

## Implementing the 'Building Better Homes, Towns and Cities' National Science Challenge

### Proposal

1. Following the recent successful funding of seven National Science Challenges (NSCs), this paper seeks Cabinet agreement to proceed to the next stage of implementation of the deferred *Building Better Homes, Towns and Cities* NSC, Ko ngā wā kāinga hei whakamāhorahora (Challenge 11), and sets out an estimated funding envelope for this Challenge. This paper also seeks delegated authority for the Minister of Finance and me – as Minister of Science and Innovation – to make a final decision on whether to issue an RfP for Challenge 11.

### Executive Summary

#### *Cabinet agreed to implement ten NSCs in 2013*

2. The NSCs, agreed by Cabinet in April 2013, identify some important national-scale issues around which some of New Zealand's government-funded research efforts should be organised. The NSCs focus the efforts of New Zealand's best researchers on big research-based issues facing the country – across disciplines and at scale.
3. Cabinet has to date agreed to implement ten of the National Science Challenges (NSCs) recommended by the National Science Challenges Panel [Cab Min (13) 13/5A refers].

The first ten NSCs are:	
<b>High Value Nutrition</b>	Ko Ngā Kai Whai Painga
<b>The Deep South</b>	Te Kōmata o Te Tonga
<b>Resilience to Nature's Challenges</b>	Kia manawaroa – Ngā Ākina o Te Ao Tūroa
<b>Ageing Well</b>	Kia eke kairangi ki te taikaumātuatanga
<b>A Better Start</b>	E Tipu e Rea
<b>Healthier Lives</b>	He Oranga Hauora
<b>Sustainable Seas</b>	Te Tini a Tangaroa me Ngā Moana Whakaumu
<b>Our Land and Water</b>	Toitū te Whenua, Toiora te Wai
<b>Science for Technological Innovation</b>	Kia kotahi mai – Te Ao Pūtaiao me Te Ao Hangarau
<b>New Zealand's Biological Heritage</b>	Ngā Koiora Tuku Iho

#### *Implementation is progressing well, with seven NSCs underway*

4. Implementation of these ten NSCs is well underway following Cabinet approval of funding envelopes in September and December 2013.
5. The quality of response to the NSCs has been impressive, with a high degree of collaboration and focus on national-scale issues from some of New Zealand's best research teams. As a result, I have recently launched two NSCs and the Science Board has

approved funding for a further five. Proposals for three NSCs are currently being refined by the applicants.

***I now propose to proceed with Challenge 11***

6. When Cabinet considered the proposed NSCs in April 2013, it decided to defer Challenge 11 pending an evaluation of whether an industry research strategy being developed for the built environment was suitable for incorporation into the NSC framework [CAB Min (13) 13/5A refers].
7. I have now concluded that Challenge 11 will complement the strengths of industry research and that the long-term, collaborative NSC approach will make an important contribution to resolution of some of New Zealand's neighbourhood, town, city and national-scale building challenges.
8. ***These challenges include:***
  - the Canterbury rebuild
  - Auckland expansion
  - the impact of changing demographics on the type of housing demand
  - housing quality and affordability more generally.
9. ***Challenge 11 would address these by delivering:***
  - practical solutions to develop smart cities, better transport and healthy urban environments
  - solutions to constraints on construction sector productivity and innovation uptake
  - innovative materials, processes and devices to the New Zealand construction sector
  - better understanding of demographic drivers and consumer preferences in housing
  - solutions for cost-effective upgrades to existing building stock.
10. Delivering better homes, towns and cities for New Zealand will require the integration and coordination of research activity, and a strong focus on uptake of research outputs. The collaborative, inter-disciplinary, mission-focussed Challenge approach is an excellent mechanism for achieving this.
11. I therefore propose to proceed to the next stage of implementation of Challenge 11.

***Challenge 11 will be refined and finalised following further work with the sector***

12. If Cabinet agrees to delegate authority, the Minister of Finance and I will jointly make a final decision on whether to issue an RfP for Challenge 11 following further work with potential research providers and end-users. This will ensure that Challenge 11 is well aligned with existing NSCs and with industry strategy.
13. The estimated funding envelope for Challenge 11 is ██████████ over 10 years. This funding envelope comprises new funding appropriated for NSCs in Budgets 2012 and 2013 and other MBIE-managed research funding currently invested in research aligned to the proposed scope of Challenge 11. The funding envelope proposed for Challenge 11 will be met from within existing appropriations. No new funding is required.

