Edited Volume

Evidence-based policymaking

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Engaging in the science-policy dialogue

1 Evidence-based policymaking

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Evidence-based policymaking


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Editorial

Scientists can contribute to the policymaking process by providing scientific evidence. The challenge for scientists is to link scientific evidence with the available range of choices or policy options, whereas political decisions are based on other criteria: Will the chosen option be accepted by society? Will it be feasible?

This workbook is the first in a series of eight, exploring the role of scientists in the science-policy dialogue. It reflects on the methods and tools of evidence-based policymaking aiming to empower decision-making, not to force particular decision outcomes. Scientists can have a great impact in this process if they are dedicated to true policy engagement. This includes a research agenda focusing on policy issues, working in multidisciplinary teams, establishing networks, and a dedication to communication using various channels and outputs. This goal does not come without cost and must be balanced with the requirements of innovative research.

The Zurich-Basel Plant Science Center (PSC) is a research network of plant scientists at the University of Zurich, the University of Basel and the ETH Zurich. Our mission is to promote plant science research for some of society’s most important questions such as adaptation and mitigation to climate change, food security, land use change, conservation of biodiversity and digital transformation. In our 20 years of existence the PSC has built up several training programs for PhD students. We realize that the transfer of scientific knowledge into the wider society in which we live remains a challenge for natural scientists. This was one of the reasons why we founded a specialized training and mentoring program in 2009: The PSC PhD Program in Science and Policy, unique in Switzerland. With academic experts and practitioners at the science-policy interface and with support from Swiss and European funding we have built up a PhD program addressing three key questions:

1. How can life scientists bridge the gap between the scientific community and the policy world?
2. How can they increase the impact of their research on political decision-making?
3. How can the dialogue with policymakers, politicians and the wider public be improved?

In a series of eight workbooks we wish to share our knowledge and experience in engaging scientists in the science-policy dialogue. But most importantly, we wish to provide a tool and skill set, which will enable life scientists to generate impact with their research.
Guide to workbook 1

The aim

Workbook 1 introduces you to the concepts of evidence-based policymaking. We discuss the role of science in the policymaking context. You will learn about methods and tools to improve the science-policy dialogue.

Competencies

- You understand the concept of evidence-based policymaking.
- You know other factors that interplay in policymaking aside from evidence.
- You can formulate and implement criteria for good policy advice in your daily work.
- You can formulate a policy brief or fact sheet.

How to read this workbook

INTRODUCTION
The introduction to the workbook series explains important concepts from policy sciences: First, it introduces the elements of the political system. It elaborates on some of the guiding principles of modern democracies and governance.

THEORY
Setting the scene
We make you aware of how the role of scientific evidence in policymaking is seen differently by scientists and policymakers. We present statements of their points of view and controversial examples where scientific evidence has or has not been implemented in the decision-making process.

Self-reflection
How do you as a scientist define your role in the decision-making context? Is it Pure Scientist,
Issue Advocate, Science Arbiter or Honest Broker? Whatever role you have chosen: it can drive the types of interaction that you will engage in: is it individual engagement or community engagement through boundary organizations?

Knowledge about types of evidence
What evidence is used in the policymaking process? You will learn how to use different types of knowledge, including systems knowledge, target knowledge, transformation knowledge and evaluation knowledge.

Key principles for giving policy advice
How will research evidence be validated within the policymaking process? Validation in society should follow the principles of credibility, salience and legitimacy.

The policy environment
You will analyze factors that interact with policymaking by considering the example of genetically modified organisms. You will understand how scientists and policymakers can work together.

COMMENT
Trends and challenges of environmental governance we explain in more detail.

TOOLS
Scientific evidence can be produced with different tools, from experimentation to interviews. Quantitative and qualitative interviews are regularly used to get some insight into stakeholders’ perspectives. Scientific evidence needs to be communicated in forms that are accepted by policymakers. We provide two instruments that can facilitate the communication process in a timely manner: the policy brief and a fact sheet.

EXAMPLES
We present three case studies from Switzerland that explain at what stages and in what forms scientific evidence was implemented in the policymaking process.
1. Introduction to science and policy

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1.1. Introduction to science and policy

1.1.1. The three dimensions of the political system

A political system defines the social practices for the preparation, production and enforcement of collectively binding societal decisions. A political system has three dimensions:

**Polity** is the institutional system that generates the framework for political action. Political institutions are part of the polity. They include the official bodies and entities of the political-administrative system, such as government, public administration, parliament and courts. Non-governmental organizations (NGOs), companies, associations, unions and parties are also part of the polity. In a polity, the rules, norms and structural elements are defined, for example in the constitution. Unwritten norms are part of the political culture of a system and are as important as the written norms.

**Politics** refers to the processes that result in political decisions. Political actors negotiate in a power struggle about both diverging and common interests and consolidate concrete political goals. Political decisions are structured processes shaped by formal requirements (e.g., legislative procedures) and by informal rules, as well as by political trade-offs and compromises. Power and interests, accountability and legitimacy influence the compromise that the political system comes up with.

**Policy** refers to the problems and programs of policy fields. Policies are formed by the government and other social actors as governmental and non-governmental organizations and agencies. Policymaking is a process that includes political decision-making as well as policy implementation and that is formalized in the policy cycle (see ‘Section. Navigating the policy cycle’).
EXERCISE 1
Understanding the dimensions of the political system

In what dimension of the political system would you place the following parts?

- Laws governing the voting system
- Parliamentary debate
- Parliament
- Tax law
- Environmental regulations
- Public administration
- Science-policy interface organizations
- Elections
- Governance
- Government
1.2. From government to governance

In its most general sense the term ‘governance’ is the act of governing or ruling. It is the set of rules and laws framed by the government and implemented by the representatives of the state. ‘Governance’ has developed into a more specific concept to describe changes in the nature and role of the state following the public-sector reforms of the 1980s and 1990s (Bevir, 2007). Governance is seen in contrast to hierarchical forms of governing as:

- Changing modes of decision-making from centralized to devolved and distributed.
- Relying on the input of different modes of expertise.
- Participatory decision-finding and decision-making processes through a better inclusion of civil society and the economy in the policymaking process.
- Democratically legitimated consensus-building.

Implementing good governance principles in the political system has been seen as guaranteeing closer collaboration of the government with different actors, better acceptance of policies, fewer difficulties in the implementation process and better alignment of policies with public concerns and needs, i.e., improved salience of the policy. With this new understanding of governance, the number of political actors and roles in the political system has broadened. In the traditional understanding of that term, organized political actors are parties, unions, associations and non-governmental organizations (NGOs) that serve as intermediaries between citizens and political institutions, i.e., the government. With the new understanding of governance as an inclusive system linking decision-making to the interests of civil society, representatives of all social systems and all social groups are in principle invited to join the political system and contribute to policymaking. They will have a variety of roles: providing knowledge for decision-making, enabling social learning in policymaking, or promoting discussion and deliberation. Some examples what we mean by this:

- Including members of social movements, with their focus on pushing for social changes, could offer opportunities for social learning in the policymaking process and for changes that are necessary for transformation and transition in society.
- Including members of minority groups with less power in the political system, or increasing public participation in policymaking, could enhance the responsiveness of policymakers to public needs and their orientation towards public welfare, both of which are important legitimation criteria in a modern understanding of democracy.

Introducing participative and deliberative procedures in policymaking is an attempt of to overcome a concept of democracy that simply represents a majority electing their representatives. This has been seen as limited because societies are becoming increasingly pluralistic.
Deliberative democracy takes a different viewpoint (Chambers, 2003): Conditions need to be in favor of deliberation and should allow discussion of viewpoints and the participation of stakeholders and minorities in the dialogue and in decision-finding and decision-making processes.

Many believe that deliberation under the right conditions will have a tendency to broaden perspectives, promote toleration and understanding between groups, and generally encourage public-spirited attitudes.


Dahl (1989) has defined five criteria as the foundation of the ideal democracy. However, no country meets this ideal:

**Effective participation**
Citizens must have adequate and equal opportunities to form their preference and place questions on the public agenda and express reasons for one outcome over the other.

**Voting equality at the decisive stage**
Each citizen must be assured his or her judgments will be counted as equal in weight to the judgments of others.

**Enlightened understanding**
Citizens must enjoy ample and equal opportunities for discovering and affirming what choice would best serve their interests.

**Control of the agenda**
People must have the opportunity to decide what political matters actually are and what should be brought up for deliberation.

**Inclusiveness**
Equality must extend to all citizens within the state. Everyone has a legitimate stake within the political process. — Dahl, 1989.

**Good governance principles**
Good governance principles have become leading issues in global governance, for example in the United Nations programs (Weiss, 2000). They refer to key normative values such as transparency, responsibility, accountability, participation and responsiveness, and link these values to the procedures for decision-making in organizations. For example organizations should ensure:

- Equality of participation in decision-making.
1.3. The role of science in participatory policymaking and governance

A large body of literature has reflected on the role that scientific results and technological innovation can have for society and on the processes necessary for knowledge transfer and acceptance (for an overview see Felt et al., 2013). Important impetus for the understanding of knowledge production at the science-society interface has come from several scientists:

Nowotony and colleagues have described ‘mode II production of knowledge’ as socially distributed, application-oriented, transdisciplinary and subject to multiple accountabilities. Scientists in this process are becoming partners in the social and political dimension with other stakeholders and representatives of the public in transdisciplinary knowledge production and validation (Nowotony et al., 2001; 2003).

Funtowicz and Ravetz (1993) coined the term ‘post-normal science (PNS)’ for scientific issues where both uncertainties and decision stakes are high in contrast to those of established science. Decision stakes are high when values are in dispute, stakeholders are discordant and decisions are urgent, while the basis of scientific evidence might be small or uncertain. In post-normal science scientists (or their representatives, i.e., science-policy interface organizations) are political actors in the policy arena, offering scientific evidence that needs to be discussed – in dialogue and debate – with the other actors in the policymaking process.

