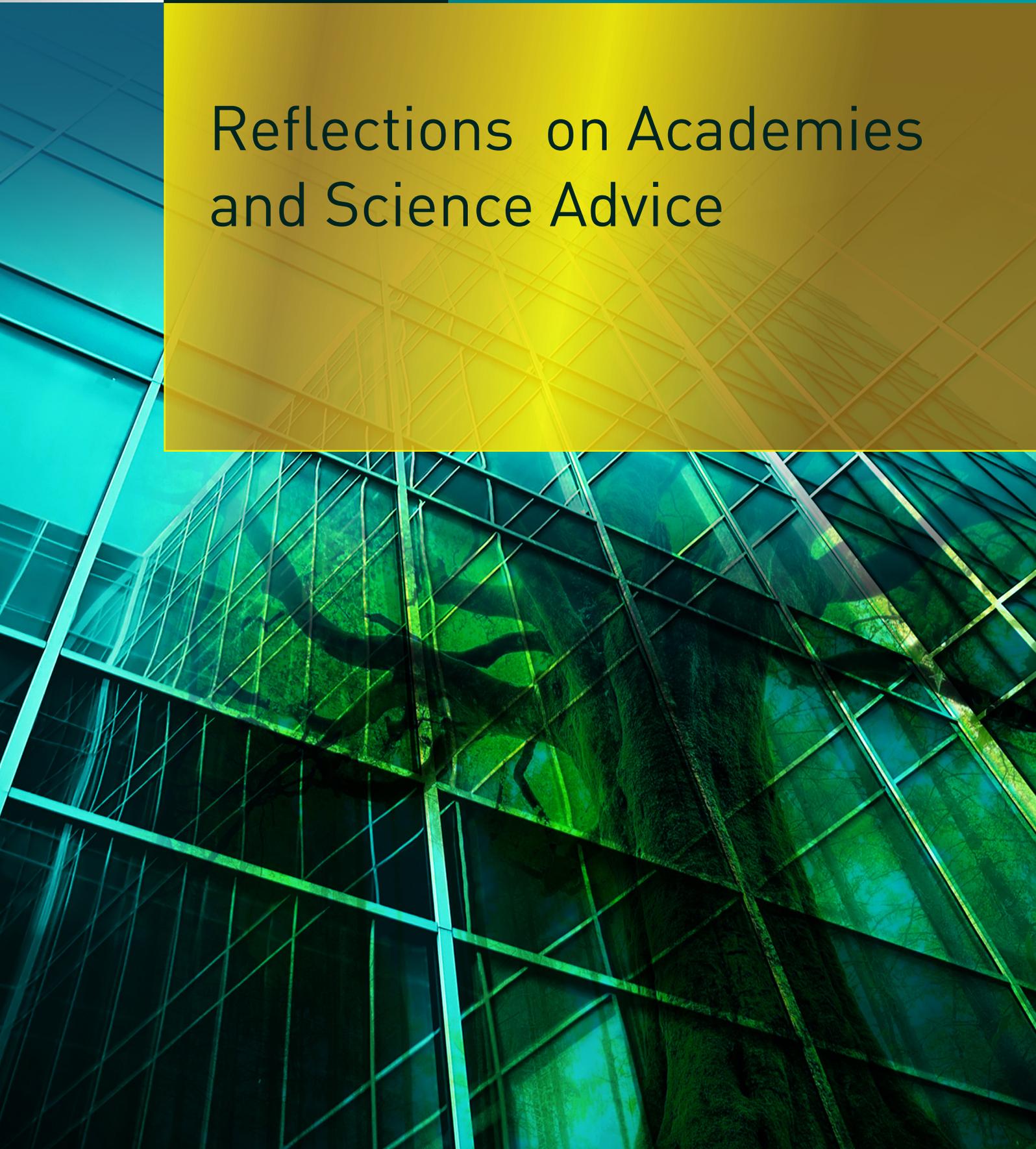


## Knowledge Sector Initiative

WORKING PAPER 13

# Reflections on Academies and Science Advice





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Written by:  
**Fred Carden**

July 2016



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The author's views expressed in this publication do not reflect the views of the Government of Australia, Government of Indonesia, or the Knowledge Sector Initiative. All entities will not accept any liability arising as a result of this publication. The paper was prepared for the Indonesian Academy of Sciences (APII).