14. I propose that the Minister of Finance and I will jointly agree a final funding envelope for Challenge 11. Crown Research Institute (CRI) funding may also contribute to Challenge 11. A Request for Proposals (RfP) for Challenge 11 could be issued in October 2014, with a subsequent funding decision by the Science Board by March 2015.

### **Background**

15. In March 2013, the independent National Science Challenges Panel (the Panel) recommended the Government proceed with 12 NSCs. The Challenges are a mission-led approach to research that generates greater impact and value from the Government's science investment.
16. On 22 April 2013, Cabinet agreed to implement 10 NSCs recommended by the Panel (combining two of the 12 recommended by the Panel).
17. Cabinet subsequently approved funding envelopes for the ten agreed NSCs in September and December 2013. Research collaborations submitted proposals to address each of the ten NSCs and the Science Board has since awarded funding to seven of these.

### **Progress on NSCs**

18. I recently launched the first two NSCs – High Value Nutrition and The Deep South – and the research collaborations have now started work. The New Zealand's Biological Heritage and Sustainable Seas NSCs will be launched shortly.
19. Three NSCs – Resilience to Nature's Challenges, Science for Technological Innovation, and A Better Start – have each been approved funding for a six-month commencement phase by the Science Board.
20. The research providers applying to address the remaining three NSCs – Aging Well, Healthier Lives, and Our Land and Water – are working with MBIE to refine their proposals and will return to the Science Board by November 2014. I am confident that all the teams involved in the remaining Challenges will move quickly to produce fundable proposals.
21. [REDACTED]
22. All proposals demonstrated significant collaboration across research organisations, as well as a focus on the key national-scale science-based issues identified in the NSCs. This level of collaboration is in some cases unprecedented, indicating a cultural shift across the sector. This is a positive outcome of the National Science Challenges process.
23. The NSCs funded to date will deliver solutions to a wide range of challenges, for example:
- Reducing the impact of natural hazards by developing new and improved warning systems.
  - Creating new business opportunities through the development of health biomarkers and product validation schemes that support health claims for New Zealand food products.
  - Predicting and developing responses to potential environmental shocks including drought, flooding, storms and high temperatures.
  - Developing a world-leading system for prioritising bio-security and biodiversity management.
  - Developing tools to maximise the potential of digital learning for young people.

### **Challenge 11**

24. The National Science Challenges Panel recommended that Challenge 11 (*Building Better Homes, Towns and Cities*) focus on research to develop affordable and better housing and urban environments (see **Annex 1** for the original Panel proposal).
25. In April 2013, Cabinet deferred Challenge 11, pending an evaluation of whether an industry research strategy being developed for the built environment is suitable for incorporation into the Challenge framework [CAB Min (13) 13/5A refers].
26. Potential science sector participants in, and industry supporters of Challenge 11 have indicated that they strongly support its implementation in order to support and complement the industry research strategy. Potential participants in Challenge 11 are engaged in constructive discussions regarding the possible scope and structure of a collaboration.
27. The NSC Panel proposed research themes for Challenge 11. These will be developed further with the sector:
  - Innovative materials, smart and assistive devices.
  - Creating vibrant cities and neighbourhoods including smart city initiatives.
  - Innovation in housing provision.
  - Upgrading existing housing building stock and creating healthy homes.
  - Land information systems.
  - Uptake of innovation and productivity improvements by the building sector and clients.

### **Implementing Challenge 11**

28. The building sector research strategy, *Building a Better New Zealand*, was launched in September 2013. Discussions that have occurred within the sector about Challenge 11 have included the input and support of designers of the *Building a Better New Zealand* strategy.
29. I have concluded that Challenge 11 will support and complement the aims of the *Building a Better New Zealand* strategy and that bringing the NSC approach to this area will deliver additional benefits to New Zealand. I therefore propose to proceed to the next stage of implementation of Challenge 11.
30. NSCs are not 'business as usual' and are a collaborative way to step-up the delivery of research in New Zealand. They are long-term, mission-led and focussed on delivering additional impact over and above existing research activity. The NSC approach would therefore make an important contribution to building better, homes, towns and cities in New Zealand alongside the strategy for the following reasons:
  - It is a long-term, collaborative approach appropriate to the major urban design challenges New Zealand faces; e.g. the Canterbury rebuild, the growth of Auckland and changing demographics; that require the development of new collaborative and solutions-focussed ways of addressing urban design.
  - The Challenge's focus on neighbourhood, town and city scale would complement the building-scale strengths of industry-led research and encourage step-change.