- Responsiveness to the needs of all stakeholders within a reasonable time frame.
- Mediation of a broad consensus between all stakeholders.
- Accountability to stakeholders.
- Transparency in the decision-making process, so that interested parties can monitor the process and understand the decisions.
- Legal frameworks for enforcing human rights.
- Improvement of processes of governance to ensure economic and social development.
- A guarantee regarding the rights of all those affected by the organization to maintain and improve their livelihood in an equitable and inclusive manner (Mehta, 2007).
Scientists engaging in the science-policy interface have to:

- Reflect on their role and attitude in the policymaking process (see ‘Workbook 1: Evidence-based policymaking’ and the fundamental work of Pielke (2007)).
- Understand the attributes that make scientific evidence heard in the policy domain (see next section on the science-policy boundary).
- Understand the processes that are necessary to legitimate scientific evidence in the policymaking process, as well as the procedures for scientific evidence to cross the boundaries between science and policy (see ‘Workbook 8: Collective Inquiry’).
- Understand the role of science in a deliberative democracy (see ‘Workbook 4: Risk and uncertainty communication and dialogue’).
1.3.1. The science-policy boundary: attributes for successful knowledge transfer

Science is a social system alongside politics and other such systems in society (for example, the economy, arts, religion, education …). Science and policy respond to different norms: science should help to find the truth and help to understand how the world works. Scientists have to produce credible information. Politics should respond to societal needs and enforce collectively binding decisions. Where science and policy form a boundary, boundary work is necessary.

In a system-based perspective what processes are necessary so that the knowledge generated in science can cross the boundary and move into the policy domain? Fundamental work was done by Jasanoff (1987) on ‘knowledge-action’ systems: boundaries are the socially constructed and negotiated borders between science and policy. They serve important functions in protecting the independence of science from politics and in allocating different powers in decision-making on the basis of legitimation. Boundaries are also barriers to knowledge transfer. Managing those boundaries allows one to effectively link knowledge to decision-making processes.

It is difficult for scientific knowledge to cross the boundary because actors on different sides of the boundary will value credibility, salience and legitimacy differently (Cash et al. 2002). Science-policy boundary organizations are institutions that can take this role. Linking knowledge from the science domain to the decision-making process will demand that scientists become doubly accountable to the scientific community as well as to the policymakers.

FIGURE 3 — The science-policy boundary.
### TABLE 1 — Attributes of knowledge at the science-policy interface.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credibility</td>
<td>Refers to dimensions of trust: Is the scientific and technical information true and believable, i.e., does it meet scientific standards?</td>
</tr>
<tr>
<td>Salience</td>
<td>Refers to the relevance of information for an actor’s decision choices in a relevant and timely manner.</td>
</tr>
<tr>
<td>Legitimacy</td>
<td>Refers to whether an actor perceives the process as unbiased and meeting standards of political and procedural fairness.</td>
</tr>
</tbody>
</table>

For more details see 'Chapter 1: Evidence-based policymaking'.
1.3.2. Involvement in the research process

A key element in making evidence salient and legitimate for the recipients can be participation in the knowledge-building and decision-making processes. The involvement can be upstream, midstream or downstream of the research process.

**FIGURE 4 — Upstream, midstream and downstream research processes.**

<table>
<thead>
<tr>
<th>Upstream</th>
<th>Midstream</th>
<th>Downstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting the research agenda and aligning it with social needs, values and concerns.</td>
<td>Defining research questions and hypotheses.</td>
<td>Implementation of research results in policy options.</td>
</tr>
<tr>
<td></td>
<td>Carrying-out research.</td>
<td></td>
</tr>
</tbody>
</table>

Upstream are governance processes focused on framework conditions that allow inclusion of all social actors in decision-making and policymaking in the consecutive research phases. Governance enables participation through offering resources, removing barriers and balancing power constellations.

Midstream processes focus on the involvement of recipients of evidence in the research process. Methods for achieving this have evolved from social research and theory, for example, methods of collective inquiry on co-producing knowledge. For more details on collective inquiry see ‘Workbook 8: Collective inquiry’ and for more details on deliberation see ‘Workbook 4: Risk and uncertainty communication’.

The importance of upstream and midstream activities is that downstream implementation and acceptance of the evidence will come naturally if issues at stake have been clarified and adequate deliberation has taken place. Deliberation serves to maximize the decision-making power of all those involved as well as enhance the high responsiveness and accountability of scientists to the needs, values and expectations of those targeted. Deliberation allows negotiation of power: it “encompasses a talk-based approach to political conflict and problem-solving” (Mansbridge et al., 2012).
1.4. Navigating the policy cycle

As a simplified systematization of the policy process, the policy cycle entails the following steps: Organized societal interests (interest organizations, associations, non-governmental organizations, etc.) articulate their political concerns and requests and elevate them into the political agenda. Political parties pick up these concerns and requests, bring them into the legislative process and formulate and implement appropriate policies together with the political-administrative domain (Laswell, 1956). The policy cycle is a simplified model, which does not reflect real-life policy processes (Jann and Wegrich, 2007). In reality, the policy process tends to be complex, with iterative networks and feedback loops between actors and their inputs that may generate intended as well as unintended outcomes (Sabatier, 1999). However, the policy cycle is a helpful model to structure and analyze the dialogue between science and policy.

FIGURE 5 — The policy cycle.
1.4.1. The policy cycle in more detail

**Agenda setting**
Problem recognition and definition is a highly political process: Which problem does or does not get enough priority to enter the political agenda? Traditionally, agenda setting has been dominated by alliances and institutional arrangements, so-called policy networks. They might hinder or favor the adoption of scientific evidence into the policy cycle based on factors such as values, interests and power (Carter, 2007). Current understanding of policymaking emphasizes the importance of organizations at the interface of science and policy. The significant impact of these organizations is in translating scientific evidence for the benefit of policymakers or the public (Osmond et al., 2010). The media also have a strong role in the agenda setting and decision-making processes, raising public awareness of, for example, climate change and the risks or opportunities of novel biotechnologies. Mass media have a specific role as both political actor and observer linking political actors. They pass information and arguments but also observe the discourse and debate. The media create publicity for all actors in the policy arena (Imhoff, 2008).

**Policy development**
Policy is formulated and adopted by considering different policy options and deciding for one. While scientific evidence can enter the policy cycle at several stages, it is of particular interest during policy formulation and decision-making. At this stage, engaging stakeholders and the public in a deliberative dialogue is the major resource for creating scenarios and seeking to establish policy support for acceptance of policy options. Additionally, transparency and communication about risks and uncertainties plays a crucial role in decision-making.

**Policy implementation and evaluation**
Policy implementation describes the stage in the policy cycle where policy programs are specified and resources are allocated to carry out the program. Policy implementation starts with transformation of knowledge: How do we come from where we are to where we should be? Forward mapping approaches start with the problem and define the steps and actors responsible for successful implementation. Backward mapping approaches start with the intended change and analyze back: What interventions are necessary to proceed from the problem or need to the intended change? Both forward and backward mapping comprise an impact chain and provide a foundation for the evaluation of policies. At the stage of policy review, impact chains depict the expected cause-effect relations. For each stage in the impact chain, indicators are defined and policy evaluators then assess these indicators.
Applying collective inquiry
Knowledge production is driven by world views, norms, values and interests. Knowledge gets embedded in the societal domain and will be accepted or contested by social systems that share or dislike the underlying world view. The framework for collective inquiry can link participatory analysis with social transformation (Brown et al., 2010) through input from different social systems with their world views and knowledge. Here the focus is on the connection of various social systems, e.g., through systems thinking and ethical inquiry. Social learning can be enabled through strategic niche management and can eventually result in a system transformation. Collective inquiry is the overarching process of establishing the meaning and legitimacy of evidence within society.

The eight workbooks in figure 5 reflect different stages within the policy cycle aiming to answer such questions as:

- Which actors contribute to policymaking?
- What role do life scientists have in policymaking and how do they enter the policy cycle?
- What is their input to the policy cycle?
- What favors or hinders their input?
- What tools and approaches are available for entering the policy cycle?
2. THEORY of creating evidence for policymaking

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2.1. Science and scientists in policymaking

2.1.1. The role of scientists

Scientists can provide systematic evidence based on experiments, data measurement and analysis. Decision-makers can use this systematic evidence for formulating solutions to a given problem. This linear model ‘knowing the facts and then acting’ works only in the most simplified situations, e.g., if a technical problem can be solved by an engineered solution. At the science-policy boundary, science is translated into policy in a procedure that assigns social legitimacy to scientific evidence. As part of a learning and self-reflection process, it is worthwhile to question the scientist’s role at this boundary.

Research and evaluation findings are often used in ways that we do not expect. We expect decision-makers to take our data and recommendations and go out and implement them. We expect to see concrete, visible changes along the lines that the data have implied and we have recommended. But much use of research is neither so direct nor so instrumental.

— Weiss, 1980: 70.

Research on expert roles in the decision-making context has remained mostly theoretical, primarily because such publications describe ideal hypothetical situations rather than actual situations which could be investigated empirically (Spruijt et al., 2014). Here, we follow the model of Hoppe (2005) in which the role of science in the policymaking context is described by its relation to two axes: one dimension concerns the primacy of science over policy, i.e., science controlling policy or vice versa. In the other dimension, the functions of science and policy for society can be seen as either divergent or convergent.

For the scientist, the primacy of science over policy means believing in the ownership of objective knowledge of the truth or the ability to get nearer to this truth if only enough research has been done. Hoppe describes a variety of possible interactions: scientific evidence enlightens policy without any activity on the part of scientists, putting policy in a pulling role – enlightenment model. In a technocratic understanding, scientists not only own objective knowledge but this knowledge is also identical with societal needs, so science will be the driving force in designing the policy – technocratic model. More moderate models tend to interpret the primacy of science over policy less strongly: scientists advocate their knowledge in coalitions and discourse – dispositional model or science and policy are linked through social learning, e.g., policy tries out experiments in society while science evaluates
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and adapts the trials for optimum goal achievement – **learning model**. Conversely, emphasizing the primacy of policy over science, scientific knowledge is translated into policy via an administrative interface – **bureaucratic model**; or via boundary organizations advocating viewpoints and seeking scientific knowledge to pinpoint their viewpoints – **adversarial model**. Knowledge is at best required to engineer solutions to practical problems as required by policy – **engineering model**; or knowledge is not taken into account beforehand, or only by chance, when policy navigates by trial-and-error – **coping model**.

**FIGURE 2 — The role of science and scientists in the policymaking process.**
Adapted from Hoppe, 2005 and Pielke, 2007.

The role of scientific experts depends on several factors, including the complexity of the issue, and is influenced by their personal values when uncertainty is inherently present. Depending on whether value consensus is present or absent and whether the issue at stake is related to scientific uncertainty, Pielke (2007) describes four idealized roles for scientists:

**Pure Scientist**
He/she is solely concerned with research without any consideration for its use or utility. Thus, there is no direct connection to policymakers.
**Issue Advocate**
The Issue Advocate uses scientific evidence to align with a group in order to advance its interests through policy and politics.

**Science Arbiter**
The Science Arbiter seeks to stay outside the policymaking process, but accepts that decision-makers will need the judgment of experts. Thus, he/she has direct contact with decision-makers either as an individual scientist answering scientific questions posed by them, or as a member of a research council.

**Honest Broker**
The Honest Broker is involved in decision-making by at least clarifying and often expanding the scope of policy alternatives available. He/she explicitly places scientific understanding in the context of policy options. The Honest Broker will likely take the form of a formal committee or assessment panel including a variety of areas of expertise and a diversity of perspectives.

---

**EXERCISE 1**

**Self-reflection: Which role would you choose?**

This is a self-reflection exercise for students to ponder their own inclinations toward one or another role as described by Pielke (2007).

Students select an actual policy issue near their field of expertise. They collect newspaper articles and other material to present the case. Each group is given one of the four roles and is asked to discuss the circumstances and situation in which they would adopt this role (telephone interview with journalist, public hearing, etc.). In the plenum, each group presents their roles by acting or narration. Then the roles are discussed and students are asked to formulate and explain their individual preferences.
Helpful questions
Which role do you like best? Can you decide which role to play and how? Do you see circumstances where your role is more appropriate than others? What are the dangers and benefits of the different roles? What could be the dangers if you let others decide on your role? What are our obligations: as scientists? As citizens? What are your own values and how do they come into play?

In the discussion, one conclusion may come up that the role of Pure Scientist does not exist (anymore), since research must increasingly be justified by its social benefits, and results have implications for society. The danger may be that a Science Arbiter is pushed into being an Issue Advocate without agreement. Or that political battles are disguised as scientific battles; it is for example always possible to argue that there is considerable scientific uncertainty and therefore no action needs to be taken.

A few points for the final discussion
Since science cannot answer all questions concerning complex issues, experts should be transparent about their values and viewpoints (Spruijt, 2014). It is important to be clear to oneself and to the public, what sort of judgment one is making. We are all entitled to our value judgments, but we are not entitled to pass them off as following automatically from our scientific premises. Often they don’t. Likewise, we should not expect others to rate our value judgments higher than theirs.

Pielke shows that in cases where value disputes cannot be resolved by reducing scientific uncertainties, scientists may advocate particular policies (as Issue Advocates). Yet they should then openly state their political values, rather than pretending that their preferred policies are a direct consequence of scientific evidence. Otherwise this pretense amounts to Issue Advocacy, where science advice is politicized and the public credibility of science is undermined.

The role of the scientist is not to determine which risks are worth taking, or deciding what choices we should take, but the scientist must be involved in indicating what the possible choices, constraints and possibilities are [...]. The role of the scientist is not to decide between the possibilities but to determine what the possibilities are.

EXERCISE 2
What role did these scientists choose?

In the following cases you will find statements by different scientists and others presenting their points of view. When reading through the controversial examples, ask yourself: What perspective on the role of science do the following statements reveal? What is your opinion about the legitimacy of the position the scientists took in each case?

Case 1
An Italian health minister supported a controversial stem cell treatment in 2013. The case evolved into a national controversy over prohibiting the treatment as illegal vs. patients and families making legal appeals to allow treatment to continue on compassionate grounds. The scientist Elena Cattaneo and colleagues were in favor of prohibiting the treatment.

At home, finding the right allies and getting the best from them was key. We need to be able to talk with everyone, regardless of their scientific knowledge – from taxi drivers to lawyers. Some people welcome the documentation and persistence that comes naturally to a scientist. Others want to debate values and opinions; it is important to respect and engage with this, steadily explaining the difference between beliefs and facts.

Nurturing relationships with fellow scientists involved in the battle was also key. We had to learn to be generous and to remember that we shared a single goal. In public advocacy, the prima donna attitude is not helpful. Maintaining valid and effective political and communicative actions requires a united front.

But it has all been worth it. Now, thanks to the European Court ruling and a Senate investigation into the case that launched three months ago, we are hopeful that these dubious treatments will soon be banished from Italy; they were displaced from Switzerland in 2011 and from Cape Verde earlier this year. We recommend that all scientists stand up for the scientific method. Science depends on public institutions and is done in the public interest – we have a duty to defend both.

Case 2
In April 2009, an earthquake of Richter magnitude 5.9 struck Aquila in central Italy. Lasting just a few seconds, it resulted in a final death toll of 307 with 70,000 people made homeless. In 2011, the court of Aquila initiated proceedings against four scientists, two engineers and a governmental official. They were convicted of manslaughter and sentenced to six years in prison for failing to adequately warn residents before the earthquake.

I think it is truth and justice,” says Vincenzo Vittorini, who lost his wife and daughter in the quake. “It wasn’t a trial against science; it was a trial against those who didn’t know how to evaluate the risk, who didn’t know to mitigate the risk. — Vincenzo Vittorini as cited in Cartlidge, 2012.

This prompted uproar from the scientific community, fearing that the verdicts could affect future scientific evaluations of the risks of natural disasters. The court case initiated discussions about risk communication and whether the failure to predict natural disasters could be seen as a crime.

It’s incredible that scientists trying to do their job under the direction of a government agency have been convicted for criminal manslaughter,” says earth scientist Thomas Jordan of the University of Southern California. “We know that the system for communicating risk before the L’Aquila earthquake was flawed, but […] This won’t help those of us who are trying to improve risk communication between scientists and the public. — Thomas Jordan as cited in Cartlidge, 2012.

In 2014, all accused won an appeal against their conviction.

MORE READING


2.1.2. What types of interaction can scientists engage in?

Scientists’ engagement in the policy-science dialogue can be multilevel, ranging from individual to institutional interactions, and from acting inside to acting outside the official political system.

**Inside the political system**

Individual scientific advisors and expert panels can be nominated by representatives from inside the policymaking system. The dominant view will be the primacy of policy over science (Hoppe, 2005). Involved scientists’ roles will be those of a *Science Arbiter* informing the policymaking process.

**Outside the political system**

Partisan activism is an example of individual engagement of scientists from outside the official policy system. Individual activism has famous representatives, for example Rachel Carson with *Silent Spring* (1962). Through her book on the dangers and negative consequences of pesticides for the environment she changed official policies toward the regulation of pesticide use. However, the line dividing this from *Stealth Advocacy* might be difficult to draw for scientists engaging in activism (Oppenheimer, 2011).

---

**Case 3**

Different scientific positions and voices accompanied the ban of neonicotinoids by the European Union in 2013. Read the opinion paper of Peter McGrath (2014) and understand the different positions and roles of parliamentarians, scientists, the public, industry, NGOs and other interface organizations. Who of the involved parties and stakeholders could fulfill the role of the Honest Broker?

**MORE READING**

TABLE 1 — Types of interaction.

<table>
<thead>
<tr>
<th>Inside the political system</th>
<th>Outside the political system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientist acts as</td>
<td>Scientific community acts as</td>
</tr>
<tr>
<td>Scientific advisor</td>
<td>Panel of scientific experts</td>
</tr>
<tr>
<td>(Science Arbiter)</td>
<td>(Science Arbiter)</td>
</tr>
<tr>
<td>Activist, partisan</td>
<td>Science-policy boundary organization</td>
</tr>
<tr>
<td>(Advocate)</td>
<td>(Honest Broker)</td>
</tr>
</tbody>
</table>

Communicating and validating scientific expertise through a science-policy boundary organization increases the legitimacy of engagement. Such an organization considers itself as independent from the political system and can act as Honest Broker (Messerli et al., 2015). It will do the assessments of existing scientific evidence to generate a synthesis that integrates the perspective of many scientists and suggests consensus-based policy options. Science-policy boundary organizations should involve stakeholders’ opinions in their consensus-building processes; only then can they become credible, salient and legitimate (see 1.1.4).

Science-policy boundary organizations fulfill important functions:

- They have dual accountability toward science and policy to fulfill the demands of both systems.
- They translate scientific evidence for policymakers using adapted language, for example in the communication of risks or uncertainties.
- They can convey the consensus-building processes between scientists and stakeholders generating scenarios and options for policymaking.

Examples of boundary organizations

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) grew from intensive collaborative research worldwide on the consequences of biodiversity loss.

The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) was a three-year international collaborative effort initiated by the World Bank between 2005 and 2007. It evaluated the quality of the scientific knowledge derived from agricultural research and related public policies.
2.1.3. Types of scientific knowledge in the science-policy process

Scientific evidence is based on systematic research-based knowledge. Scientific evidence can inform the policy cycle as knowledge about what is (systems knowledge), knowledge about what should be (target knowledge), knowledge about how we go from where we are to where we should be (transformation knowledge) and knowledge to monitor the success of any intervention (evaluation knowledge) (Wuelser et al., 2012; Messerli et al., 2015). Each of these types of knowledge can interact with certain phases of the policy cycle.

**TABLE 2 — Types of scientific knowledge.**

<table>
<thead>
<tr>
<th>Stage of the policy cycle</th>
<th>Types of knowledge</th>
<th>Questions</th>
<th>Examples for questions related to climate change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agenda setting, Policy formulation</td>
<td>Systems knowledge is knowledge about how a system works and what the problem is.</td>
<td>How does the system work? What is the problem? What do we know about the problem?</td>
<td>How does the climate system work? How does climate change happen? What problems are linked to climate change? How do greenhouse gas emissions (GGE) from human activities contribute to climate change?</td>
</tr>
<tr>
<td>Policy formulation</td>
<td>Target knowledge generates options for policies and provides scenarios and modeling.</td>
<td>What should change?</td>
<td>What policy options could support climate change mitigation or adaptation? What policy options could restrict climate warming to a 2°C average? What policy options could reduce GGE?</td>
</tr>
<tr>
<td>Policy implementation</td>
<td>Transformation knowledge is knowledge about how we get from where we are to where we should be.</td>
<td>How can change happen?</td>
<td>How can our societies adapt to climate change? How can we mitigate the effects of climate change? For example, what changes in our personal lifestyle can we make to realize a scenario of an average 2°C climate warming?</td>
</tr>
<tr>
<td>Policy evaluation</td>
<td>Evaluation knowledge allows us to monitor the success of interventions through systematic data collection.</td>
<td>Did it work? What can we improve?</td>
<td>How can we monitor and assess what policies work for climate change mitigation or adaptation?</td>
</tr>
</tbody>
</table>
2.1.4. Key principles for giving policy advice

The idea of a new public policy and governance system started to flourish in 1996 (Rhodes, 1996; Salamon, 2001). Governance focuses on the equality of all social groups and participatory approaches targeted toward the inclusion of minorities, cooperative systems and consensus-finding based on multilateral negotiation between social groups.

With good governance approaches, the demand evolved for transparent scientific evidence that could inform policy and contribute to finding the best policy solution. Evidence-based policymaking has been intensively elaborated in evidence-based medicine (Oxman et al., 2009). It is based on the understanding that policymakers should be informed by the best available research:

Evidence-based policymaking is a discourse or set of methods which informs the policy process, rather than aiming to directly affect the eventual goals of the policy. It advocates a more rational, rigorous and systematic approach. The pursuit of evidence-based policymaking is based on the premise that policy decisions should be better informed by available evidence and should include rational analysis. This is because policy, which is based on systematic evidence is seen to produce better outcomes.

— Sutcliffe and Court, 2005: iii.

Scientific policy advice becomes of major importance in the decision-making process – for long-term development as well as immediate emergency management. The demand for scientists or scientific institutions to provide high quality and scientifically sound advice is increasing, while problems of transparency or independence are emerging due to increasing complexity of policy issues. Successful implementation of scientific, as well as technical advice into the policy cycle crucially depends on how it is perceived and accepted by its recipients.

How will research knowledge be validated and accepted within the process of policymaking? First, the knowledge that is generated in science needs to cross the boundary and move into the policy domain. This boundary is a barrier for knowledge transfer. Certain attributes need to be assigned to this knowledge in order for it to be valued in the policymaking process. Cash et al. (2002, 2003) described these attributes as:

- Credible. Is the scientific and technical information true and believable, i.e., in accordance with the standards of scientific process? Can it be trusted? Who is accountable for this knowledge and its implementation?
• **Salient.** Does the information respond to an actor’s need for information supporting decision choices in a relevant and timely manner?

• **Legitimate.** Does an actor perceive the process as unbiased and meeting the standards of political and procedural fairness? Was the knowledge validated in policymaking in a process that considers the values and perspectives of all relevant actors?

For credibility, both policymakers and public need to be able to trust that the scientific process was correctly implemented and that the scientist’s interpretation of the results is correct. Transparency is an important principle in generating credibility: the risks, uncertainties, values, and interests influencing interpretation have to be made transparent. This transparency can interfere with acceptance of the results in the policy and public domains. However, a fair and accountable legitimation process can generate trust, i.e., if scientists feel a responsibility to create knowledge relevant to the needs of those with a stake in the issue and to engage in deliberative processes that consider all values and stakes in generating policy options.

Research questions often lack salience for intended users of the information. Research, for example, on new technologies has to address the questions: Why? Who needs this technology? Says who? (Stirling, 2007). Technology that is inappropriate for the social or environmental context at a local level fails to be salient for those involved. Farmers need information on adaptation of their crops and farm management to local climate change: What varieties can they plant and when? If scientists can give them this information, then scientific information becomes valorized and salient.

Either before or after entering the process of policymaking, scientific knowledge is socially valorized by those with a stake in the question.
TABLE 3 — Attributes of validation.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Description of the process of validation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credibility</strong></td>
<td><strong>Guarantee of quality</strong>&lt;br&gt;Creates robust, scientific evidence based on a broad range of empirical data and the expertise of many scientists. Assures sound, legitimate and unbiased scientific input. A transparent peer-review process guarantees that the data is analyzed and reviewed in a coherent way with transparent criteria about assumptions and about what is included or excluded from the analysis. Accessibility of scientific reports and details of the scientific process must be assured.</td>
</tr>
<tr>
<td></td>
<td><strong>Risks and uncertainties</strong>&lt;br&gt;Expert advice informs the audience about uncertainties and risks openly and transparently. Risk governance should adopt the precautionary principle (European Commission, 2000).</td>
</tr>
<tr>
<td></td>
<td><strong>Values and interests</strong>&lt;br&gt;All underlying world views, values, interests and conflicts should be made visible. Scientists should speak in a coordinated manner with both consensus and disagreements made transparent.</td>
</tr>
<tr>
<td><strong>Salience</strong></td>
<td><strong>Communication</strong>&lt;br&gt;Incorporate communication activities into the project design. Map existing information demands of policymakers and respond to these. Communicate punctually and use appropriate platforms that are accepted and targeted to policymakers. Involve policymakers in formulating research questions. Invest in clear communication to a broad audience without jeopardizing correctness and quality of scientific content.</td>
</tr>
<tr>
<td><strong>Legitimacy</strong></td>
<td><strong>Participation</strong>&lt;br&gt;Engage in participatory processes involving stakeholder dialogue. Guarantee equality of participation, i.e., consider the values and perspectives of all involved. Respond to the needs of all stakeholders in a reasonable time frame and mediate between all stakeholders in order to aim for broad consensus. Ensure transparency in the process, so that interested parties can monitor it and understand the outcomes.</td>
</tr>
</tbody>
</table>
2.1.5. Understanding the policy environment

The policy environment includes all aspects surrounding policymaking, such as social, economic or political aspects. It is not static, but changes in response to the political and economic circumstances, public concerns or international influences.

What factors influence policymaking?

- **Cost-benefit analyses** need to be part of policy implementation, as resources are limited.
- **Experience and expertise** involve also the tacit knowledge and intellectual capital of all social actors involved.
- **Values and interests** refer to the underlying world views and norms of involved stakeholders, as well as their interests.
- **Habits and traditions** are built on social and cultural norms.
- **Lobbyism and advocacy** interfere with the process of policymaking.
- **Pragmatics** describes the timetables, parliamentary terms, and capacities of institutions that will determine if or when evidence can enter the policymaking process.

FIGURE 3 — Factors influencing policymaking.
Adapted from Davies, 2004.
EXERCISE 3
Debating the use of genetically modified organisms

This exercise should allow you to understand the underlying values, interests and conflicts of the public debate on the use of genetically modified organisms (GMO) in Europe.

The majority of European citizens do not support GM food [...]. In addition to the ambivalent perceptions by EU citizens, 20 years after the first EU directive on deliberate release [...], the issue of GM crops and food is still unresolved. Only two crops have formal approval for cultivation and only six countries have planted GM crops, Spain and Poland, less than 100'000 hectares in total in 2009, compared to more than 100 million hectares worldwide. Furthermore, currently six countries have bans on GMOs using the ‘safeguard clause’, e.g., France, and Germany. Italy has said that it will defy the EC and refuse to allow GM crops to be grown, but has not done so formally [...].

In summary, despite the investment in GMO safety, European citizens do not support GM food and there is a great heterogeneity within the Member States. Obviously, there are deep concerns in European society related to GMOs, which have not been resolved and lead consequently to a low and even to no commercialization of GMOs in Europe compared to the rest of the world. — Options for Strengthening Responsible Research and Innovation, European Union, 2013: 14.

We would like you to consider: What are the major concerns of society regarding GMOs? Examining these issues, which arguments link to knowledge gaps or uncertainties and which reflect underlying world views? You can start here:

www.who.int/foodsafety/areas_work/food-technology/faq-genetically-modified-food/en
2.2. How can scientists and policymakers work together?

In our trainings, participants interviewed scientists, practitioners and policymakers on their understanding of the role of science in the decision-making process. The main conclusions were:

- Publications and articles are not an efficient way to communicate scientific information to policymakers. The scientific language is often a barrier for comprehension. Translation needs to be done.
- Personal opinions of politicians and policymakers are already formed. Evidence is often read selectively.
- The formation and maintenance of personal contacts and trusted networks with mutual responsiveness between scientists and policy actors is essential.
- Communication is important at every stage of the policymaking process, but the extent of engagement is limited by the availability of money, time and human resources on the part of both scientists and policymakers.
- A link between science and policymaking in the form of a knowledge-broker who processes, summarizes and communicates scientific evidence, would be very helpful to improve knowledge transfer from one field to the other.
- More efforts could be made by the scientific community to focus on applied aspects, which can be directly implemented in practice. This weakness could be overcome through the creation of platforms for improving the connection between science and practice.
To engage in an accountable relationship with policymakers, scientists need to work in the following dimensions:

- Understanding the policymaking process: knowing the mechanisms of knowledge transfer, familiarity with crucial stages and actors.
- Timely communication in forms that are accepted and targeted to policymakers (e.g., policy brief, fact sheet).
- Establishing long-term relationships and trusted networks with other scientists, policymakers and stakeholders to broaden and generate debate before and during policymaking. It should also be possible to foster friendly, informal communications.

The UK government (2010) formulated guidelines for policymakers on the use of scientific advice, which includes early identification of issues where science is needed, inclusion of a wide range of advisors, transparency and a collective working approach.
3. COMMENT
Environmental governance

Christian Hirschi
Project lead at the Parliamentary Control of the Administration, the evaluation service of the Swiss Federal Parliament, Berne, Switzerland

3.1. Environmental governance
3.1. Environmental governance

Despite notable successes, many environmental problems have not yet been sufficiently addressed from a societal or political perspective. Many of today’s most pressing environmental problems can be characterized as persistent, meaning that over a longer period of time policy attempts to address them have failed or have not shown the desired effects (Jänicke and Jörgens, 2006). Examples of persistent environmental problems are urban sprawl and the rapid use of previously undeveloped land, global climate change as a consequence of burning fossil fuels, polluted ground water and soil due to intensive agriculture, and biodiversity loss accelerated by human activity (Rockström et al., 2009).

Environmental governance comprises all societal attempts to address environmental problems. It can be defined as the set of institutions and rules that determine how a society regulates its interaction with its natural environment (Evans, 2012). Institutions are primarily the established political institutions, such as government, public administration, parliament and courts. Beyond these branches of government, political institutions also include the rules, norms and practices that structure all areas of social endeavor (Ostrom, 1980). Accordingly, we also have to consider the policy instruments (regulations, taxes, subsidies, information provision, etc.) that the state applies in laws and policy programs in order to steer society (Howlett et al., 2009). Furthermore, a society develops cultural norms regarding how it interacts with its natural environment – norms that provide the foundation of formal laws, but can also be informal (Agrawal and Lemos, 2007). Finally, environmental governance is not limited to the state but also comprises civil society, business, international organizations, non-governmental organizations, scientific bodies etc., as important actors (Carter, 2007).

The environment as a policy problem

Garret Hardin (1968) described the failure of society to effectively address environmental problems as a tragedy of the commons. Many natural resources are public goods or common-pool resources and as such are characterized by open access, that is, nobody can be excluded from using them. Hardin uses the example of a meadow that belongs to a community and is available to all farmers of that community to graze their cattle. Because there is free and unlimited access to the meadow, the farmers have an incentive to use it as intensively as possible if they do not want others to take advantage and use most of the resources before them. Due to the unlimited access to a limited resource and no effective regulation in place to limit its use, the community faces the destruction of its livelihood without being able to collectively avoid such a tragedy.

Of course, Hardin’s example has to be seen as a thought experiment and not as an exact picture of reality. In fact, empirical research has shown that local communities in particular are often able to manage their natural resources sustainably as a result of historically grown rules and social control (Dietz et al., 2003). Nevertheless, Hardin refers to a fundamental challenge relating to natural resources: if they are available for everybody to use without restriction, they will be over-exploited. Furthermore, resource-conserving behavior is
not rewarded because no direct individual benefits result from more sustainable use. Rather, others may free ride on the efforts of those who use the resources more sustainably without contributing to the costs of such efforts.

The common-pool characteristics of many natural resources and the related governance problems are, however, not the only aspect of the environment as a policy problem. Environmental problems such as air and water pollution, and currently above all climate change, are not bound to national borders. Moreover, the source of the problem may be totally dislocated from its impacts. The transboundary characteristic of many environmental problems requires cooperation between different political jurisdictions, which often proves challenging. Ecological systems and processes are also complex and subject to major uncertainties. Impacts may occur with delay and, once manifest, are irreversible or regeneration takes a long time. It may already be too late to intervene from a societal or political point of view when ecological problems become perceptible (Carter, 2012).

Environmental economists describe this problem as a form of market failure (Mäler and Vincent, 2003). In economics, a market failure occurs when the allocation of a good or a service through a market is not efficient (i.e., not optimal). In other words, another outcome might make everybody better off, but the market fails to achieve it. The same problem can be described in terms of external costs (or external effects): the costs that result, e.g., from air, water and soil pollution or changing climate conditions are not fully reflected in the price to be paid by the individual resource user; they are externalized and, thus, borne by the general public. The general answer, from a policy perspective, to market failure and external costs, is the internalization of these costs into the market price. This way, environmental costs become part of the cost/benefit calculation of the resource user. The internalization is typically implemented through governmental regulation. Despite such a clear economic understanding of environmental problems and, at least theoretically, feasible policy solutions through the internalization of external costs, many environmental policies fail to achieve their intended outcome or are not even adopted. To better understand why, we have to know the environmental policy process in further detail, and to this we will turn next.

The environmental policy process

Like any policy process, environmental policy processes are shaped in different arenas by different political actors. In modern democracies, the political influence of interest organizations is not limited to the articulation of problems: an important factor in policy formulation and implementation is interest representation in parliament and vis-à-vis the government and administration. Also the role of government and public administration cannot be confined to policy implementation. In particular, governmental agencies often play a central role when new policies are crafted. Accordingly, environmental concerns are not only initiated by societal interests but also by the government itself. Furthermore, we should not forget that the media often plays a critical role in articulating or reinforcing environmental concerns and in mobilizing the broader public.
The environmental policy process is first and foremost an interest representation and mediation process where different societal interests bargain with each other to influence public policies. In Switzerland, as in most industrialized countries, environmental policy has developed into a central line of political conflict that no longer coincides with traditional societal divisions between the political left wing and right wing or religious-denominational differences (Linder, 2010). Moreover, the central line of environmental conflict runs through various policy areas such as economic policy, energy policy, and agricultural policy and is mainly shaped by the division between the interests of resource users and resource conservationists. On the one hand, there are those mainly motivated by economic interests where natural resources are seen as a production factor and environmental pollution as an undesirable but unavoidable side-effect of economic development. Typical representatives of these interests are industrial sectors, trade associations, big agricultural firms, commerce, and tourism organizations. On the other side, there are those who give priority to environmental protection and advocate stricter environmental regulation of production, consumption and mobility. Among the actors here are typically environmental organizations but also often environmental experts and scientists engaged in advisory work.

Today, environmental policy spans various areas of regulation. In a narrower sense, environmental policy is structured along individual natural resources and includes water, air, soil, forest, landscape, nature protection and biodiversity policies. In a broader sense, transportation, agriculture, energy, fishery and health policies are also considered as environmental due to their significant environmental impacts. Furthermore, climate change, sustainable development and spatial planning have developed into branches of environmental policy that are today sometimes considered individual policy areas by themselves (FOEN, 2013). Coordination between these different policy areas is often weak. Environmental agencies often have limited institutional power to implement environmental policies effectively. Environmental policies were in the past rather end-of-pipe solutions, addressing the symptoms of environmental problems rather than their causes. Regulation, as the historically preferred policy instrument of environmental policy, is sometimes seen as an obstruction to more effective environmental policies because it often encounters strong resistance on the part of the addressees of such regulations, and its implementation can be correspondingly costly (Fiorino, 2006).

### TABLE 4 — Realistic picture of the policy process and role of different political actors.

<table>
<thead>
<tr>
<th></th>
<th>Media</th>
<th>Interest groups</th>
<th>Political parties</th>
<th>Parliament</th>
<th>Government</th>
<th>Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem definition</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Agenda setting</td>
<td>•</td>
<td>•</td>
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<td>•</td>
</tr>
<tr>
<td>Policy formulation</td>
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<td>•</td>
<td>•</td>
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<td>•</td>
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</tr>
<tr>
<td>Policy implementation</td>
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<td>•</td>
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</tr>
</tbody>
</table>
‘New’ environmental governance

In addition to a general understanding of environmental governance as the set of institutions and rules that define how a society regulates its interaction with its natural environment, ‘governance’ has also developed into a more specific concept in political science (e.g., Rhodes, 1996; Bevir, 2012; Steurer, 2013). Governance is mainly seen in contrast to a hierarchical mode of governing and emphasizes a more cooperative form of political leadership. The ‘governance’ concept has gained a lot of traction in the field of environmental policy due to the persistence of environmental problems and a lack of appropriate policy responses (Lafferty, 2004; Durant et al., 2004; Cash et al., 2006; Evans, 2012).

The concept addresses issues related to both actors and policy instruments. At the level of actors, governance stresses the consideration and inclusion of the various actors concerned with different stages of the policy process. More specifically, it promotes the inclusion of civil society and economic actors in the formulation and implementation of policies in order to achieve better acceptance of policies, overcome conflicts of interests early in the policy process and, as a consequence, reduce implementation deficits. At the level of policy instruments, a governance approach advocates the broadening of policy instruments beyond the classical application of regulatory measures and advocates the use of market-based instruments such as taxes, tradable permits and voluntary approaches, as well as better deliberation and communication of policies through information, consultation and negotiation.

These two central aspects of modern governance reflect changes that can be observed in policymaking over the last few decades (e.g., Pierre, 2000). They imply the strong normative claim to result in better policies, on the one hand by including actors from civil society and the economic sector and, on the other applying less hierarchical and authoritarian policy instruments. While the first claim is hardly disputed from a democratic point of view, the second one is contested (Jordan et al., 2013). Various scholars have therefore concluded that effective environmental policies require policy instrument mixes rather than single instruments (Taylor et al., 2012).
4. TOOLS for evidence-based policymaking

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Andrea Pfisterer
Former coordinator of the PSC Science & Policy training program for graduate students, Zurich-Basel Plant Science Center, Switzerland

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4.3. Policy brief 56
4.4. Fact sheet 58
4.1. Interviews

In general, interviews are a method of data collection; they are necessary tools in generating research evidence in the social sciences. Interviews aim both to obtain information and to gain insights. With careful design and preparation, conducting an interview can help the scientist gain insight into the opinions and motivations of policymakers and stakeholders. There are two main types of interviews, the structured/quantitative interview, and the semi-structured/qualitative interview.

**TABLE 5 — The different methods and purposes of research interviews.**

<table>
<thead>
<tr>
<th>Structured interview / Quantitative research</th>
<th>Semi-structured interview / Qualitative Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formalized, limited set of questions; standardized answers.</td>
<td>Thematic framework rather than fixed preset questions.</td>
</tr>
<tr>
<td>Inflexible; questions do not change.</td>
<td>Flexible; new questions can be added during the interview as a result of what the interviewee says.</td>
</tr>
<tr>
<td>Maximize reliability and measurable validity of key concepts.</td>
<td>Emphasis on generality of initial research ideas.</td>
</tr>
<tr>
<td>Questions reflect researchers’ concerns.</td>
<td>Interest in interviewee’s perspective.</td>
</tr>
</tbody>
</table>

4.1.1. Quantitative interviews

**Purpose**

Structured interviews (quantitative or standardized interviews) are used for quantitative research; they are based on a formalized, limited set of questions and standardized answers. In general, quantitative research aims to quantify a problem or issue by statistical analysis. Both questions and answers are administered by the interviewer and are preferably closed-ended. Questions are inflexible and do not change from one interview to another; this minimizes the effects of the interviewer (interview effect) and allows comparison between responses. For a representative sample, a larger number of interviews is required.

Questionnaires (e.g., online, mobile or paper surveys) are a preferred way to retrieve a large amount of data from many respondents at once. However, compared to interviews (face-to-face, telephone), there are multiple disadvantages. First, hard-to-reach groups might not be involved in the data collection. Second, anonymous data collection might not encourage accurate and honest answers. And third, the respondent might not understand questions and/or selectable answers correctly.
Applications
Quantitative interviews can be used to involve a large group of respondents or stakeholders.

Time needed
Theory: 1 hour.
Interview preparation: 1 day (8 hours).
Conducting the interview: 30–45 minutes per participant. This time is not necessary when using e.g., online questionnaires.
The time needed to evaluate an interview may vary widely, but should be around 1–3 hours.

Implementation

Number of interviews
The appropriate number of interviewees is difficult to determine and depends on many factors. For example, if interviews are to be an additional source of information, only a few interviews with key informants need be considered, whereas if they form the main source of information, more interviews are needed.

Interview preparation
- Prepare an interview schedule or plan, containing the questions and answer options that the interviewer will present to the interviewee. They must be the same for all interviews (consistency).
- Develop a rating scale or numerical code or Likert scale (e.g., 1 = best to 10 worst) for each answer.
- Determine the purpose and format of the interview. There are multiple formats such as the phone interview, individual (face-to-face) interview, group or panel interview, or multi-interviewer interview. These formats are today often replaced by online questionnaires.
- Practice the interview by conducting test interviews to become familiar with the questions, to improve the interview structure (e.g., handling the interviewee(s), timing, balancing open-ended and focused questions, etc.), to test the equipment (e.g., recorder), and to get feedback on communication skills.

Recording
Recording the interview is necessary if open questions are included or the interview effect will be investigated or considered. Appropriate equipment (e.g., recorder, microphones) need to be organized.
The interview

- Try to set a common background. The provision of material or handouts in advance may be useful in order to inform the interviewee(s) about the general aim, topic, and framework of the interview.
- The interaction with interviewee(s) needs to be respectful and courteous. Open-ended questions may improve conversation; leave 80% of the talking time to the interviewee(s); make notes where necessary (if not recording the interview), and listen carefully.
- Close the interview by leaving time for further questions from the interviewee, thank her/him for participation and explain the next steps in the procedure.

Interview analysis

- For the statistical analysis of quantitative interviews, responses must be coded numerically. A data analysis computer program can then identify patterns across responses.
- Open questions are coded by labels (e.g., yes or no) or by assigning a numerical value to codes, labels or the most likely response.

Limitations

Drawbacks are the interviewer effect and the time spent on meeting a large number of interviewees. This large number might be reached much faster with a questionnaire survey than by time-consuming face-to-face or telephone interviews. Since questions and answers are usually closed-ended, depth of information and complexity is lacking. Moreover, the pre-planning is highly work intensive.
4.1.2. Qualitative interviews

Purpose
With qualitative interviews the interviewer seeks to uncover the factual and meaningful level of the subject’s experiences. The interviewer designs an interview guide and leads the subject through the series of topics in a relaxed and open manner.

Applications
A good qualitative interview will help you prepare for a discussion with policymakers. Ask the questions most relevant to you, listen actively and intervene when the discussion goes adrift. This will also prepare you to productively steer an interview should you be interviewed yourself.

Time needed
Becoming familiar with the method should take approximately 15 minutes. Preparing the interview guide could take 2 hours. Conducting the interview should take at most 50 minutes per participant. The time needed to evaluate an interview may vary, but should be around 3 hours.

Implementation

STEP 1
Decide on the main research question, design an interview guide, and select an interview subject.

The Interview Guide
When designing an interview, it’s important that you give a lot of thought to the issues to be addressed or questions to be asked:

- What is the purpose of the interview? State the main research question and what you already know about it.
- What are the topics or themes (or sub-questions) that you would like to explore?
- Discuss with colleagues, read relevant literature, and brainstorm for ideas.
- Put the topic areas in a logical order, but feel free to change this order during the interview.
- Be sure to cover areas that are also important from the interviewee’s perspective.
STEP 2
Contact the interview subject to organize the date and location. Consider conducting interviews with a partner: one person to focus on the questions and the other to take notes on verbal and non-verbal communication.

STEP 3
The interview. Take a recording device with you. Check that it is working and that the recording is audible immediately before beginning the interview.

Introduction. Explain the purpose of the interview and any confidentiality issues (how and in what form the answers will be used). Reassure the respondent that there are no right or wrong answers and obtain permission to record the interview.

Warm-up. Cover some background information and help the respondent to relax. Ask questions about their job title, responsibility, time spent with project, etc. Be authentic, positive and confident. Be aware of your non-verbal communication as well as theirs.

Main body of interview. Be flexible during the interview to allow discussion and deeper probing of important or interesting topics. In order to get a fruitful interview with real insights into the subject’s experiences, it is valuable to include the following kinds of question:

- **Introduction.** Can you tell me about....? Do you remember an occasion when...?
- **Follow-up.** Directly questioning what has just been said, repeating relevant statements.
- **Probing.** Get more detail about a situation. Can you give me a specific example of that? Is that something you have experienced? Can you explain your answer?
- **Specifying.** What did you do when you felt that? How did you react?
- **Direct.** These questions can often be answered by yes, no or short responses. E.g., Have you ever received money for providing your opinion?
- **Indirect.** How do you believe scientists regard the work of policymakers like you?
- **Structuring.** Indicating when a theme is exhausted by breaking off long, irrelevant answers. E.g., I would now like to introduce another topic:...
- **Silence.** Pauses allow interviewees time to associate and reflect and break the silence themselves, perhaps with significant information.
- **Interpreting.** Attempting to verify ones’ interpretations of the subject’s answers. E.g., Is it correct that you mean....? Does the expression.... cover what you have just said?
Avoid long, complicated, or technical questions, and leading or vague questions. Also, avoid questions that are insensitive or beyond the respondent’s ability to answer.

Listen effectively and evaluate the answers. Ask yourself: Is it clear to me what that means? Is that really relevant to the question? Is the answer complete? Is that really the truth? Ask the interviewee for clarification.

Closure. Ask if the respondents have anything to add to what they have said, or any questions they would like to ask. Decide with them whether they would be open for further contact and be sure to give them your sincere thanks.

STEP 4
As soon as possible, write down any additional personal observations you made during the interview.

Limitations
Conducting research with this method requires several interviews and continuous question development to dig deeply into an issue. Interviews have to be transcribed and evaluated in line with accepted standards. Though not addressed here, there is a large body of literature about qualitative interviews that covers these points.

SOURCE
4.2. Communicating policy advice

Purpose
Effective communication is an important skill for scientists, who rely on the support of the public. Society benefits when scientists disseminate knowledge for the public good. Therefore, it is in the best interest of researchers and policymakers to support and encourage communication between science and policy.

To improve dissemination, one can follow a set of guidelines that are generally applicable to several modes of communication. Ultimately, the most effective communicators are those who take advantage of the many opportunities to establish contact with the public, and who use the resources of the public relations offices at their respective institutions.

Applications
Scientists in research institutions, professional societies, international advisory bodies or any individual wishing to improve the communication of science to policymakers.

Time needed
This method has to be understood as an ongoing process, including networking, actively scanning the policy horizon, incorporating policy-relevance and outreach activities into research proposals etc.

Implementation
The following tips are intended to assist you in an ongoing effort to communicate scientific knowledge to the public and to policymakers. Singly and in combination, these tips will assist you in disseminating your research effectively.

