrastructure projects directly, or 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 the enclosures to this response.

The IFoA's Resource and Environment Board studies questions such as the likely impact of climate change, which is relevant for the sustainability of infrastructure projects.

IFoA response to NIC consultation

1. The IFoA welcomes the opportunity to respond to the National Infrastructure Commission (NIC) consultation on The National Infrastructure Assessment – Process and Methodology. The IFoA's Finance and Investment Board and Risk Management Board are jointly responsible for the drafting of this response, and have oversight of the Infrastructure Working Party, which contributed much of the content.

2. The IFoA supported the creation of the NIC, which we believe has the potential to reverse historic underinvestment in infrastructure. We also support the National Infrastructure Assessment (NIA). This will provide a much-wanted long-term assessment of the country's infrastructure needs that will be "joined up" for the first time; that will seek to achieve political consensus; and that will reduce uncertainty for infrastructure investors. It provides an opportunity for the development of funding vehicles for infrastructure that will encourage participation by UK and overseas long-term investors.

3. The IFoA endorses the general approach to setting priorities described in the consultation paper, which involves drawing on a wide range of sources, such as scenarios based on historic data, models, and the views of sector experts.

4. The consultation paper makes no mention of the EU, but the Referendum result could have a significant impact on infrastructure investment in the UK. Possible implications include loss of subsidies, reduced confidence among investors, and uncertainty about whether EIOPA's preferential treatment of the asset class for insurance companies would continue to apply.

Such uncertainties could lead to project deferment and a negative impact on national economic growth.

5. We recognise that the Commission's remit from Government includes economic infrastructure but not social infrastructure such as schools and hospitals. Nevertheless, we would encourage the Commission to maintain an awareness of how its recommendations in the NIA could affect social infrastructure and vice versa, given the interdependencies between social infrastructure and the types of infrastructure covered by the Commission.

Q1. The Government has given the National Infrastructure Commission objectives to:

a. foster long-term and sustainable economic growth across all regions of the UK
b. improve the UK's international competitiveness
c. improve the quality of life for those living in the UK

What issues do you think are particularly important to consider as the Commission works to this objective?

6. To achieve these worthy but challenging objectives, the NIC will need to encourage an infrastructure investment market in which there is a broad range of high quality projects in which to invest, and in which potential investors have sufficient incentive to do so. This is not just a question of providing an adequate return on the investment (important though that is) but also – crucially – only seeking to place on investors the types of risk that they are willing and able to bear.

7. We believe it is important to develop close liaison and transparency between planners and potential investors. One way to do this would be to give investors access to risk studies on individual projects, since whatever the investor's risk appetite, it is crucial for them to understand the risks in depth so they can balance the risks and prospective returns. The project information provided to investors should cover environmental and social aspects as well as economic ones.

8. The NIC should also encourage sponsors and planners to present projects and their proposed financing arrangements in standard formats as far as possible, to facilitate due diligence by potential investors and comparisons between projects. The presentation should specify the risks which the investor will bear and those which will be borne by other parties.

Q2. Do you agree that, in undertaking the NIA, the Commission should be:

a. Open, transparent and consultative
b. Independent, objective and rigorous
c. Forward looking, challenging established thinking
d. Comprehensive, taking a whole system approach, understanding and studying interdependencies and feedbacks?

Are there any principles that should inform the way that the Commission produces the NIA that are missing?

9. We strongly agree with all of these principles for carrying out the NIA. We particularly support the need for a whole system approach, understanding and studying the interdependencies and feedbacks. We have commented on this in more depth under question 5. In addition, we welcome plans for the NIA to incorporate an element of scenario or stress testing to demonstrate the robustness of the eventual recommendations.

10. You may wish to consider adding "evidence-based" to the Commission's list of qualities.

Q3. Do you agree that the NIA should cover these sectors in the way in which they are each described?

11. We support the approach of treating each sector in an integrated way, and then similarly looking at all sectors together.

Q4. Are there particular aspects of infrastructure provision in these sectors which you think the NIA should focus on?