# Table of Contents

Table of Contents .....	iii
Forewords	
Science in the Public Interest – the Role of National Academies of Science .....	1
1. Introduction .....	3
2. Sources of Data .....	4
3. Funding Consensus Reports/Expert Panels .....	5
4. Mandate .....	6
5. Tools and Approaches Explored .....	7
6. Promoting Evidence .....	10
7. Conclusion .....	13
References .....	14
Annex A - Academies Reviewed .....	15
Annex B – Expert Interviews .....	16

# Forewords

## Science in the Public Interest – the Role of National Academies of Science



**N**ational Academies of Science are a central actor in any country's knowledge sector. When they are well-resourced and well-managed, they play an important role in helping to translate evidence into policy-ready advice for government. They are sometimes neglected by social scientists but they should be seen as an important tool in thinking about the implementation of public policy because they bring together the best minds on a subject and turn that into policy advice. Social scientists would do well to make strong use of academies in their efforts to improve policy advice.

Recently I attended a workshop with the [National Academy of Sciences in Indonesia – AIPi](#). AIPi was established by the Government of Indonesia 25 years ago. A major push has been on for several years now to strengthen the Academy so that it can fulfill its primary mandate as science advisor to the nation. The workshop benefitted from presentations from the US National Academies as well as the Australian Academy of Science and input from the Dutch Royal Academy.

The President of the Academy, Professor Sangkot Marzuki, asked me to present the results of a small survey I did of how other Academies provide science advice. He wanted to make sure they were considering approaches that Academies around the world are using to provide science advice.

I looked at the websites of 18 organisations that provide science advice, most of them Academies but some Royal Societies, after the British model. I spoke to staff and Academy members in Indonesia, Canada, the US and Australia. These are the key things I learned from those conversations:

- | There is a convergence of approaches around the provision of advice through expert panels that survey the evidence and provide advice to their governments based on that review.
- | Academies can run into controversy because they address topics that

are sensitive but of central importance such as right-to-die legislation, immunization, etc.

- | Academies are increasingly focused on communicating not only to their governments but are also trying to ensure the public has access to the best possible evidence. As a result, they are spending more time and effort on communicating their findings to the public.
- | To ensure the integrity of their findings, Academies are scrupulous in ensuring the independence of their panels and in ensuring that a wide variety of views is included in the panel. I found one case where an Academy lost that reputation for independence for a short period of time; it took years to recover.
- | National Academies are increasingly supporting the development of Young Academies to encourage young scientists to stay in research and contribute to national development. They are doing this through a range of support, sometimes financial, often through mentoring in joint studies such as [SAINS45](#) in which AIPI, working with a team of young scientists, are proposing a national research agenda for Indonesia.
- | Where countries invest little in science, their scientists contribute their knowledge and experience in other countries, resulting in a knowledge deficit in their own countries. Canada and Indonesia share this challenge. In undervaluing the potential of their Academies, both are making it much harder to bring evidence to bear on public policy.

Through the survey I did for AIPI, I understood more deeply the important role that Academies and Royal Societies play in supporting science in the public interest. In providing rigorous evidence on issues of national importance, they ensure that governments have the best information available to inform public policy. They are a key actor in the knowledge sector of any country. No Academy can ensure that a government heeds its advice, but by presenting the evidence and making it known to the wider society, it expands policy horizons and opens platforms for public debate and indeed legal challenges in some cases. No knowledge sector in any country is complete without a well-functioning and suitably supported National Academy or Royal Society.

# 1

# Introduction

**N**ational Academies of Science play a crucial role in a strong knowledge sector. They bring together the leading scientists in both the physical and social sciences and can provide strong science policy advice to their country. Scientists seeking to influence public policy with evidence would do well to consider the role of the national academy in that process.

This note is a reflection on the role of science academies in providing scientific advice. It is prepared for a consultation with the Indonesian Academy of Sciences (Akademi Ilmu Pengetahuan Indonesia – AIPI) as they consider how to strengthen their own role in this regard.

