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# Effective Science Communication (Second Edition)

A practical guide to surviving as a scientist

Sam Illingworth and Grant Allen

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## Chapter 8

### Science and policy

*Science without policy is the pursuit of knowledge. But policy without science is the pursuit of ignorance.*

—Anon

#### 8.1 Introduction

The above quote appears to imply that science can do very well on its own (thank you very much), but that policy without science is a lost cause. Another interpretation is that while science can reveal an understanding about the Universe and the human beings that inhabit some infinitesimal corner of it, that understanding is useless if it does not induce positive change for the people that are discovering it. Change is indefatigable, necessary, and inevitable. After all, the passage of time is measured and defined by discrete and measurable events. Yet how change manifests itself in our everyday lives is very much the result of guiding policy, defined for us by ‘policymakers’, whether they be regulators, lawmakers, governments, managers, CEOs or vice chancellors. Policy defines modern civilisation, the rule of law, and the impacts we have on our planet. Whether we always agree with it or not, policy defines our world and a greater part of our lives than we probably truly realise. However, ‘good’ policy, or perhaps rather ‘optimal’ policy, is that which is informed by knowledge, coupled with the policymakers’ ability to understand this knowledge and to use it to make predictions about the potential impacts that this policy may have.

This is where science comes in. Without informed policy, we are arguably at the mercy of arbitrary or subjective guidance from groups or individuals that may not be experts, or who may be biased by independent or narrow viewpoints and vested interests. Science can provide the evidence base, the wisdom, and the predictive capacity for policymakers to make the best possible choices within the constraints of the political and socio-economic climate of the day; a climate which is itself a function of the science and policy that defines our expectations, aspirations, the way

we think, and the way in which we live our lives. Yet the route that this important information takes to get into the policymakers' hands is not always as optimal as it could, and perhaps should, be.

This chapter is concerned with that pathway—the route by which science informs and influences policy. We shall explore some of the established and recognised ways that science is used in decision making in the modern world, and how you can make your scientific voice heard. Policy is often made by debate and by building a consensus, and while other voices may have opposing views, it is important that we each take a role in putting forward the best-informed, evidence-based facts and opinions to those that need, and want, to hear it. Expert guidance and opinion, especially from independent academics and scientists, is much valued by policymakers and trusted by the public. But that guidance is only useful if it is heard and received in a form that can be understood, while retaining accuracy and honesty.



## 8.2 How science informs policy

There are manifold direct and indirect pathways that science and knowledge is taken into the consciousness of government, lawmakers and policymakers. Indirect pathways are typically less tangible and may be subject to bias. These include personal opinion formed over time based on reading articles, watching TV documentaries, interacting with social media, and the voices of organised lobby groups with a specific agenda. Such pathways clearly have an important role and can be powerful. However, communicating science through these more passive media are dealt with in other chapters in this book. Here we will concern ourselves with more direct pathways, such as submitting parliamentary evidence and guidance for best practice.

The examples we shall present are by no means exhaustive. The pathways by which science is used in policy are many and are at times untraceable. Policies that draw on scientific evidence can apply at international, national and local levels with impacts affecting stakeholders from multi-national industries to individuals. We

shall offer some general advice and some example in-roads into national policy here to help you think about how science is seen, heard, and used by policymakers. And in doing so, we will be mindful of what can be done as scientists to influence decision making more generally.

Two excellent examples of modern-world policy direction and how these have been influenced by scientific evidence, are those that are associated with the regulation of the tobacco industry, and the sometimes-conflicting priorities between slowing (or mitigating) climate change and sustainable economic growth.

In the early 20th century, smoking was not widely known to be hazardous to human health, with some doctors actually, and of course incorrectly, hailing its many health benefits. As such, the industry was not regulated in the way that it is today. However, taking the UK as an example, the route by which the tobacco industry has been constrained by policy decisions such as restrictions on advertising, restrictions on smoking indoors in public places, increases in taxation, and public health campaigns, has been (arguably) slow. This is widely observed to be due to the conflict between personal freedoms, the influence of well-funded industrial lobby groups, economic impact (with both negative and positive aspects), and the now-obvious science of negative public health impact. Over time, the accumulated evidence of health impacts and a growing consensus by health professionals has led to the policy climate we see today. Very few people on the planet are unaware of the risks; and those that choose to smoke are actively or indirectly discouraged by higher taxation, less prominent advertising, and easily-accessible public health information and advice. However, this policy success, if measured in terms of the proportion of people smoking in the western world, was absolutely the result of concerted efforts by scientists to provide unequivocal evidence to policymakers that there were significant public health impacts. These scientists provided policymakers with the information from which to make decisions about the best policies to balance health, economic, and personal freedom considerations in the face of pressure from lobby groups.