- The Challenge 11 mission's breadth and long-term focus to develop better housing and urban design, and a more productive construction sector matches the scale of the potential long-term benefit to New Zealand's economic performance, and New Zealanders' health and wellbeing, from improvements in this area.

**31. Challenge 11 would:**

- Delivering practical, New Zealand-specific solutions to enable the creation of smart cities, healthy urban environments and integration of urban transport.
  - Bringing innovative materials, processes and devices to the New Zealand construction market to deliver higher quality, more affordable buildings.
  - Developing our understanding of future demographic drivers and consumer aspirations in housing, and providing innovative responses to these.
  - Providing solutions to constraints on productivity and the uptake of innovation in the construction sector.
  - Delivering innovations to enable better, more cost-effective upgrades to existing building stock.
32. Industry, guided by the *Building a Better New Zealand Strategy*, will continue to lead the way in constructing our homes and neighbourhoods. Challenge 11 will deliver the focussed research and improved capability that we need alongside industrial innovation to ensure that residential and urban development delivers the best outcomes for all New Zealanders.
33. Implementation of Challenge 11 presents an exciting opportunity to accelerate and broaden our efforts to develop better and more affordable homes, towns and cities.
34. Therefore, I propose to proceed to the next stage of implementation of Challenge 11 now in order to give the science sector the confidence to invest resources in developing their response to the Challenge.

**Setting funding levels for Challenge 11**

35. If Cabinet agrees to proceed with Challenge 11, I propose that the Minister of Finance and I, as the Minister of Science and Innovation, have delegated authority to make a joint final decision on whether to proceed to an RfP, including finalisation of a funding envelope for the Challenge. This decision would follow MBIE-led workshops with the sector to refine the current Challenge description.
36. In order to inform Cabinet's decision, MBIE has estimated [REDACTED] could be included in a funding envelope for Challenge 11. This would be funded from within the National Science Challenges funding already agreed by Cabinet – including funding provided for NSCs in Budgets 2012 and 2013 – and from other MBIE-managed research funding.

***Funding for Challenge 11 will come from National Science Challenges funding and from MBIE-managed contestable funding***

37. In September 2013 and December 2013, Cabinet agreed to funding envelopes for the first 10 NSCs, which included the allocation of new funding [CAB Min (13)21/17 and EGI Min (13)30/7 refer]. After funding these 10 NSCs, new funding of [REDACTED] over ten years was set aside for Challenge 11.
38. Cabinet also agreed in September 2013 that Vote Science and Innovation contestable funding in current contracts that directly link to the outcome of a NSC be included in the

funding envelope for a NSC along with the new funding [EGI Min (13)285]. The Science Board makes funding decisions on NSC up to the maximum of the approved funding envelope.

- 39. Of current contestably-funded contracts managed by MBIE, two directly link to the outcomes of Challenge 11 based on its current description. The current description of Challenge 11 was proposed by the National Science Challenges Panel and is included in **Annex 1** to this paper. Over ten years, transferring this funding to Challenge 11 (as these contracts end) would make a further [redacted] available for this Challenge.
- 40. The funding envelope for Challenge 11 will be approximately [redacted] over 10 years. I expect that only minor changes, if any, would be made to this funding envelope following further development of the Challenge 11 description. The estimated funding for Challenge 11 is summarised in the table below.

	Funding source		Total ten-year envelope (\$m)
	Total new funding (\$m)	Total from MBIE-managed contestable funding (\$m)	
Challenge 11	[redacted]	[redacted]	[redacted]

**CRI core funding may also contribute to Challenge 11**

- 41. Core funding provided to CRIs supports work that underpins many of the NSCs. As a shareholding Minister in CRIs I am ensuring that these levels of investment are maintained in the NSC research areas. It is likely that some CRI core funded research will be aligned to the objectives of Challenge 11. Once the Challenge 11 description is finalised, I will ask CRIs to make an estimate of their potential contribution to it through their core funding.