All Academies of Science and Royal Societies (the British model) provide science advice to the nation to some degree. Some also provide advice to international organisations. There are a number of commonalities across Academies, large and small, as to the processes and approaches they use, such as Consensus Reports (also called Expert Panel Reports). The purpose of this note is to outline the main approaches Academies are using to provide science advice as well as highlighting some key differences in approach. It was developed for a workshop at AIPI.

# Sources of Data 2

The approaches presented here come largely from well established Academies because they have the richest experience with these processes and therefore provide the best possible advice on good practices. The one exception to this is the inclusion of the Academy of Science of South Africa (ASSAf) because of the major infusion of support it had from the National Academies of Science, Engineering and Medicine in the USA (NAS) from 2004-2014. As a fellow G-20 middle income country that has quickly developed an active and well regarded Academy, it seems a useful inclusion. In terms of Asia, The Chinese Academy is of course well established and large. With over 60,000 staff and over 100 affiliated institutes, it plays a major role in scientific research in the country. Evidence of its work in policy influence is scant on the website, other than to note that its mandate includes science advice and involvement in Science and Technology planning at a national level. Neither it nor the Singapore National Academy of Science (SNAS)<sup>1</sup> publish any policy papers on their websites and both appear to focus primarily on their leadership role in conducting scientific research in their respective nations rather than in providing science policy advice.

A separate review and discussion could be had with emerging Academies, particularly those in Southeast Asia, Indonesia's neighbors, to explore challenges in Academy development and strategies that have been tried. A regional network does exist and could be the home for such an initiative – the Association of Academies and Societies of Sciences in Asia (AASSA) with 30 member countries, spread from Turkey to New Zealand.

Evidence has been gathered here from websites, phone interviews and site visits. See References for a full list of Academies and Societies included in this review.



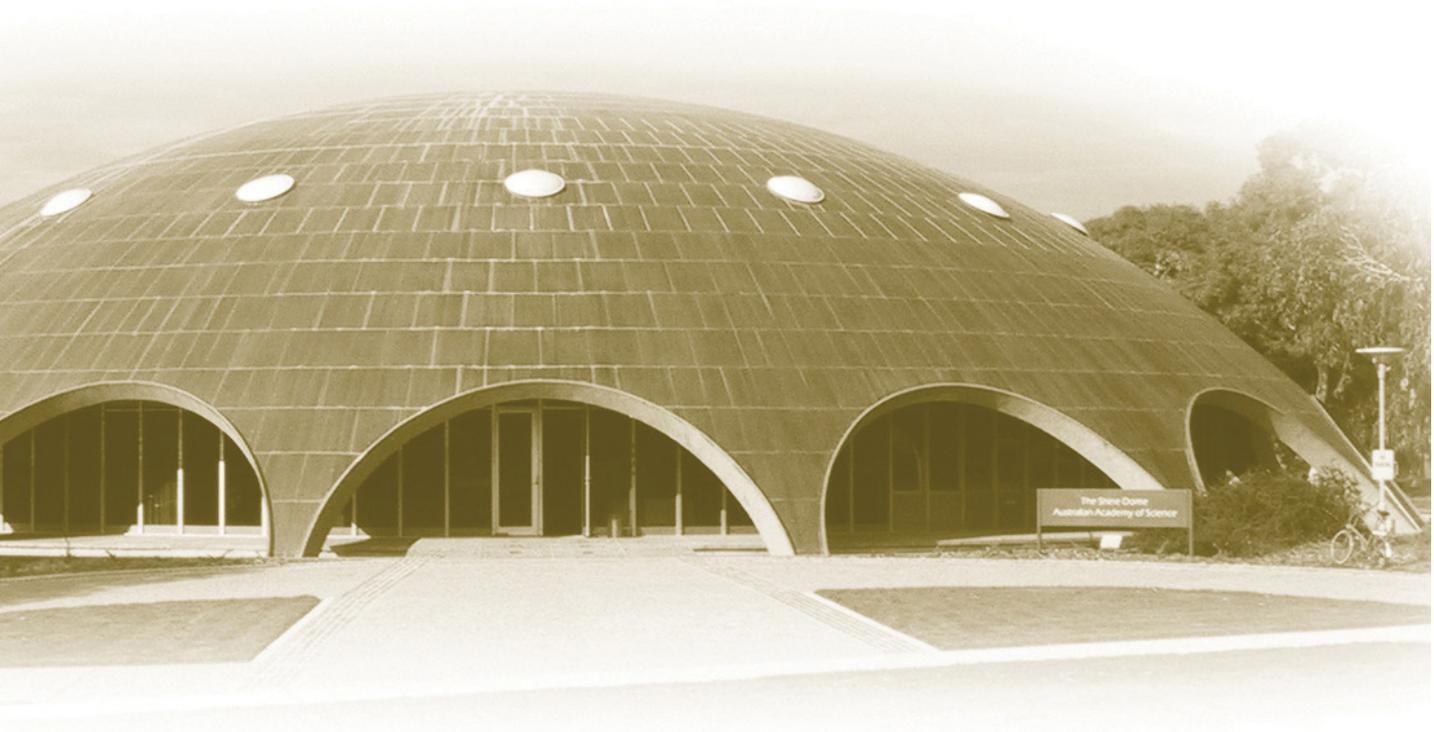
The AASSA Secretariat  
[www.aassa.asia](http://www.aassa.asia)