In the case of climate change policy, the debate surrounding the proportionate weight of policy (nationally and internationally) to mitigate or reduce the effects of climate change, remains far from one-sided. While an almost unanimous consensus of climate scientists makes clear that anthropogenic climate change is real and happening, a significant number of policymakers, as well as a very small proportion of scientists, claim that there is no such thing as climate change, or that any change is not induced by human activity; or else maintain that a policy response to it is not justified if it negatively impacts specific industries or national economies. Thankfully, the balance of overt opinion among policymakers and governments is that steps do need to be taken to tackle this very real problem. As such, national and international agencies and organisations such as the United Nations International Panel of Climate Change (IPCC) are carefully providing and updating the evidence base and predictive capacity in a form that is readily accessible and useful to policymakers. Furthermore, policymakers are integrated into this process through the United Nations Framework Convention on Climate Change (UNFCCC), who facilitate international and legally binding responses to climate change—perhaps

most markedly through the negotiation of national greenhouse gas emissions targets. This allows policymakers to make informed, collective decisions to mitigate or reduce specific tangible risks and the causes of them, and to form domestic policy to best meet agreed targets.

The enormous but effective organisation of science for this purpose through groups of experts like those comprising the IPCC, which collates and interprets the very best peer-reviewed evidence available from across the world, clearly represents a gold standard and a concerted (and costly) effort. This bottom-up approach, by which carefully chosen experts scour the peer-reviewed literature for evidence, review it, and summarise and present it in an accessible form, makes for a system that does not simply pay attention to the loudest voice in the room (or lobby). Moreover, the IPCC reports provide a regular review that highlight remaining sources of scientific uncertainty, which then sets a forward agenda for individual scientists to respond to, seek funding to explore, and consequently better inform on. Clearly, such a global challenge demands a global response and the global participation of scientists. But the fact remains that policy decisions need to be taken on the best available evidence to hand. And without a structure like the IPCC, policymakers would be awash in a cacophony of individual research papers and individual academics, each with their own favourite climate impact and research interest, as well as vocal counter claims and agendas from lobby groups and a few maverick (to be over-kind) scientists. There is still some way to go to fully predict and understand this complex field of Earth System Science and how it will undoubtedly affect human beings going forward in a world with a rising population. To further complicate matters, in a changing environment (physical, political, and economic), it will be an evidence base that may always require regular updating. However, the pathways to policy in this arena exist and have been well organised; no policymaker can strongly argue that they are not as well informed as science (and scientists) can possibly make them.

For many other fields of science, the organisation of science-policy pathways is much less formal, and individual scientists may need to be proactive in personally bringing their evidence and outputs to the attention of policymakers. In the following section, we shall explore some of the ways in which this can be done.

### **8.3 What you can do to inform policy**

This section gives just a few examples through which your work may influence policy. In practice there are many ways that this can happen. You may be identified by specific agencies or individuals who have heard about your work in a specific field, and as a result of this you may be asked to provide advice in the form of expert reviews of government-commissioned reports, written by civil servants or other academics and think tanks. Or you may be invited to tender for contracts to provide such reports yourself. To raise your visibility in such circles, your academic track record needs to be exemplary, while you must simultaneously seek to network through science advisory groups such as those which exist in many national science funding councils. Often, direct invitations to participate in this manner are passed

through word of mouth between existing expert networks, or by recommendations from other academics who may cite your academic track record as a reason to solicit advice from you, and to draw upon your specialist expertise.

Such ‘top-down’ invitations would normally come some way into your academic career after you have established yourself as an expert and leader in your field. With this in mind, there are more proactive routes through which you can provide input while simultaneously raising your profile in policy circles earlier in your career. For example, national parliaments typically form specialised committees composed of, and chaired, by elected representatives who are tasked with gathering evidence for debate on policy matters of national interest prior to legislation, and who debate the impacts of legislation after they have been introduced. These committees regularly issue open calls for evidence, to which anyone can provide input. Most democratic governments, at both a local and national level, work in similar ways—they consult the public and experts for guidance to inform debate and decision making. We shall explore an example of such a consultation in the exercise below.

**Exercise: find opportunities to provide evidence to policymakers**

Examine the webpages of your parliament’s select committees and look for open calls for evidence.

Pick one of the open (or historic) calls and follow the guidance for preparing evidence. It doesn’t matter if there are no open calls relevant to your field, but it may help to look for previous calls that are.

Have a look at previous committee reports and learn about how the evidence has shaped the narrative of the report and any resulting debate. Think about how your expertise could inform that narrative and how you would best present it to these policymakers.

Should you choose to submit evidence to such a committee, it is important to approach your writing in the same way you would any academic narrative by structuring it with an introductory summary (analogous to an abstract), a body of text citing appropriate references in the context of the policy being discussed, and a conclusion, avoiding the use of technical language where possible. Evidence submissions may necessarily require you to extrapolate on your knowledge to form an opinion or a conclusion on the policy in question. As in any scientific writing, it is therefore important to be clear where you are stating your personal opinions, and what comprises the evidence informing that opinion. It may also be useful to reflect on the confidence of your conclusions and identify any knowledge gaps and what science may be required to better constrain any uncertainty.

A parliamentary committee may then reference your evidence in its report or in debate, and you may even be invited to be interviewed by that committee. This may seem daunting. However, think about the positive impact that you can then have on changing the course of debate and policy. We have discussed the impact agenda in chapter 3 and how this is a necessary part of modern science funding. The use of

your science in policy and the traceability of it through citable policy pathways such as this are an incredibly important aspect of your work, and your future ability to secure funding for your research. It shows that you know how to translate science into impact, inform public and political debate, and bring about change.

Another simple way that you can provide direct input to policymakers is by registering your expertise with your national parliamentary library. Parliamentary libraries are a service to members of a parliament (or congress, assembly, etc), and their librarians do a lot more than simply run a book-lending service. Much like civil servants in government departments, parliamentary librarians provide an information connection service to elected representatives with specific questions. This may be in response to a question raised in parliament, or by a member of the public or lobby group. Parliamentary libraries often collate research briefings for parliamentarians on specific subjects of topical debate [1]. To do this, library researchers will consult published literature, including peer-reviewed academic journals, and also consult an in-house database of experts, who may be contacted for advice. You can register your expertise in your field with this database by contacting parliamentary libraries, such that you may be asked for input or advice in response to requests for information from elected officials. This may even result in you being put in direct contact with them.

Parliamentary offices offer all sorts of other services to policymakers, members of parliament, and civil servants. For example, the UK Parliamentary and Science Committee publish a quarterly magazine, ‘Science in Parliament’ [2], which is available to all of its members. This magazine, like many of its international analogues, openly solicits ideas from academics for articles. You can suggest a topic for an article to an editor, explaining why it is relevant and topical to policymakers and you may be invited to submit an article for publication. Note that you are not likely to receive remuneration for such work; like so much in academia it is a labour of love. However, it is an excellent way to raise your profile in policy circles as a new academic with an emerging track record.

## 8.4 Impact from research

As discussed throughout this book, the end result of science is typically not a research paper. Science is used by ourselves (as scientists) and by others for a variety of positive reasons and this can lead to what is known as research ‘impact’. Impact can take many forms. This includes: economic gain, policy change, environmental benefit, public health benefit, technology development, public awareness of science, and innovations in pedagogy. Impact can often include many of these aspects simultaneously. In most cases, impact is a result of science communication in one format or another; and the process of generating impact from science is often referred to as the pathway to impact. This pathway may include communicating science at public events to increase public awareness, or it may focus on engaging with public, commercial, or government stakeholders to change policy, or bring about a change that results in economic, environmental, or public health benefit.