**Next steps**

- 42. If Cabinet agrees to the proposals in this paper, MBIE will work with the sector to refine the objective, themes and outcomes for the Challenge. This will involve MBIE-initiated sector workshops and specific consultation with Māori. MBIE will then brief the Minister of Finance and me, seeking decisions on a final Challenge description and funding envelope.
- 43. Following this process, CRIs will be asked to estimate the contribution of core funding to this Challenge.
- 44. The Minister of Finance and I will then make a joint decision on whether to release an RfP for Challenge 11, and on the funding envelope for Challenge 11.
- 45. After proposals have been received, an independent assessment panel will review proposals and make recommendations to the Science Board. The Science Board will then make funding decisions. I anticipate that an RfP could be issued in October 2014 and a Science Board funding decision made by March 2015.
- 46. The proposed process will ensure that the original Panel proposal for Challenge 11 (see **Annex 1**) reflects the latest research, is fully informed by sector expertise and is suitably scoped to deliver the objective of ‘research to develop affordable and better housing and urban environments’.

**Consultation**

- 47. The following agencies have been consulted in the development of this paper: Ministry for the Environment, Ministry of Social Development, Ministry of Health, The Treasury, Te Puni Kōkiri, Ministry for Primary Industries, Ministry of Transport, Land Information New Zealand

and Ministry of Pacific Island Affairs. The Department of Prime Minister and Cabinet has been informed.

**Financial implications**

47. The proposals in this paper are fiscally neutral. I seek authorisation for the Minister of Finance and me to make fiscally neutral adjustments to the Hazards and Infrastructure Research Fund appropriation as required to implement the transfer of funding to the National Science Challenges multi-year appropriation that Cabinet agreed to establish in September 2013 [EGI Min (13)21/17 refers].

**Legislative implications**

48. None.

**Human rights implications**

49. None.

**Gender implications**

50. None.

**Disability perspective**

51. None.

**Publicity**

52. Subject to Cabinet's agreement to the proposals in this paper, I propose to make an announcement about the decision to proceed with Challenge 11 and the next steps in terms of its implementation. I also propose to release this Cabinet paper publically.

**Recommendations**

The Minister of Science and Innovation recommends that Cabinet:

1. **Note** that when Cabinet agreed to implement the National Science Challenges in April 2013, it deferred implementation of Challenge 11 – *Building Better Homes, Towns, and Cities*, pending an evaluation of whether an industry research strategy being developed for the built environment was suitable for incorporation into the Challenge framework;
2. **Note** I am satisfied that Challenge 11 supports and is complementary to the finalised industry research strategy
3. **Note** that sector stakeholders have indicated that they strongly support the implementation of Challenge 11, and have demonstrated a willingness to participate in the collaborative Challenge process;
4. **Agree** to officials proceeding to work with the sector to develop the detail of Challenge 11 – *Building Better Homes, Towns and Cities*;
5. **Agree** to provide delegated authority to the Minister of Finance and the Minister of Science and Innovation, following workshops to develop the detail of Challenge 11, to jointly:
  - a. finalise estimated Challenge 11 funding as set out in recommendation 6 below, and

- b. decide whether to release a RfP for Challenge 11;
6. **Note** the estimated ten-year funding envelope specifying the funding available to Challenge 11 (based on existing Vote: Science and Innovation funding and new money allocated to National Science Challenges in Budgets 2012 and 2013) shown below:

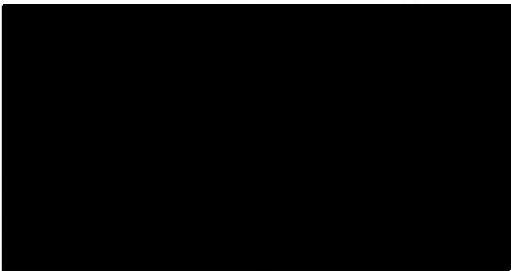
	Funding source		Total ten-year envelope (\$m)
	Total new funding (\$m)	Total MBIE-managed contestable funding (\$m)	
<i>Building Better Homes, Towns and Cities National Science Challenge</i>	██████	██████	██████