<sup>1</sup> The Singapore National Academy of Science was originally established as an association of institutes, (Institute of Physics Singapore, Science Teachers Association of Singapore, Singapore Association for the Advancement of Science, Singapore Institute of Biology, Singapore Mathematical Society and Singapore National Institute of Chemistry), but since 2011 it has begun to appoint members to the Academy itself. It is not clear if it will take on more of the usual roles of an Academy as a result of this move.

# 3

## Funding Consensus Reports/Expert Panels

There are different models of funding in use. The Australian Academy of Science only takes on studies that are funded by the requester. They fund other activities through membership fees, sale of publications and through income from their investments. The Royal Society in the UK receives an annual grant from Parliament and it determines what studies to fund. The US National Academies appears to have a mixed model, with most of its work coming from requests from government departments, but with the capacity to also decide on studies it wishes to undertake in the public interest.



The Shine Dome,  
Australian Academy of Science

Academies are often launched with a largely private function that is, celebrating the achievements of their members who are senior members of the scientific community and have made major scientific contributions. This is an important role of Academies. But strong and growing Academies also have a public function that is expressed through a mandate from government to provide science advice to the nation. Aside from the general mandate from government, the Academy needs to be expected to make a contribution to national development. In the United States, President Lincoln mandated all government departments to seek science advice through the academies. In the Netherlands, the Royal Netherlands Academy is mandated to oversee a number of research institutions. In Canada, the Royal Society of Canada has only succeeded in obtaining a general mandate from government. As a consequence while it remains a strong Academy, it has suffered in its ability to deliver science advice. This case is outlined briefly below (see Box 1).

Academies are also beginning to respond in new ways to the need to improve links with policy makers while not losing sight of their primary role in promoting fundamental scientific research. The Academy of Science of South Africa is directly addressing policy makers through a series of [guidance notes for policy makers](#). Others

are finding new ways to engage with the policy process. The Australian Academy of Science puts considerable efforts into public awareness. For example, it produces a '[Q&A Series](#)' that presents evidence for the general public on a topic of concern, such as immunisation. The mandate also includes efforts to improve the enabling environment for research, such as AIPi's efforts to build the Indonesian Science Fund, efforts to improve the capacities of scientists to deliver evidence effectively, and efforts to promote the value of scientific evidence to policy makers.