12. One of the work-streams of the Commission should be to study existing publicly-owned infrastructure in each sector (including assets owned by agencies and local authorities). This would be done with a view to identifying which assets could be leased (for 20 or 30 years) to long-term private sector investors at home or overseas, such as pension funds or insurance companies, in order to raise funds for new infrastructure investment. This could lead to a continuous cycle developing in future, whereby new assets would mainly be financed by the public sector, but when construction was complete and the asset in operation, it too would be leased off in order to raise funds for the next round of investment. The leasing of the Channel Tunnel Rail Link is a useful precedent.

13. Private institutions considering an investment are likely to want assurance that any new technology which is to be used has been thoroughly tested first in real-life operation. In the IFoA's response to the recent Department of Business, Innovation and Skills call for ideas on a National Innovation Plan, we noted that through Innovate UK, the Government is supporting researchers and entrepreneurs to develop a range of systems for adaptable infrastructure. We would encourage the NIC to liaise closely with Innovate UK, so that the NIA can take account of how innovation could influence the provision of infrastructure in each of the sectors.

14. We believe that the energy sector, and especially the generation and distribution of electricity, is of such critical importance that the NIA should focus on it particularly. Regard should be had to future demand forecasts but there should at all times be a sufficient margin (and/or contingency plans) to allow for unexpected extra demand and for discontinuities in the supply chain due to causes such as severe weather or terrorism. The NIA should be consistent with the UK's carbon budgets and expert advice (e.g. from the Committee on Climate Change) about the need to decarbonise the energy sector to meet climate change targets.

15. Climate change effects, including more widespread flooding, could give rise to water supply problems in parts of the UK, and we believe that ensuring resilience of the supply in those areas should be a priority.

Q5. The NIA will seek to pull together infrastructure needs across sectors, recognising interdependencies. Are there are particular areas where you think such interdependencies are likely to be important?

16. Energy is likely to have strong interdependencies with transport (as noted in paragraph 42 of the consultation paper) and with most other forms of infrastructure. There are also important interdependencies within the transport sector, e.g. between roads and railways, and between both of these and airports. As paragraph 8 of the consultation notes, new housing drives the need for energy, transport and schools, and conversely, provision of adequate infrastructure can affect whether planned housing developments are viable.

17. We would encourage the NIC to look at whether interdependencies could be mapped in a methodical way in the development of the NIA. A simple scale of (say) 1 to 5 could be used, where 1 means low and 5 means high levels of interdependence. For example, a city's tram scheme would probably be ranked 1 against most other forms of local infrastructure, and possibly 2 against local electricity infrastructure. By contrast, a new airport might have a ranking of 5 against other airports, and against roads and railways in its locality.

Q6. Do you agree that the NIA should focus on these cross-cutting issues? AND
Q7. Are there any other cross-cutting issues that you think are particularly important?

18. We agree with the list of cross-cutting issues set out in the consultation paper. We welcome the focus on governance and the recognition that effective frameworks for planning and decision-making are crucial to success. We also wish to highlight three other cross-cutting issues.

19. We are pleased that the NIC has included evaluation and appraisal methodology in the list. The IFoA and the Institution of Civil Engineers have collaborated on two projects (further details of which are attached with this response) which are relevant to this area:

    a. The RAMP Guide contains procedures for project appraisal, including a method for determining probabilities of various outcomes, leading to a risk-adjusted Net Present Value. RAMP has been used by Crossrail as one of the foundations of its own risk-management system (along with STRATrisk, a guide to managing ongoing strategic risks).

    b. 'Front end thinking' describes the analysis that needs to be undertaken between identifying a possible need for new infrastructure and authorising a particular project. During this period it is essential to ensure that critical issues are not inadvertently left out of proper consideration and to avoid premature commitment to a particular project. There is a need to use data which is as accurate as possible, with cross checks to other projects, and there should also be a rigorous approach to risk, both quantifiable and qualitative. Without these, many mistakes or omissions can occur, which can lead to sub-optimum projects being selected or even the eventual failure of a project.

20. A second cross-cutting issue which is particularly relevant to the IFoA is funding and financing. We believe that it may be possible to develop more efficient financing structures, which sub-divide the financing into different tranches, carrying different degrees of risk. This would enable different kinds of investor to select the tranche which best meets their own needs from a risk and return viewpoint, and hence encourage their participation. For example, some investors might be willing to bear construction risks and the risks associated

with traffic forecasts, in order to achieve higher investment returns, whereas other investors might be more conservative and wish to invest only in completed projects. Equity finance is often most appropriate in the early stages of a project, while investment in completed projects may be undertaken through debt instruments (possibly index-linked) or a combination of debt and equity. Subdividing the financing structure in this way is likely to encourage public-private partnerships which would provide a greater degree of risk clarity and enable projects to go ahead more quickly, without the confusion and delay which can arise when risks only emerge after a due diligence process has been completed.

21. Some approaches the Commission could consider include:
    a. Financing of large developments by developers using bank finance, with a commitment from the outset by long term investors to buy the developer out once construction is complete and operation has commenced (used successfully in the 1970s for large town centre shopping malls);
    b. "Shadow tolls" paid by the public sector for those kinds of infrastructure which do not carry their own income stream from charges made to users;
    c. Public-private partnerships based on charges to the public sector for the provision and continued availability of suitably serviced assets.

    We believe that work by the Commission on financing issues would be of material help in getting future projects off the ground efficiently, and the IFoA would be pleased to assist if required.

22. One additional area which we suggest should be studied is the question of how best to compensate people and businesses adversely affected by proposed infrastructure projects. The aim would be to try to work out a better system which would reduce opposition and the resulting long delays, so that projects could commence earlier and their benefits be received sooner. The study should include the quantum and timing of the compensation that would be needed, and the criteria for receiving it, as well as an assessment of whether the costs of any new system recommended are justified, having regard to the resulting savings in development costs and the earlier attainment of a project's benefits.

23. The third cross-cutting issue we wish to comment on is performance measures. The consultation paper notes (paragraph 55) that performance metrics often fail to give an adequate account of the value of services provided. Developing meaningful performance measures will be important both for target-setting and for post-implementation studies to learn lessons for the future. We note that this is an area of active interest for the social impact investment field.

Q8. Do you agree with this methodological approach to determine the needs and priorities?

24. The IFoA would endorse the general approach to setting priorities described in the consultation paper. We agree that difficult judgements will be unavoidable and that the NIC should draw on a wide range of sources, such as scenarios based on historic data, models, and the views of sector experts.

25. The remit of the 'Vision and Priorities' document, which will precede the NIA, includes setting out 'priority areas for action over the medium term' (paragraph 4). Below we have set out a list of some potential infrastructure priorities (not in any particular order):

    a. Ensure the safety and resilience of our electricity supply, including scenarios where demand increases sharply.
    b. Introduce more protection against terrorism

c. Improve resilience to severe flooding.
d. Identify infrastructure schemes which would ease the lives of ageing and disabled people.
e. Identify schemes which would help us to meet greenhouse gas emission targets or improve the environment.
f. Reduce the risk of stranded assets by considering the compatibility of proposed projects (especially energy and transport ones) with carbon budgets and climate change targets.
g. Identify schemes which would improve social justice or other aspects of human welfare.
h. Improve or replace existing infrastructure nearing the end of its life.
i. Using national and regional growth plans, identify possible infrastructure schemes which would assist the achievement of the growth targets in those plans.

26. This is not a definitive list, but we have set it out here because we believe that to be effective, the NIA should include a mechanism for deciding on the relative weights to attach to each of these priorities (and possibly others) when selecting projects This will require both information and judgement at several levels - political, economic and financial. This is a challenging task but we believe the Commission will need to embrace the challenge in order to produce a NIA that yields optimum benefit for the UK and its population. One possible approach could be to use a 'Quadruple bottom line' framework in which economic considerations are supplemented by social and environmental assessments together with an analysis of the sustainability of all three factors. Another possible approach might be to award points to prospective projects, under each of the priority headings (weighted as necessary), and then to select a short-list of those projects which score most highly, before using judgement to refine this short list into a programme.

27. Another important consideration will be the timing of projects, given scarce resources. It will not be possible to implement every desirable project immediately. Having a clear idea of the nation's most urgent needs will help in deciding which projects should be implemented first, and political inputs may be helpful in making such judgements, as well as prioritisation scores.

28. One issue may be the appropriate scale for priorities. For example, the process for setting priorities should be able to deal with the fact that a national priority for, say, a more comprehensive road network may not apply in some regions.

Q9. Do you have examples of successful models which are particularly good at looking at long-term, complex strategic prioritisation in uncertain environments?

29. We have already referred to RAMP, which includes a simple practical model that can produce a probability distribution of outcomes, something which scenario analysis on its own cannot do (consultation paragraph 59). This enables projects to be prioritised according to a "risk-adjusted Net Present Value", and not just according to the expected Net Present Value in the business case. Care needs to be taken in applying an appropriate discount rate, noting that, when assessing public projects intended to benefit society as a whole, it may be appropriate to use a lower rate than when assessing the benefits of a project to a private investor. The model also enables risk mitigation options to be prioritised according to their degrees of cost effectiveness.

30. We would also suggest considering Multi-Criteria Analysis (MCA). MCA approaches enable projects/options to be ranked using an appropriately-weighted combination of criteria. It is particularly suitable for "mixed type" data (i.e. a mix of qualitative and quantitative criteria, with the latter expressed in a variety of units) and where it is desirable to involve stakeholders in the prioritisation process.[1]

Q10. Do you believe the Commission has identified the most important infrastructure drivers [population and demography, economic growth and productivity, technology, and climate change and environment]? Are there further areas the Commission should seek to examine within each of these drivers?

31. We believe that most infrastructure needs are generated by one or more of the four drivers suggested.[2] It may also be worth mentioning consumer preferences and political pressures, which are harder to measure than economic factors but which could also have a significant impact on people's perceptions of infrastructure needs. Other factors which might give rise to a demand for more or improved infrastructure, or impact on the detailed design of infrastructure, include social dimensions such as protection against crime, more rigorous safety regulations, and pressures to catch up with improved infrastructure in other countries. Another driver might be the need to redistribute some infrastructure within the country in order to reduce vulnerabilities in "hot spots".

Q11. The NIA will aim to set out a portfolio of investments that best meets the demands of the UK in the future. Do you have a view on the most appropriate methodology to determine that portfolio? AND
Q12. In your view, are there any relevant factors that have not been addressed by the Commission in its methodological approach?

32. *General approach* The IFoA agrees with the broad approach described in the consultation paper. Analysing individual sectors and their interdependencies (which we have suggested could be mapped in a structured way) will help to lead to an initial set of infrastructure priorities.

33. *Measuring social and environmental factors and their sustainability* When comparing both high-level priority areas and specific projects, the Commission should consider using a broad range of metrics which cover not only economic outcomes but also social and environmental measures as well as a sustainability assessment. The IFoA is involved with environmental and resilience questions such as flooding, asset stranding and limitations of resources. We are also aware of increasing social engagement with these issues, and we would encourage the NIC to make an active effort to take account of all members of society in developing the NIA's priority list and portfolio selection.

34. *Scale of projects* The infrastructure portfolio does not need to be limited to large, concentrated projects. Smaller, more local and more geographically spread out projects may increase resilience by containing the impact of unexpected events such as a natural disaster or a terrorist attack.

[1] See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7612/1132618.pdf .

[2] We note that they are closely aligned with the IFoA's Key Policy Priorities (KPPs), which cover issues around the ageing population (similar to 'Population and demography'); investment policy (similar to 'Economic growth and productivity'), the area of risk and insurance (which is broadly related to 'Technology'), and resource and environment issues (similar to 'Climate change and environment').