- Provide accessible summaries of research.
- Keep research reports brief and concise.
- Publish also in mainstream media.
- Use language and styles of presentation that engage interest.
- Target material to the needs of the audience.
- Extract the policy and practical implications of your research.
- Tailor dissemination events to the target audience and evaluate them.
- Use a combination of dissemination methods.
- Cooperate with users of the media.
- Be proactive and contact relevant policy and delivery agencies.
- Understand the external factors likely to affect the uptake of research.

— Nutley et al., 2002: 37.
Educate yourself on and practice communicating your scientific topic to lay people. Ask a friend outside your field or outside science to review your summaries, publicity reports, speaking points, media releases etc. for intelligibility. Make contact with scientists who are already active in public and ask them how they started, what do they struggle with. Ask, for examples, of the material they have written for the public and for policymakers. Most importantly, practice effective communication, both in written and spoken form.

**Limitations**

Today, issues and challenges are increasingly complex. They require multi-, inter- and trans-disciplinary collaborations and networks as well as international collaborations to provide sound scientific advice.

**SOURCES**


**MORE READING**

4.3. Policy brief

Purpose
Policy briefs are written communication tools in a policy or outreach campaign. A policy brief concisely summarizes and defines an issue by synthesizing existing knowledge to support policymaking or decision-making. It communicates information and identifies and evaluates policy options in order to provide a rationale for a particular policy alternative or course of action in an ongoing policy debate.

Overall, there are two types of policy briefs. The advocacy brief argues for a particular course of action or alternative. The objective brief provides balanced information and a focused discussion on multiple policy alternatives without favoring or promoting a particular one.

Applications
Scientists, other stakeholders and policymakers who are aiming to influence a political debate or policymaking process should consider compiling a policy brief. As a hard copy, a policy brief can be distributed at hearings, conferences or workshops. A policy brief provides a valuable resource for presentations, discussions, press releases or interviews. It can be linked to web pages, spread by email or networks (professional, social, etc.), or published in journals, brochures, newsletters, magazines or online.

Time needed
Introduction to the structure of a policy brief and the topic should take around 1 hour. Depending on knowledge of the topic, it could take two days or more to write and format the brief.

Implementation
A policy brief should be short, professionally written (not academic), publicly available, persuasive, evidence-based and action-oriented. The target audience is non-academic and may comprise NGOs, government agencies, politicians, international organizations or donors. Typically, a policy brief ranges in size from 1-8 pages and contains approximately 700 words and photographs to improve attractiveness. Check for and follow existing guidelines if available.

Policy brief content outline
- The title (less than 12 words) should be interesting and highlight the main idea.
- The executive summary should clearly indicate the purpose or question to be addressed, and be easily understood.
• **Recommendations** can be presented in a separate sidebar or box either throughout or at the end of the text. However, they should be short, realistic, clear, and visible.

• The **introduction** should grab the reader’s attention and outline the problem. It should contain a statement of the problem/issue and provide background information (importance, causes and effects). This section can also refer to pre-existing policies and their implications.

• **Policy options** (max. 5) for the defined policies should be presented and discussed, with a focus on effective improvement of the changed or revised policies. Advantages (potential benefits) and disadvantages (costs, side-effects) of each policy option and any pertinent evidence should be considered. If not previously given, include your recommendations.

• A short **conclusion** is optional and should focus on the importance of the issue, while avoiding repetition (max. 1 paragraph).

• **Sources** (consulted or recommended).

• There should be a maximum of 1 box or/and sidebar per page, including a box title (e.g., case studies, definitions, additional information, or examples).

• **Tables** should be simple, concise, include a short title, contain sources and should not be too detailed (e.g., no p-values, etc.).

• **Graphics** (i.e., diagrams, maps, graphs) should be related to the issue, be simple, appropriate, easy to read and include a title or caption.

• **Photographs** can be included to attract the reader. They should be of high quality, with descriptive caption and legitimimized by the copyright owner.

• **Additional information** such as acknowledgements, contact address, name of publisher, date, information on copyright and disclaimer.

**Policy brief formatting**

• The masthead is located at the top of page one. It includes information such as the title, organization logos or publication details (brief series, date).

• If authors are mentioned (depends on the publishing organization), then positions and contact details need to be added beneath the title or on the last page. If authors are not mentioned, a contact address should be given for further information.
4.4. Fact sheet

Purpose
The difference between a fact sheet and a policy brief is scale and intention. A fact sheet is a brief overview on or compilation of research on a specific issue, with the primary function of providing information in a style that facilitates quick and easy absorption and comprehension. Its purpose is to inform: it contains objective facts and should be free from overt bias and opinion. However, it can still be persuasive by clarifying a complex or misunderstood subject.

Applications
Both a policy brief and a fact sheet are useful tools for scientists to introduce their research question into a political debate in the context of topical problems, recent scientific findings and a scientist’s perspective on the implementation of alternative policy options. As a hard copy, a fact sheet can be distributed at hearings, conferences or workshops. A fact sheet provides a valuable resource for presentations, discussions, press releases or interviews. It can be linked to web pages, spread by email or networks (professional, social, etc.), or published in journals, brochures, newsletters, magazines or online.

Time needed
Introduction to the structure of a fact sheet and the topic should take around 1 hour. Depending on knowledge of the topic, it could take two days or more to write and format the fact sheet.

Implementation
A fact sheet does not exceed 4 pages, including illustrations.

Limitations
Policy briefs and fact sheets should only be seen as one tool amongst others to influence the policymaking process.
EXERCISE 4
Reviewing a policy brief or fact sheet

When reading and comparing policy briefs or fact sheets, try to answer the following questions:

- Who is this policy brief/fact sheet targeted to? (technical experts, policymakers, the wider public?) Is the tone, diction, layout and evidence appropriate for this audience?
- Is the topic appropriately reflected in the title?
- Does it begin with an overview of the topic? Does it provide background information about the topic’s relevance and relationship to broader public issues?
- Is there a clear structure and if so, how is it attained?
- Are boxes used to pull out key points?
- What is the main message? Is it solely based on facts, or do you find reasoning based on personal opinions?
- Are any charts, graphs, tables or pictures included? How do they enhance understanding?
- How would you rate the balance between being concise (as brief as possible) and being inclusive (does it reflect the complete picture of the issue)?

SOURCES


MORE READING


5. EXAMPLES of evidence-based policymaking

5.1. The Swiss Biodiversity Action Plan

Daniela Pauli
Managing director of the Swiss Biodiversity Forum, Science and Policy Platform of the Swiss Academy of Sciences, Switzerland

5.2. Regulation of new plant breeding techniques

Bruno Studer
Professor for Molecular Plant Breeding at ETH Zurich, Switzerland

5.3. Policymaking in Swiss agriculture

Jasmin Schubert
Participant in PSC Science & Policy training program for graduate students and scientists at the Plant Development Genetics group, Department of Plant and Microbial Biology, University of Zurich, Switzerland

Robert Herrendörfer
Participant in PSC Science & Policy training program for graduate students and scientists at the Institute of Geophysics, Department of Earth Sciences, ETH Zurich, Switzerland

Kaitlin McNally
Participant in PSC Science & Policy training program for graduate students and scientists at the Molecular Plant Biology / Phytopathology group, Department of Plant and Microbial Biology, University of Zurich, Switzerland
5.1. Example 1
The Swiss Biodiversity Action Plan

Biological diversity is a vital resource. That is why it is essential for Switzerland to know how the country’s biodiversity is doing and developing. Switzerland has committed itself to long-term biodiversity monitoring by signing the Convention on Biological Diversity (CBD).

Where are we in the policy process?
The Swiss Biodiversity Action Plan was adopted in 2017. However, the process of policy endorsement of scientific evidence already started in 2004 and lasted more than 12 years, moving from agenda setting to the beginning of the implementation phase. The Swiss Biodiversity Forum – a scientific competence center – played a leading role as a boundary organization. Founded in 1999, the Forum acts as a contact point for all stakeholders. Based on the best available knowledge and expertise, the Forum contributes significantly to the implementation of the 2020 biodiversity targets and acts as an initiator and catalyzer to anchor biodiversity in all sectors of policy and society.

Lessons learned
Engagement at the science-policy boundary needs willingness for long-term involvement and the availability of necessary resources. Both the Swiss Biodiversity Strategy and its Action Plan are based on the best available scientific knowledge.

What should scientists do to ensure a successful science-policy dialogue?

- Cooperation within the scientific community for finding joint synthesis and to find consent between scientists.
- Well organized links to regulation and policy.
- High credibility of institution(s) and scientists.

What should scientists avoid to ensure a successful science-policy dialogue?

- Initiatives by single scientists.
How have scientists contributed to the science-policy dialogue?

Agenda setting

1998 Scientists in Switzerland call for the first time for a national biodiversity strategy. — Suter et al., 1998.


Nov 2004 Meeting of the Forum with the Parliament. Foundation of the Parliamentary Group on Biodiversity and Species Conservation with members of all parties.


May 2007 After meeting the members of the Swiss Biodiversity Forum, the OECD criticizes Switzerland and recommends urgent development of a biodiversity strategy.

Sep 2008 Based on a petition by the Federal Councilor Adèle Thorens Goumaz (Les Vers, VD), the Parliament integrates the elaboration of a Swiss Biodiversity Strategy into the legislative period 2007–2011.

Policy options

Beginning of 2009 The Federal Office for the Environment (FOEN) starts the elaboration of the strategy. The Biodiversity Forum has one seat in the group of experts.

22 Apr 2010 Publication of a broad synthesis: *Wandel der Biodiversität in der Schweiz seit 1900.* Many of the results enter the strategy.
— Lachat et al., 2010.

Nov 2010 Congress: The Future of Biodiversity in Switzerland in Villars-sur-Glâne, organized by the Forum. Declaration with 10 recommendations to be integrated into the strategy.

Sep–Dec 2011 The strategy plan is in consultation, the Swiss Biodiversity Forum guides the position of the Academies.
16 Nov 2011  The Forum organizes an information event for all those who are invited for consultation.

25 Apr 2012  The Federal Council adopts the strategy. Within 24 months, an action plan is to be elaborated for the strategy.

2012/13  Draft of approximately 100 measures for all policy sectors in a participative process, involving 250 institutions / organizations and 650 experts (including many scientists).

2014  The Swiss Biodiversity Forum publishes the report: *Surfaces needed for the preservation of biodiversity in Switzerland.* — Guntern et al., 2013.

Apr–Jun 2015  The Cantons are invited to comment on selected measures of the action plan and their financing.

Apr 2015  The Swiss Biodiversity Forum, together with universities, data centers, museums and universities of applied science, publishes the report: *State of biodiversity in Switzerland 2014 – the analysis of science* and sends it, among other addressees, to the Cantons. — Fischer et al., 2015.

**Implementation**


Dec 2016  The consultation on the action plan starts at the end of 2016.


At the same time, the *Action Plan Biodiversity: Requests from the Perspective of Civil Society* is published. It includes all measures that have been developed in a participatory process in 2012-2013. It addresses all the objectives of the biodiversity strategy and is more comprehensive than the other action plan. — Mueller et al., 2017.
5.2. Example 2
Regulation of new plant breeding techniques

New plant breeding techniques (NPBT) are methods that allow the development of new plant varieties in a similar, but often faster and more precise manner than conventional breeding, and effectively overcome a number of limitations of conventional breeding. Of particular interest are genome editing techniques that allow site-directed modification of the DNA sequence in the genome without the need to include transgenic DNA from other species. The debate was on the status of these NPBTs: should they be regulated as genetically modified organisms (GMOs) with a strong focus on the biotechnical process? Or, should they be regulated as non-GMOs with a strong focus on the final product, which is indistinguishable from products derived from traditional introgression breeding and mutational techniques?

Where are we in the policy process?
In July 2018, the European Court of Justice (ECJ) has published its ruling on the legal status of NPBT as covered by existing EU GMO regulation. With this decision, NPBT are equally regulated as GMOs that are banned in many European countries. Switzerland has had a moratorium on the use of GMOs since 2005; this was achieved, after a long public and political debate, through the vote of the majority of Swiss citizens.

Where would we like to be in the policy process?

- Established regulatory frameworks, which plant breeders’ strategies can rely on.
- Clarity about biosafety and risk assessment approaches, including an evaluation of NPBT and comparison with traditional plant breeding. Who is responsible for risk assessment? Should there be tight governmental control or is it the responsibility of producers/breeders?
- Transparency toward farmers and consumers, e.g., the establishment of a binding and timely GMO/non-GMO distinction in order to assure freedom of choice for farmers and consumers.
- Established international regulations that regulate import/export to the EU and Switzerland.
What should scientists do to ensure successful science-policy dialogue?

The role of boundary organizations

• Create a platform at the interface of science and policy, like for example the Forum for Genetic Research of the Swiss Academy of Sciences (SCNAT).
• Get organized within the (scientific) community and find a common position (unity).
• Use the right platform that the (community’s) voice will be heard.
• Ensure independence of the dialogue platform (politically and economically).

The role of scientists

• Participate and contribute to the discussion.
• Get familiar with and try to understand the political system and processes.
• Communicate with short, precise and clear statements.
• Approach the topic from different angles.
• Collect opinions and involve stakeholders, but be aware: with an increasing number of stakeholders, your voice will get louder but it also gets increasingly difficult to find a common position.
• Act with a positive attitude in a positive environment.
• Learn to listen (and hope you will be listened to).

How have scientists contributed to the science-policy dialogue?

Agenda setting


Policy options: NPBT to be regulated as GMO or non-GMO?

Feb 2015  Statement from the Federal Office of Consumer Protection and Food Safety (BVL), Germany: Oligonucleotide directed mutagenesis (ODM) based rapeseed cultivar is not considered as GMO.

Mar 2015  Interpellation of Marina Munz (SP, SH) to the Federal Council in Switzerland: NPBT to be considered under Swiss GMO legislation.

Apr 2015  Response of the Federal Council:
- Cannot be answered under the current legal framework.
- Clear line between conventional breeding, NPBT and GMO cannot be drawn with the Swiss GMO legislation.
- Relevant Federal Offices will evaluate the necessity of legal adjustments.

— SCNAT, 2016.

Mar 2017  The report by the European Academies’ Science Advisory Council (EASAC): Genome editing: scientific opportunities, public interests and policy options in the European Union gives advice to European policymakers. EASAC concludes that policy considerations should focus on the applications in prospect rather than the genome editing procedure itself as an emerging technology. It is important to ensure that regulation of applications is evidence-based, takes into account likely benefits as well as hypothetical risks, and is proportionate and sufficiently flexible to cope with future advances in the science. Swiss scientists contribute to this report.
— EASAC, 2017.

Sep 2017  The SCNAT established an Evidence Review Group. This group will evaluate the risk and benefits of using gene technology in Swiss agriculture.

Policy development

July 2018  The European Court of Justice (ECJ) decided that NPBT are covered by existing EU GMO regulation.
Example 3
Policymaking in Swiss agriculture

The main criticisms of the agricultural policies prior to AP14–17 were (a) that the policy instruments, particularly direct payments, were not adapted to directly serve the objectives defined through Art. 104 (Mann and Lanz, 2012), and therefore did not conform to the constitution, and (b) the direct environmental payments could be improved, because they were ecologically and economically not always effective and efficient (Mann and Lanz, 2012). Some examples of the ineffectiveness and inefficiency of some direct payment measures are the misleading incentives for the expansion of livestock, unprofitable cattle production, and decreasing farm incomes in valley regions, all of which harm the environment (OECD, 2015).

Where are we in the policy process?

In response to the criticisms of earlier agricultural policies, the further developed AP14–17 follows the Tinbergen rule, which states that each measure needs to fulfill a certain objective (Mann and Lanz, 2012). In the case of AP14–17, each direct payment follows one objective as defined in Art. 104 of the constitution. Furthermore, all payments require proof of their ecological performance (OECD, 2015); a transitional payment was also introduced to make the reform more socially compatible.

The policy development process of AP14–17 officially started with parliamentary discussions about the previous AP11 and its weak points in the motion titled ‘Development of the direct payment system’ in 2006; and AP14–17 was finally officially adopted by the Federal Council in October 2013.

Actors from a wide spectrum of interest groups were involved in AP14–17 and the process was characterized by different science-policy and science-society interactions. Due to the broad formal and informal process of considering evidence and opinions provided by interest groups and experts, huge amounts of information had to be dealt with and processed at the Federal Office for Agriculture (FOAG). They have experts who review the evidence and contextualize it into a proposed policy, consider additional evidence that is brought into the discussion after the policy proposal, and change policy proposals if additional evidence suggests these changes. The Parliament then decides if it accepts the new policy.

Agricultural Policy 2014-2017 (AP 14-17) was adopted on October 23, 2013 by the Swiss Federal Council. The central focus of the policy regards new direct payment regulations, which are incentives to remunerate farmers for public and common interest services (i.e. providing food, preserving natural resources and caring for the landscape).
Lessons learned
Policy development is a lengthy and very complex process with a lot of actors and science-policy as well as science-society interactions involved. Different actors provide different types of evidence with different interests to the policy-development process. The fact that scientific evidence is contested by various social actors – including interest groups – leads to better contextualized and thus more robust scientific evidence. Evidence provided by the actors was influential to the policy-development process from the beginning. The main criticisms of former/earlier agricultural policies (APs) were provided by social scientists, environmentalists and liberals. The report on the further development of the direct payment scheme, which was the response to the motion mentioned above, had significant influence on the direction of the AP14–17. It was developed by the Federal Office for Agriculture (FOAG) and relied on evaluation studies primarily conducted by Agroscope, a Swiss research institute for agriculture, nutrition and the environment. A substantial contribution of scientists to the process was the provision of indicators to operationalize and define policy aims. During the public consultation process, 400 interest groups, experts, and the Cantons were involved in giving feedback on the draft of the new agricultural policy. Their feedback was widespread and touched topics such as modeling the future income of farmers, and statistics about land use in mountain and valley regions. In addition, experts on agricultural policy and practice gave advice regarding Switzerland’s economic and farming needs. The precise formulation of the AP14–17 was made following discussion rounds with stakeholders and interest groups.

How have scientists contributed to the science-policy dialogue?

Problem Definition

2006 Scientific criticism from social scientists: Tinbergen rule policy formulation.

2007 – 2008 Report preparation by scientific committee led by Agroscope. The information from the report was used as a basis for the formulation of the WDZ report (Weiterentwicklung des Direktzahlungssystems) in 2009.

2011 Draft consultation by the Federal Council: experiences/ claims/ speculations of interest groups; model calculations by Agroscope & ETH Zurich; statistics provided by Swiss Statistics and Farmers Union.
Decision making

Nov 2006  1\textsuperscript{st} Motion: Economic Affairs and Taxation Committee(s).

Dec 2007  1\textsuperscript{st} Motion accepted by the Federal Council & the Council of States.

Mar 2007  1\textsuperscript{st} Motion accepted by the National Council.

Oct 2009  2\textsuperscript{nd} Motion by the Economic Affairs and Taxation Committee(s).

Nov – Dec 2009  2\textsuperscript{nd} Motion accepted by the Federal Council & the Council of States.

Mar 2010  2\textsuperscript{nd} Motion accepted by the National Council.


2012 – 2013  Consultations: detailed discussions, involvement in committees/plenum by the Parliament, the Cantons, interest groups, committees.

Implementation

Jul 2013  Revised AP14–17 accepted by the Parliament.


Jan 2014  AP14–17 comes into force.
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