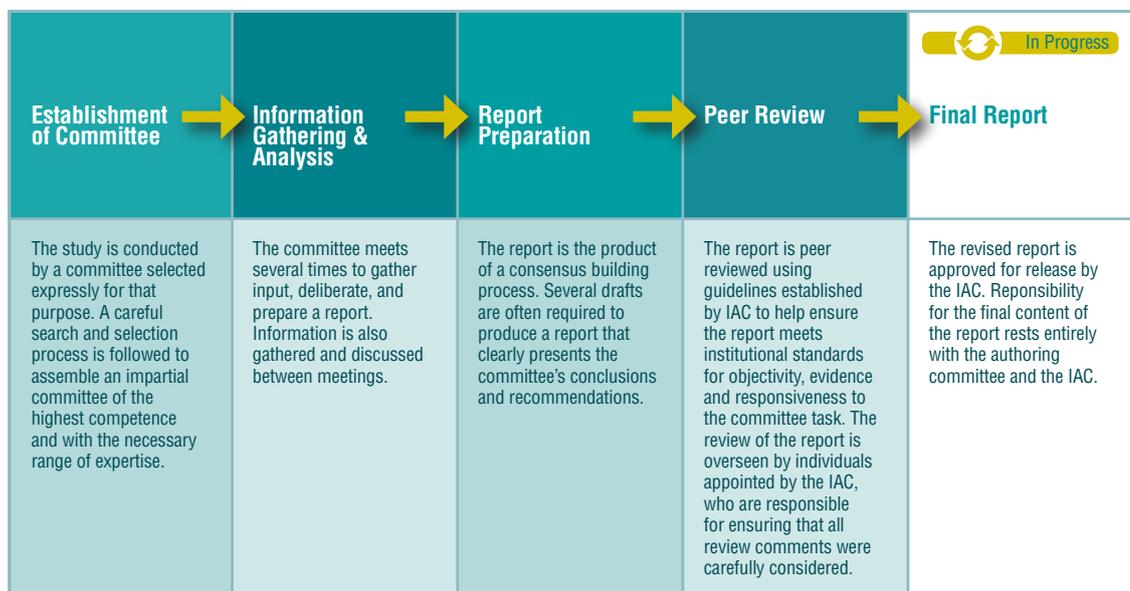
Members of Academies and Royal Societies generally have full time positions and participate in Academy business on a voluntary basis. In most Academies, it appears that a relatively small number of members are actively involved in Academy business on a regular basis. Often Scientific Committees are formed (with the support of the full Academy) from among the active members. With the support of Academy staff, these Committees are key to fund raising, topic selection, panel identification, quality control and follow up on studies.

# 5

## Tools and Approaches Explored

There is considerable convergence in how Academies deliver science advice and science policy advice. Consensus Reports (also called Expert Panel Reports) are the principal vehicle in virtually all Academies that deliver science policy evidence or advice, whether to national governments or international bodies. These are particularly well described by the [NAS](#) and by The InterAcademy Council ([IAC](#)) as outlined in the graphic below from IAC.

Figure 1: The Consensus Report Cycle



Importantly, the Royal Society of Canada has codified [Procedural Guidelines for Expert Panels](#). This detailed manual was developed with significant input from the US Academies and the National Science Foundation. The US bodies were using most of these procedures but had never codified them. This manual is a useful guide to operationalising a panel process.

There are some important characteristics that cut across Consensus Report Panel approaches:

### 1. Independence

- a. They are made up of experts who are selected for expertise not for affiliation;
- b. Their reports are not subject to negotiation with the commissioner of the study;
- c. They may be funded through Academy operating funds or by the commissioner; where funds are provided for individual studies, clear boundaries are set that limit the commissioner role to commissioning the study and receiving the results;
- d. Panel members are reimbursed for expenses only, not their time;
- e. Panel members may be members of the Academy or experts who are not members;
- f. Members of the panel may be nationals or international experts;
- g. Reports are published by the Academy. At NAS, they are panel reports without academy interference so long as processes and quality are acceptable; in the Royal Society they are normally endorsed by the Society prior to publication.
- h. Members are carefully screened for conflict of interest; and
- i. Panels incorporate a diversity of perspectives.

### 2. Transparency

- a. Commissions, study designs, panel memberships and reports are usually publicly posted;
- b. Information gathering meetings of the panel are sometimes open to the public but panel discussions are private;
- c. Panel documents are available to the public

(except in cases of official secrets);

- d. Public consultations are a common feature of panels in most academies; and
- e. Reports may be presented to the commissioner in advance of public release, but normally this happens within a week of public release and does not result in any changes to the report or adjustment of the findings and conclusions.

### 3. Quality

- a. At all stages of a consensus report from design through to final report, checks and balances are in place to ensure quality, independence, ethical practice;
- b. External peer review of final reports is common; and
- c. Some Academies have a panel monitor as well. The monitor's role is to oversee the rigour of the process as well as ensure peer review of the product takes place.