From a career perspective (see chapter 9), keeping an updated record of your research impact and impact pathways can also be extremely important in public audits of the impact of science. Many countries operate an evaluative exercise to assess this periodically, such as the Research Excellence Framework (REF) in the UK [3]. The reach and significance of the impact of science in the policy arena, as well as impacts on society, health, and the environment, are typically peer-assessed and graded in the UK and elsewhere, and used to calculate public funding settlements for public research institutions such as universities. Therefore, the impact of science matters not only in terms of its direct and tangible benefit, but also in terms of personal and institutional prestige and institutional funding. More generally, the measurable impact of science also directly justifies public investment. Many national research councils audit the impact of the research they commission, to strategically direct future funding and make an evidence-based case in public spending reviews.

When attempting to formally quantify and contextualise the impact of research for evaluation, evidence is key. Claims must be backed up and others must be able to see and follow the pathway between the outputs of research and its ultimate impact independently. This can take the form of testimonials from stakeholders that have benefitted from your research, such as company directors who have used your findings to generate profit. Or it may take the form of policy documentation that cites your research, or other evidence that is based on such outputs. It may also take the form of public surveys that track awareness of science; the awareness of problems related to plastic pollution (and changes in plastic consumption and disposal) is an excellent contemporary example. Therefore, keeping a track of the pathways your research takes toward impact, and collecting evidence of impact along the way, is a vital step in the development of both your research and profile. This may include keeping active relationships with stakeholders who are using your research to generate impact, as you may wish to ask them to evidence the impact of your research at a later time.

## 8.5 Summary

This chapter demonstrates some of the routes by which scientific evidence is used by policymakers and stakeholders, and provides some specific routes for how you can contribute to the process proactively as a scientist. We have introduced how the direct and indirect benefits of research are known as research impact, and how these can extend well beyond the policy sphere. Impact can be thought of as the practical societal justification for our scientific work, and demonstrating impact often justifies public and commercial funding of the work that we do.

Almost universally, the people charged with making decisions and setting policy welcome the input from experts and crave evidence to help them make informed judgments for the benefit of everyone; no one likes to make a bad decision. However, except for global ‘grand challenges’ or matters of high national importance and public interest, the organisation of science into policy is typically bottom-up, and relies on the proactivity of individuals or the widening of existing expert networks.



You can raise your visibility by getting involved in evidence requests and by talking to those in existing networks, while simultaneously developing your track record of expertise and underpinning research. Keep an eye out for opportunities, register and subscribe to email alerts and policy publications, and make a difference.

## 8.6 Further study

The further study in this chapter is designed to help you think further about developing your science policy skills:

1. **Read a policy report.** Visit the UK Parliament's Recent Select Committee publications [4], and read one of the recent reports on a topic that is related to your field of research. You will find that these documents provide an excellent summary of the topic and its policy implications, and they will give you a good idea of the kind of evidence that is most frequently submitted and referred to in such reports.
2. **Join the library.** Subscribe to the email alerts from the UK Commons Library and its research service [5]. Even if you are not based in the UK, these emails will keep you up-to-date with parliamentary debates, reports, and calls for evidence in any subject area that you wish to specify.
3. **Read a POSTnote.** The Parliamentary Office of Science and Technology (POST) provides balanced and accessible overviews [6] of research from across the biological, physical, and social sciences, and engineering and technology that are used to brief UK Members of Parliament. They provide excellent summaries of many different topics, and are worth reading to both broaden your knowledge, and highlight areas that require further evidence.

## 8.7 Suggested reading

*The Science of Science Policy: A Handbook* [7] provides an overview of the current state of the science of science policy from three angles: theoretical, empirical, and policy in practice. The authors offer perspectives from the broader social science, behavioural science, and policy communities in this evolving arena, delivering insights about the critical questions that create a demand for a science of science policy. *Using Science as Evidence in Public Policy* [8] encourages scientists to think differently about the use of scientific evidence in policy making. It investigates why scientific evidence is important to policy making and argues that an extensive body of research has yet to lead to any widely accepted explanation of what it means to use science in public policy. This book, which is also available as a free online report from The National Academies Press would be of special interest to scientists who want to see their research used in policy making, offering guidance on what is required beyond producing quality research, translating results into more understandable terms, and brokering the results through intermediaries, such as think tanks, lobbyists, and advocacy groups. Finally, *Merchants of Doubt* [9] is a general interest read and cautionary tale about how poor science can negatively influence policy debate and hinder policy trajectory; and explores in depth the tobacco and climate change examples we highlighted in section 8.2.

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