

Draft 2016 National Research Infrastructure Roadmap Submission Template

Please provide your comments in this word document below, noting that the overall word count should not exceed 1,000 words and any content exceeding this amount may not be counted as part of your submission. If you would like your comments published, please ensure that your submission, including all pictures, diagrams or tables adheres to online accessibility requirements as stated on our [Terms and Conditions](#) page.

When your comments are complete, save this document in two of the accepted file types and upload both documents to the Department submissions page in accordance with the instructions.

Submission from National Committee for Materials Science and Engineering (NCMSE), Australian Academy of Science

NCMSE sincerely thanks the Chief Scientist and the Expert Working Group on National Collaborative Infrastructure (NCI) and Departmental Staff for the opportunity to comment on an excellent draft of the 2016 National Research Infrastructure Roadmap. Advanced Materials play an important role in modern life and future knowledge based industries and advanced manufacturing will rely on advanced materials and nanotechnology. The draft Roadmap adequately covers materials and two infrastructure focus areas have concentrated on materials, Advanced Fabrication and Manufacturing and Characterisation.

P7 - Key Recommendations – recommendation #5

Response: This recommendation is to be applauded but attention needs to be given to identifying appropriate funding mechanisms that can attract, build and retain relevant expertise over meaningful, long-term time frames.

P13, section 1.2, Definition of National Research Infrastructure:

Response: “Expertise” should be added to the following definition:

i.e. “National research infrastructure comprises the nationally significant assets, facilities, EXPERTISE and services, to support leading-edge research....”

Justification: Infrastructure without expertise has little benefit. To provide a genuine capability to researchers, infrastructure must be accompanied by relevant specialist expertise in data acquisition and analysis.

P16, A Framework for National Research Infrastructure Governance, 3rd dot point:

Response: “Expertise in data acquisition and analysis” should be added to the following definition:

i.e. “A principles-based approach to maintaining, terminating or creating new national research infrastructure based on merit-based access for research excellence, state of the art instruments and methods, EXPERTISE IN DATA ACQUISITION AND ANALYSIS, innovation, collaboration, national interest, socio-economic impact and international engagement.”

Same justification as above

P23, Table 2 : Alignment of National Science and Research Priorities and Focus Areas:

Characterisation should also be shown as supporting the priorities “Transport” and “Energy”, in addition to those shown.

Advanced Fabrication and Manufacturing also supports priority areas “Food”, “Soil and Water”, “Transport”, “Cyber Security” and “Environmental Change”. Justification: For example, ANFF WA node is developing hyperspectral imaging systems being used for monitoring food quality, carbon content in soil etc.

P32, Future Directions, paragraph 2:

Response: Emerging areas of characterisation should include: “time and energy resolved microscopy; in-situ microscopy;”

i.e. “Over the next five years emerging areas of characterisation will include: atomic scale microscopy; cryo-electron microscopy; TIME AND ENERGY RESOLVED MICROSCOPY; IN-SITU MICROSCOPY; multimodal imaging.....”

Justification: This is vital for most of the National Science and Research Priority Areas: Food, Soil and Water, Transport, Energy, Resources, Advanced Manufacturing, Environmental Change and Health.

P33, under “What we need” – “Microscopy”

Response: This list should include: “next generation electron microscopy for material sciences”:

i.e “The next stage for microscopy research infrastructure should include: cryo-electron microscopy, NEXT GENERATION ELECTRON MICROSCOPY FOR MATERIAL SCIENCES, new generation atom probe tomography and ion beam mass spectrometry.....”

Same justification as above

P 35, para 2, under “Future Directions”

This section could be further strengthened by adding:

Metamaterials and metasurfaces for photonics, optical MEMS and NEMS, Nanowires for integration of nanoelectronics and optoelectronics and ‘brain on a chip’ to develop engineering neuronal networks.

Page 36; Section on “What we need”

Advanced Fabrication and Manufacturing relies on “advanced metrology” as well, this section will be strengthened by adding a statement like:

The advanced fabrication requires advanced metrology tools to ensure that the fabrication is achieving the designed specifications.

Advanced Modelling tools are also needed to design the next generation materials, devices, circuits and systems.