### 4. Interdisciplinarity

- a. The problems that face our societies are seldom specialised problems. They normally need to be addressed by a multi- or interdisciplinary panel that can bring many different facets of the natural sciences together with the social sciences; and
- b. Even understanding the future of a discipline of study usually requires engaging with other disciplines that affect and are affected by the discipline under study.

### 5. Clarity

- a. Clarity of roles and responsibilities is essential to maintain independence;
- b. Terms of reference are carefully reviewed to ensure clarity of the request and process; and
- c. Formal approvals at all steps help to ensure process is honoured.

### 6. Position

- a. Academies generally take a position on the evidence they review. They will reject

- a request for a study that comes with a prescribed response; and
- b. Academies generally respond to concerns that are brought to them. They may also identify issues that they expect to become major issues to which science can contribute, but they are generally demand-rather than supply-driven.

The Council of Canadian Academies describes the characteristics of their process using the following graphic. With one exception it is typical

of the content and approach used by most Academies. That exception is that the Council reports do not contain recommendations to the commissioner. This is an approach that generates critique in the community of Academies where the expert panels are normally expected to make findings based on their review of the evidence (more on the Council can be found in Box 1, and on their website).

Figure 2: Characteristics of Consensus Reports



# Promoting Evidence

## 6

In addition to the primary activity in fulfilling the public mandate of an Academy of producing consensus reports on critical issues, Academies engage in promoting science and science policy in a number of ways:

1. Most carry out foresight studies to explore new areas of science and to understand long range global change. Among them, the Australian Academy of Science appears a relative newcomer to [foresight studies](#); the Swiss Academies of Arts and Sciences has foresight built into its mandate. These studies may be identified by the Academy or by a potential funder of the research. Again, if there is a funder involved, their role and influence ends with commissioning the work. They receive the final report for consideration, but do not engage in drafting at any stage or have influence on the final product.
2. Most develop [decadal or ten year plans](#) for their fields of work, in order to identify key priorities and directions. These may be developed internally or with external consultation. They are normally posted to the academy website.
3. Projects are common, such as the capacity building program, [ASADI](#) (African Science Academy Development Initiative) at the US Academies through which experienced Academies give back to their community in programs to strengthen other Academies.
4. International exchange and dialogue is a priority for virtually all Academies. The [Kavli Frontiers of Science](#) program through which Indonesia collaborates with the US National Academies in joint seminars is one example. For the first time at [Kavli 2015](#), Australian scientists also participated making this a truly multinational undertaking. International fora and workshops are seen as valuable tools for the exchange of knowledge and ideas across countries and across disciplines.
5. Journals are frequent in Academies and they are variable. Some are multi-disciplinary, and peer reviewed, such as the [Proceedings of the National Academy of Sciences](#). The Singapore National Academy of Science publishes [Cosmos](#), a thematic journal with invited articles, a format used by some other Academies as well. A more recent addition to Academy journals is the [South African Journal of Science](#) which is not peer reviewed and is more oriented towards informing the public and creating a space where science is presented in non-specialist language. The approach taken for its journal tends to mirror the orientation and approach of the Academy. For new and small Academies, the costs of producing a journal, especially a peer-reviewed one, can be prohibitive and most seek alternate publication channels.
6. Young Academies are increasingly common. As in Indonesia, there is a recognition of the importance of mechanisms to keep young scientists involved in scientific research.

The Academies often see a responsibility to support that engagement. It is achieved in different ways – in Indonesia through the creation of a Young Academy launched with a high profile activity in proposing a national science agenda – [SAINS45](#); in other countries such as the Netherlands, a [Young Academy](#) is part of the effort of the Royal Academy to promote science among young academicians and researchers. In both Indonesia and the Netherlands, the Young Academies promote interdisciplinarity, engage in activities with senior scientists and promote the importance of science to the public and to students at all levels.

7. Position statements are also used by many Academies and notably by networks of Academies. They are responses to specific issues and situations, such as the [ASSAf statement on xenophobic attacks](#) in South Africa or the [2005 joint statement by the InterAcademy Council](#) to the United Nations on the importance of science in achieving the Millennium Development Goals.

### Box 1 – When Mandate is Weak

In the 1980s, the Royal Society of Canada started producing science policy advice under the leadership of Dr. Kenneth Hare, a respected and prolific Canadian scientist. He led on several reports and by the late 1980s, the society was producing a number of high quality reports under the leadership of others as well. The Royal Society of Canada's Expert Panels followed the kinds of protocols outlined in this paper and its reports were well respected. In 1989, through the Ministry of Industry, The Royal Society of Canada accepted a contract from the Government of Canada valued at \$1million per year for 5 years, for "services". This contract appears to have led to the demise of the capacity of the Society to produce independent reports (Leiss 2005). The Society lost some credibility as a result of work conducted under this contract. (It should be known that this was a difficult time for science in Canada beyond these efforts of government to reduce the independence of the Society. In this same time period the Science Council of Canada had its funding terminated as well.) So when budget cuts came to the Canadian economy in 1993, the Society was an easy target. In 1996, The Royal Society of Canada re-launched its expert panels, but on a case-by-case basis, as funding became available. After discussions lasting almost ten years, in 2005, the government decided to re-launch modest funding for Expert Panels, but it chose to do so through a newly created Council of Canadian Academies (effectively cutting the Royal Society of Canada and the Academies and Engineering and Medicine out of the management of Expert Panels). The Council includes all three Canadian Academies as members but is not itself an Academy. Nor can it be seen as a representative body of the Academies because it was not created by them but by Government. Unlike Academies, the Council does not make recommendations in its report. As such it is subject to criticism in some quarters as lacking in independence and authority. It nevertheless follows the norms and practices of Consensus reports as outlined here to generally good outcomes in terms of quality.

The Canadian government remains unwilling to address critique coming from science,<sup>2</sup> which fuels further critique of the independence of the Council, which is a government creation. The Council's funding was recently extended for another five years until 2020.

It remains very modest<sup>3</sup> and some have pointed out that as a result Canada's best scientific talent is contributing more to scientific advances (and concomitant economic gains) in other countries than in Canada.

What of the Royal Society of Canada itself? It still operates successfully through a mandate that was conferred by the Government of Canada in an Act of Parliament in 1882. In 2010 it launched its first report in a new series of independent scientific reviews. Indeed, its [2011 Study on End of Life Decision Making](#), a report on assisted suicide, was cited by the courts including the Supreme Court of Canada in its rulings on the legislation surrounding assisted suicide. Since then the Royal Society of Canada has produced several additional reports, but funding is uncertain and emerges study by study. Some of its reports have generated controversy and some have generated criticism as is to be expected when addressing difficult and controversial topics.<sup>4</sup> The Royal Society of Canada maintains a strong reputation and addresses issues as they emerge. It maintains strong commitment to engaging with other Academies and supporting them where it can. The challenge remains that no core funding is provided so revenue has to be generated for each activity or Expert Panel.

That the Royal Society of Canada's mandate from the government has never extended beyond that general mandate granted by Parliament in 1882 means that it struggles to have the resources to contribute to Canada and to help make the best use of the country's scientists. As it stands, like Indonesia, many of Canada's best scientists make their contributions in other countries. It is not enough to have a formal mandate. Use is the thing. The Royal Society of Canada continues to strive to expand its mandate.

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- 2 The good news is that the recently elected Government of Canada has created a Ministry of Science. It has also made some strong steps to support science in Canada, such as re-launching the long form census and un-muzzling government scientists (who, until the election of this government, have not been permitted to speak publicly about their work without approval for some years). They still have some way to go to demonstrate a strong commitment to the role of science in national development.
  - 3 The Council receives CAD3 million per year from the Federal Government. In contrast, the National Science Foundation in the US has a budget of USD 7 billion.
  - 4 See for example the listings under Gosselin et al., concerning the 2010 report on the Tar Sands, always a controversial topic; and article by Atzman related to a study on low intensity radiation.

# 7

## Conclusion

This note has not attempted to be fully comprehensive in its review but rather to highlight key elements in science advice. The experience of the Royal Society of Canada presents a salutary reminder that a strong mandate is essential. Without that, much value the scientific community can contribute will be lost.

The criteria for science advice and the requirements for independence and transparency have stood the test of time. Where these have not been compromised or seen to be compromised, the academy findings are taken seriously and considered in policy processes.

Building a staffing complement to manage a credible approach to science advice will differ from country to country and will differ according to the size of the Academy. But sufficient staff to ensure qualified reviewers, independence of process and high quality peer review cannot be underestimated. At NAS, the chief staff person on a study has expertise in the field under review and will usually spend 20-30% of their time on a study (this can be higher). Staff at NAS are funded by projects so considerable effort goes into generating a steady flow of work to ensure staff continuity.

As the Royal Society UK Case study on Indonesia (Shetty et al. 2014) concludes:

Indonesia's scientific system has a great many strengths but also some weaknesses. The flaws are not fatal however, and if addressed soon, and with genuine commitment, the country could start to change its scientific fortunes.

The Indonesian Academy of Sciences (API) has a key role to play in the re-building. And as the Honourable Foreign Secretary of the Royal Society of Canada wisely said in an interview, "the only way it can start is to start."

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# Annex A - Academies Reviewed

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Academy of Science of South Africa (ASSAf)	<a href="http://www.assaf.org.za">www.assaf.org.za</a>
Akademia Sinica Taiwan	<a href="http://www.sinica.edu.tw">www.sinica.edu.tw</a>
Association of Academies and Societies of Sciences in Asia (AASSA)	<a href="http://www.aassa.asia">www.aassa.asia</a>
Australian Academy of Science	<a href="http://www.science.org.au">www.science.org.au</a>
Chinese Academy of Sciences	<a href="http://english.cas.cn">english.cas.cn</a>
Council of Canadian Academies	<a href="http://www.scienceadvice.ca">www.scienceadvice.ca</a>
Global Network of Science Academies (IAP)	<a href="http://www.interacademies.net">www.interacademies.net</a>
InterAcademy Council	<a href="http://www.interacademycouncil.net">www.interacademycouncil.net</a>
Korean Academy of Science and Technology	<a href="http://www.kast.or.kr">www.kast.or.kr</a>
National Academy of Sciences of the Republic of Korea	<a href="http://www.nas.go.kr">www.nas.go.kr</a>
National Academies of Science, Engineering and Medicine, USA	<a href="http://www.nationalacademies.org">www.nationalacademies.org</a>
Royal Netherlands Academy of Arts and Sciences (KNAW)	<a href="http://www.knaw.nl">www.knaw.nl</a>
Royal Society of Canada	<a href="http://www.rsc-src.ca">www.rsc-src.ca</a>
Royal Society of New Zealand	<a href="http://www.royalsociety.org.nz">www.royalsociety.org.nz</a>
Science Council of Japan	<a href="http://www.scj.go.jp/en">www.scj.go.jp/en</a>
Singapore National Academy of Science	<a href="http://www.science.edu.sg/about/Pages/SingaporeNationalAcademyofScience.aspx">www.science.edu.sg/about/Pages/SingaporeNationalAcademyofScience.aspx</a>
Swiss Academies of Arts and Sciences	<a href="http://www.swiss-academies.ch/en/index/Aktuell/News.html">http://www.swiss-academies.ch/en/index/Aktuell/News.html</a>
World Academy of Sciences for the advancement of science in developing countries (TWAS)	<a href="http://www.twas.org">www.twas.org</a>

# Annex B - Expert Interviews

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John Boright, National Academies of Sciences, Engineering and Medicine,  
24, 25 September 2015.

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Tijs Creutzberg, Canadian Council of Academies,  
9 October 2015.

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David O'Brien, Senior Program Officer, International Development Research Centre.  
9 October 2015.

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Howard Alper, former President of RSC and Professor of Chemistry,  
University of Ottawa. By email. October 2015.

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Nancy Pritchard, Australian Academy of Sciences. By email,  
September-October 2015.

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William Leiss. Member and Former President of the Royal Society of Canada.  
16 October 2015.

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Keith Hipel, President of the Academy of Science in Canada and Fellow of the Royal Society of  
Canada. 16 October 2015.

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Jeremy McNeil, Hon. Foreign Secretary, Royal Society of Canada.  
19 October 2015.

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Australian  
National  
University



The Knowledge Sector Initiative (KSI) is a joint program between the governments of Indonesia and Australia that seeks to improve the lives of the Indonesian people through better quality public policies that make better use of research, analysis and evidence.

KSI is a consortium led by RTI International and in partnership with Australian National University (ANU), Nossal Institute for Global Health, and Overseas Development Institute (ODI).