35. *Optimism bias* The Commission should also study the impact of optimism bias in project appraisals. There is reason to believe that the inclusion of these massive contingency allowances in capital costs distorts the comparative appraisals between one project and another, runs the risk of rejecting worthwhile projects, and provides project managers with too comfortable a budgetary cushion leading to waste. It also discourages the application of comprehensive risk-management techniques which would provide more accurate assessments of project worth, identify opportunities for enhancing the project to increase benefits, and assess which risk mitigation options are cost-effective. Where comprehensive risk management is undertaken, projects will be fully thought through in advance and there will be a strong case for reducing or sometimes even eliminating optimism bias adjustments.

36. *Resource issues* In practice there are constraints on the size of any infrastructure investment programme, because of limits on the resources of people and materials which can be made available at any one time. We suggest that the Commission should study these constraints and consider possible ways in which they could be overcome, both in the short term and the longer term. From a longer term perspective, and given post-Referendum uncertainties about freedom of movement from the EU, the NIA is an opportunity to assess what workforce capabilities are needed and to proactively use projects to build this resource within the UK population. This may increase costs for projects in the short term while bringing total costs down in the long term.

37. *Funding issues* To go from strategic priorities to recommending a portfolio of specific projects, the Commission will need to have a deep knowledge of funding issues. This should include the impacts of different investment vehicles; whether the existence of too many risks would make some projects inaccessible for most investors; and funding sources, including whether these are UK-based or overseas-based. The IFoA would be willing to help the Commission in this area.

38. *Insurance of infrastructure* We also recommend that a study should be made of the insurance products which can be made available for enabling public-sector sponsors of infrastructure to be covered against a variety of risks. This study should cover not only the standard insurance products, but also ways in which additional risks might be insured, for example through Lloyd's. Consideration should be given to possibilities such as the insurance of only a proportion of each risk, enabling the public sector to continue to bear much of the risk itself (if desired) and keeping the cost of insurance premiums as low as possible, but enabling the public sector sponsor to get the benefit of the risk mitigation and risk control measures suggested by the insurer. Such measures could control the costs of a project to a greater extent than sometimes occurs at present. The IFoA has many members working in general insurance and would be pleased to discuss these ideas further.

Q13. How best do you believe the Commission can engage with different parts of society to help build its evidence base and test its conclusions?

39. The NIC should be as open as possible with stakeholders as it seeks evidence to develop the NIA. For example, organisations such as the ESRC's Centre for Understanding Sustainable Prosperity could help the NIC to identify holistic, long-term and resilient projects. The NIC should also ask local and community-based organisations for their views on early drafts. The IFoA would also be happy to be involved with this.

40. Preliminary discussions should be held with HM Treasury so that the NIA can be prepared against a realistic understanding of the present financial situation, and an awareness of

possible enhancements to the NIA which might become possible if some of the financial constraints could be relaxed. Key questions would include whether the Government would be prepared to bear more risk itself in order to get more projects off the ground, and if it will reimburse investors for monies expended in the event of premature cancellation of a project. There is also the question of possible studies on the leasing of existing infrastructure, optimism bias, compensation for people affected, and shadow tolls. The IFoA would be pleased to join in such discussions if that would be helpful.

Should you wish to discuss any of the points raised in further detail please contact Matthew Levine, Policy Manager (Matthew.Levine@actuaries.org.uk / 0207 632 1489) in the first instance.

Yours faithfully

Colin Wilson
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Enclosures:

i. **A copy of the RAMP Guide** ***https://www.dropbox.com/s/unupwq4fixqbdok/RAMP%203rd%20edition%202014%20for%20NIC.pdf?dl=0***

ii. **Appendix 12 of the RAMP Guide 2nd edition,** ***Risks in Major Infrastructure Projects*** ***https://www.ice.org.uk/ICEDevelopmentWebPortal/media/Disciplines-Resources/Best%20Practice/ramp-2nd-edition-appendix-12-major-projects.pdf***

iii. **Front-end thinking issues paper produced by joint working party of the IFoA and the Institution of Civil Engineers**