7. **Note** that it is likely that only minor changes would be made to the estimated funding envelope following further work to develop the Challenge with the sector;
8. **Note** that I will ensure, as a shareholding Minister in Crown Research Institutes, that Crown Research Institutes maintain an appropriate level of investment of relevant core funding in Challenge 11;
9. **Authorise** the Minister of Finance and the Minister of Science and Innovation to jointly make fiscally neutral adjustments to the multi-year appropriation 'National Science Challenges' and the annual appropriation 'Hazards and Infrastructure Research' to provide funding for Challenge 11, and make subsequent fiscally neutral changes to its agreed funding envelope as required;
10. **Note** that subject to Cabinet's agreement to the proposals in this paper, MBIE will:
- a) engage with the sector to refine objective, themes and outcomes for Challenge 11;
  - b) seek estimates from Crown Research Institutes of the level of core funding relevant to this Challenge;
  - c) supply further advice on implementation of Challenge 11, including a draft final Challenge description and funding envelope, to the Minister of Finance and Minister of Science and Innovation for their joint decision on whether to release an RfP; and
  - d) subject to joint Ministers' approval, release a RfP for Challenge 11.
11. **Agree** that similar mechanisms will be used to implement this Challenge as for the other National Science Challenges, namely:
- a) the use of a Gazette notice to advise the funding envelope for Challenge 11 and to set criteria the Science Board must consider when assessing proposals for funding;
  - b) a RfP to undertake Challenge 11; and
  - c) the Science Board to make funding decisions.



12. **Agree** that subject to Cabinet's agreement to the proposals in this paper I will make:

- a) an announcement of the Government's decision to proceed with development of Challenge 11 and the next steps in terms of its implementation; and
- b) this Cabinet paper publically available.



Hon Steven Joyce  
Minister of Science and Innovation

15/8/14

**Annex 1: National Science Challenges Panel proposal for  
Challenge 11**

Challenge	
<b>Title</b>	<b>Building better homes, towns and cities: Research to develop affordable and better housing and urban environments</b>
<b>Opportunity</b>	<p>New Zealand has a number of relatively distinct needs related to housing. Our population mix is changing with changing expectations, we are becoming more urbanised, we still have a high use of timber in building, we need to consider energy efficiency and resilience to natural hazards, and we need to address issues of affordability. There is a need to deliver dwellings and built environments that meet the needs and desires of New Zealand's diverse and changing households, communities and businesses. There is also the potential for global leadership in creating affordable housing systems and technologies. We need to identify and develop faster and more cost-effective construction industry innovations.</p> <p>There is a need for a more coherent approach to research in housing, building and urban design than exists now and the returns from such an approach should be both social and economic.</p> <p><i>The Panel concluded that supporting this Challenge would create very significant additionality with strengthened co-ordination and integration flowing from the multi-disciplinary and cross-institutional research needed to meet the Challenge.</i></p>
<b>Science Goal</b>	Providing tailored and appropriate scale solutions, technologies and information for decision-makers (such as councils, property developers, regulators) that enables transformation of our built environment.
<b>Societal Goal</b>	Vibrant cities and towns, new and upgraded homes and buildings that are of real value – modern, well-priced, well-located, high-quality, resilient, meeting our diverse needs and aspirations.

Themes	Examples of Research Activities
<b>Innovative materials, smart and assistive devices</b>	<p>Innovative use of engineering grade radiata pine timber technologies (New Zealand is world leader in this industry sector).</p> <p>Roof tile solar panels and energy storage systems.</p>
<b>Creating vibrant cities and neighbourhoods including smart city initiatives</b>	<p>Sensors, solar cells, smart grids, integrated transport, digital infrastructure including urban modelling, Christchurch as a demonstration site.</p> <p>Low carbon footprint cities, forging "the New Zealand way".</p> <p>Multi-disciplinary research to design urban environments that are economically competitive, enhance health and well-being, and are resilient to hazards.</p>
<b>Innovation in housing provision</b>	<p>Assessing different demographic demands and aspirations (e.g. the elderly, ethnic groups, mentally disadvantaged).</p> <p>Investigations into demand and the best means to supply housing within designated affordability and density parameters.</p>
<b>Upgrading existing building stock and creating healthy homes</b>	Investigating innovative designs and structures for healthy, energy efficient homes.
<b>Land information systems</b>	<p>Application of GIS, geodetic research and modelling approaches to monitor changing needs and land use patterns, including for growing export markets.</p> <p>Visualisation of complex datasets to underpin essential Land Information Systems research capability.</p>
<b>Uptake of innovation and productivity improvements by the building sector and clients</b>	Use of social science research to understand and overcome entrenched constraints on the rapid adoption of innovations and life-cycle efficient decisions in the construction sector.

Annex 2:

