An evidence-informed environment
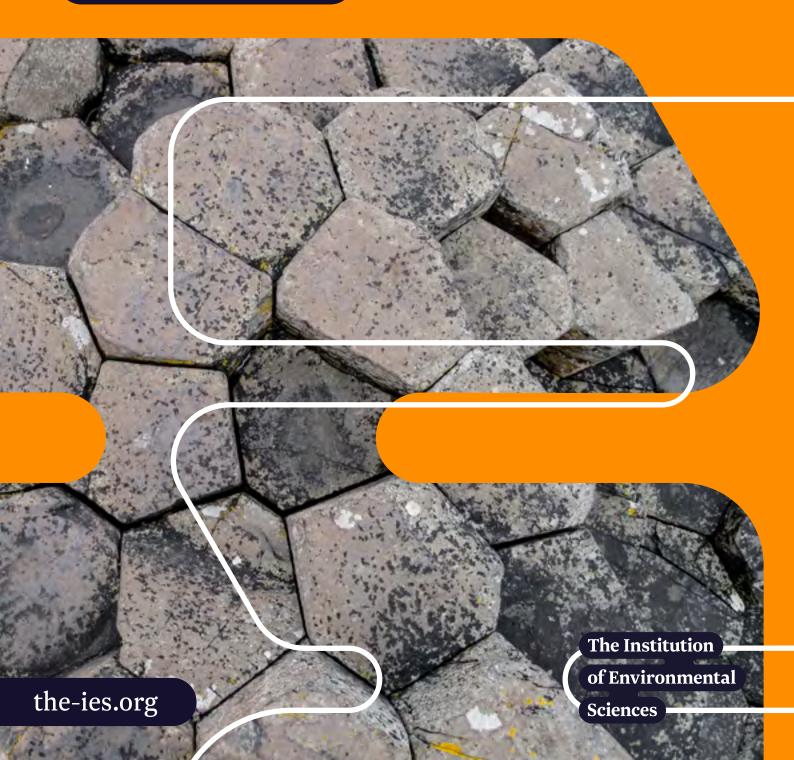
Two evidence and data challenges for the environmental sciences and policy making

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About the Institution of Environmental Sciences

The Institution of Environmental Sciences (the IES) is at the forefront of uniting the environmental sciences around a shared goal: to work with speed, vision and expertise to solve the world's most pressing environmental challenges, together.

As the global professional membership body for environmental scientists, we support a diverse network of professionals all over the world – and at every stage of their education and careers – to connect, develop, progress and inspire.

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Executive summary

The state of the environment has never been subject to such a high degree of scrutiny and observation as it is now.

As a result, we have more evidence than ever before, providing a crucial opportunity to ensure an evidence-informed approach to policy making, where scientific insights are used alongside social and democratic perspectives to produce policy which delivers thriving people, a healthy economy, and a flourishing environment.

Despite the size of that opportunity, barriers remain: policy makers do not always use the evidence to inform decisions, either because of the cultures surrounding decision making, or because they lack access, capacity, or resources.

Policy makers and environmental professionals also share in a further challenge: sometimes environmental data is inaccessible as a source of evidence, even if that data already exists.

The reality of these challenges is that our society often forfeits the potential for better solutions and improved environmental outcomes. That has immediate consequences for people, the economy, and nature, all of which suffer when policy making is not informed by the evidence.

This report provides an overview of how those challenges have manifested in practice, informed by the perspectives of IES members, analysis of the wider literature, and the reflections of an interdisciplinary expert working group.

The IES recommends:

1. Adopt cultures of evidence-informed policy making across government.

2. Train policy makers in effective evidence-informed policy making.

3. Provide the resources and capacity across government to deliver evidence-informed policy making in practice.

4. Deliver comprehensive mapping of the environmental evidence landscape.

5. Adopt a plan for consolidating evidence, including from environmental assessments for individual projects.

6. Provide incentives to open up accessibility of privately-held evidence.

Further recommendations are set out in Our Shared Mission for Sustainable Wellbeing.

Introduction

Evidence is critical to policy making. It plays an essential part in the design and implementation of policy, as it helps us to understand the policy problems we face and what we expect to happen when we intervene.

Although evidence is important, it is not always used. This is not always a failure of policy processes: sometimes there are other relevant considerations that make some categories of evidence less important.

However, there are also times when policy as a whole acknowledges the need for an evidence-informed approach, or potentially even where evidence is sought and used, yet the outcomes of policy making in practice do not reflect an evidence-informed approach. These issues are particularly challenging for environmental science, where the implications of policy failure are felt across sectors.

This report sets out how these barriers have manifested, with some recommendations to improve evidence-informed policy making.

The IES and our expertise

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As the global professional membership body for environmental scientists, we support a diverse network of professionals all over the world – and at every stage of their education and careers – to connect, develop, progress and inspire.

We draw members working in climate change, air quality, land condition, water, nature, and anywhere else where environmental work is underpinned by science, so we understand the challenges that are associated with evidence-informed policy.

The interdisciplinary background of the IES family makes it particularly well-placed to address interconnected environmental challenges such as the use of evidence and data collection.

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Purpose and scope

This report was produced as part of the IES's Evidence and Data project. The project had two objectives:

- **Evidence-informed policy:** to explore the interface between science, policy, and the public, particularly for the use of evidence by decision makers and how this can be improved.

- **Data:** to explore how access to data can be improved to facilitate evidence-informed decisions, as well as how evidence, data, and the distinctions between them are understood.

Many of the underlying issues addressed in this report do not rely on a specific policy context. However, for clarity, the intended scope of both objectives will primarily address decision making in the UK, with particular reference to environmental policy.

Background

This report takes a first step towards identifying and addressing the challenges that many IES members have experienced relating to evidence-informed policy and the role of data.

It was developed with reference to the practice of environmental professionals, as well as a range of existing reports, articles, and publications from across the environmental sciences, government, and international organisations.

This evidence was considered in discussion with a working group of expert members and through conversations with IES members and stakeholders.

At its first meeting, the group identified the following questions as a framework for understanding the extent to which a decision is evidence-informed:

- What do we need to know?

- Do we know what we need to know?

- Do we know what to do with what we know?

- Do we do what we know we need to do with what we know?

- What can we do so that we do what we know we need to do with what we know?

These questions provided a framing through which the abstract elements of

evidence-informed policy could be considered in practical terms.

Framing and scope

The group also identified that in conversations around policy, the distinction between evidence and data is often blurred, with practical consequences for evidence-informed decisions.

To avoid any uncertainty or contradiction, the group adopted the following definitions for the purpose of the project:

Evidence can be understood as the available facts or information which can be cited in support of a conclusion or statement, indicating whether a belief or proposition is true or valid. Similarly, evidence can disprove the truth or validity of a belief or proposition.

Evidence is not always data: there is a category of evidence which extends beyond the data itself, including lived experiences of how environmental policy works in practice and how data is understood, used, or brought together such that it can support decisions.

There are situations where the outputs of evaluation or systematic reviews are themselves considered data, but it can be simpler to consider these as separate categories of evidence.

Data can be understood as a collection of information (each individually being a 'datum'), often obtained in a scientific manner (and sometimes used to refer to numerical or quantitative information, but not in this report).

Data is not always evidence: individual data points or pieces of information may not meaningfully translate into actionable or useable evidence that can be used to prove or disprove the validity of a statement or proposition (i.e. some data does not meaningfully provide the means to make or influence decisions).

Context

In many cases, these terms have been used interchangeably in policy making, producing confusion and unnecessary uncertainty. There are two contexts in which conflating these two concepts can lead to practical challenges.

Firstly, a lack of appreciation for the differences between data and evidence can lead to situations where data is understood as the only important evidence, leading policy makers, organisations, or individuals to pursue data collection without specific purposes in mind, mistakenly believing that decisions will be made better if they increase the amount of data they have.

By comparison, by collecting data (or other evidence) with specific purposes in mind, such that the collective body of evidence produced is able to answer the questions needed for policy makers to make decisions, resources are not unnecessarily devoted to collecting unhelpful information and decisions are simplified to the evidence that actually matters.

Put simply, we should collect data when we need it to make a decision, not because we believe it increases 'the amount' of evidence we have. This is particularly stark when indicators are produced for monitoring improvement in the

environment, as imprecise indicators can make it difficult to measure whether interventions are actually making a difference.

Secondly, conflating evidence and data invites a simplistic view of complex issues, particularly for the environment where many linked systems are involved. If a policy maker believes that the only evidence is data, or that all data is evidence, it may lead them to feel satisfied that they are able to make evidence-informed decisions as soon as they have access to any data, even if it is not the right data, or if they lack a complete picture. In many instances, gaps in data are not outright barriers to decision making, but it will be important to understand where gaps exist and their implications.

For example, if a policy maker only had data on the greenhouse gas emissions associated with a handful of transport options, they may believe that they have the necessary evidence to determine which is the most environmentally friendly option.

However, if the same policy maker took a more holistic view of evidence-informed decision making, they may also seek to consider a wider body of evidence on other emissions across the lifecycle of that transport option, how other natural systems such as biodiversity may be affected, and social or economic considerations.

While the linguistic distinctions between evidence and data may appear trivial, they can lead to very real consequences in how evidence-informed policy making is approached, ultimately affecting the type of evidence that is collected and how it is used to make decisions.

To address these issues, it is important that policy challenges, especially those relating to the environment, are understood systematically, with a complete understanding of the full range of both evidence and data and how each can support decision making.

Challenge area one: Evidence-informed policy

The challenges for the use of evidence in environmental policy are not new. Historically, the biggest question was whether we had the evidence neeeded to make decisions, or whether we knew how to use the evidence we had to make the right decisions. A third challenge has also arisen: whether we know why we do not use the evidence we have to make decisions in the ways we know we should.

For the most part, we have the evidence we need: there is a vast base of evidence and monitoring data, albeit that the most appropriate indicators are not always used to monitor progress and inform decisions. We also know how we should be using that information: several existing assessments already provide clarity on how we should approach evidence in the policy process.

There are four general categories of reasons why the use of evidence in policy often still fails, despite the progress that has been made:

1. **Time:** there is limited time available for policy making, the length of political terms encourages a short-term focus, and civil servants cycle too quickly for approaches to evidence to be permanently institutionalised.

2. **Complexity:** limits to the ability of policy makers to deal with many issues at once mean they cannot always process the full complexity of ideas and may prioritise immediate or simple gains, so nuanced ideas are not always understood, funded, or rewarded.

3. **Competency:** some policy makers or civil servants lack the skills, knowledge, or motivations to use evidence in the best possible ways, or those with the evidence lack the skills to share it effectively with policy makers.

4. **Culture:** the way evidence is understood and the relationship that policy makers have with evidence lead them to engage with it in particular ways, which can be detrimental.

During the process of developing the report, the working group identified four thematic issues where evidence-informed policy faces these challenges:

1. Evidence collection for policy

2. How evidence is used in policy making

3. Monitoring and evaluation

4. The science-public-policy relationship

> "The challenges for the use of evidence in environmental policy are not new... We have the evidence we need."
>
> Institution of Environmental Sciences
> Challenge area one: Evidence-informed policy

Thematic issues

These four themes are intrinsically linked: the evidence we collect shapes how it is used, particularly in the context of data for monitoring, but we do not routinely choose the evidence we collect with the purpose of monitoring in mind.

The relationship science has with policy makers and the public is grounded in the provision of useable evidence, as well as expectations of delivering desired outcomes, to which monitoring and evaluation are critical.

The science-policy interface drives how evidence is collected and sets the terms for how it is used, particularly in the context of monitoring and evaluation.

1. Evidence collection

a. A considerable amount of evidence that is collected is not used or is not used to its fullest extent, so there is an increasing need to make better use of the evidence that already exists.

b. There is a particular gap in the appropriate use of evidence synthesis.

c. There is not always a strong rationale underpinning which evidence is collected and why. This can be a particular problem for long-term monitoring or indicators used in policy.

d. Policy makers face a trade-off between only collecting evidence which is strictly necessary for monitoring (to minimise costs) and collecting a more holistic body of evidence to promote innovation and to develop a broader understanding.

e. There are specific issues facing data accessibility, which are addressed in the next chapter. These compound existing challenges for evidence collection.

f. Where evidence collection may be imperfect, it can still be productive as long as limitations are recognised. Currently evidence is not consistently used in a way that recognises these limitations.

2. Use of evidence

a. How evidence is used is influenced by the questions asked by policy makers (or others) and the ways that policy is evaluated and communicated.

b. How evidence is used is influenced by the skills and experience of policy makers. Often, time and resources do not allow for these skills to be developed or utilised.

c. Sometimes policy operates within organisational cultures which do not encourage evidence-informed policy, or which deprioritise scientific evidence compared to other sources.

d. Cultures of evidence-informed policy can be short-lived due to the short tenures of policy makers or due to civil servants moving to other organisations or roles. Embedded approaches, such as the Wellbeing of Future Generations Act in Wales, may help to mitigate against this challenge.

e. How evidence is used is influenced by the quality of communication. Concepts such as risk, uncertainty, or systems may be particularly difficult to communicate, as they are subject to a higher degree of nuance and complexity.

f. Evidence synthesis is a particularly important and underutilised approach to the use of evidence for policy making.

g. Existing research, such as the 'levels of evidence pyramid' for evidence-based medicine, provide insights into different approaches and their value for decision making, though this is not fully realised in practice.

3. Monitoring & evaluation

a. Evidence-informed policy can be made more effective through a strong relationship between evidence collection, monitoring, and evaluation, with 'monitoring for evaluation' as a clear rationale embedded at the data collection stage.

b. Monitoring is a significant driver for evidence collection in policy, where regulation aligns with a particular type of evidence or an agreed indicator.

c. Policy makers do not always act on the outcomes of monitoring and evaluation, particularly where broader values disagree with actions suggested by evaluation.

d. Isolated metrics for monitoring often lead to oversimplification and the loss of important information or context.

e. Research funding is becoming increasingly focused on multidisciplinary approaches. Supporting evidence synthesis through research funding would accelerate these successes.

4. Relationship between science, policy, & the public

a. Decisions are often not based solely on what has traditionally been viewed as 'evidence'. This may be to account for other social needs or perspectives, or for less positive reasons, such as short-termism and political convenience.

b. Policy makers may not have completely understand the evidence and may not know which questions to ask scientists or researchers.

c. Extensive analysis of evidence is not always possible in government departments and delivery organisations, due to limited time and resources.

d. Researchers are not always equipped with the skills and competences needed to effectively share their findings with policy makers.

e. Expectations may not always be aligned between policy makers and researchers. This can be exacerbated when outcomes are uncertain, as each group may have a different appetite for risk.

f. The relationship between science and the public is complex. Citizen engagement can be blocked by policy makers or researchers, potentially leading to the perspectives of citizens being ignored as a form of evidence.

g. Different models for public engagement with science exist, ranging from citizen science to citizen assemblies. Depending on the circumstances, some models may be more appropriate than others.

h. There have already been considerable analyses of the science-policy interface, including the Cabinet Office's 1999 report 'Professional policy making for the twenty first century' and Susan Owen's book on the RCEP: 'Knowledge, Advice, and Policy'.

Solutions

Potential solutions identified during the discussion and throughout the wider literature on the science-policy interface include:

• Providing more resources, money, skills, and capacity for engagement between science and policy.

• Training and guidance on evidence and data for government communications or policy professionals, supported by engagement with research communities.

• Investment in leadership on (and championship of) evidence within policy

making, including the development of compelling narratives about the role of evidence throughout the whole policy project timeline.

• The use of 'Quantitative Storytelling' and similar approaches as practical tools to translate evidence into policy

• 'Better evaluation' approaches to the culture of evidence use and production within government.

• Improved analysis, evaluation, and monitoring functions within government, focusing on improved evidence transmission within government (such as access to past evaluations to support evidence-informed policy).

• Collaborations, networks, and relationships to leverage evidence and maximise constrained resources (including identifying opportunities for citizen science).

• Action to forefront innovation and trial as a component of policy development.

• Annual reviews of decisions to assure the quality of evidence-informed policy, potentially with systems for rewarding and encouraging appropriate approaches.

Reflecting on the breadth of these solutions culture is a key component in bringing together all the aspects of a successful science-policy interface in a coherent way. Organisational culture has the means to bring processes and people together, building skills and capacity.

Considering the the high degree of fragmentation across government, including

between national and local government, where challenges can be sector or topic specific, broad approaches to organisational culture have the ability to create positive change despite different contexts.

Any cultural interventions would need to address the reality that increased operational complexity may face political opposition from those seeking to simplify the decision making process. Therefore, solutions would need to be integrated effectively without introducing new complexity. To that end, coherence without overcomplication would need to be a key consideration.

Recognising that policy processes are typically subjective, especially around sustainability, the goal should be to instil appropriate understandings and attitudes to evidence in those participating in the policy process, rather than dictating that they use evidence or make decisions in a particular manner.

A culture of evidence-informed policy is essential to delivering environmental outcomes.

Challenge area two: Access to environmental data

Beyond the immediate challenges facing evidence-informed policy making, there are specific issues around the accessibility of environmental datasets. Naturally, this relates to the thematic issues on evidence-informed policy. Improving data accessibility would likely have positive consequences for evidence-informed policy in general.

As a category of evidence, datasets have particular features that contribute to the overall quality of evidence-informed policy. They can provide a consistent and comprehensive overview of the state of certain aspects of the environment, depending on how they are constructed and utilised.

However, this is not always realised in practice. Both the construction of datasets, as well as how they are used in decision making and shared with stakeholders, give rise to challenges that prevent the full benefits of comprehensive environmental datasets being realised.

Construction of datasets

Many of the challenges associated with data collection start with the purpose for which data is used. There are two 'extreme' perspectives on how datasets are collected for policy, between which lie most typical approaches. At one end of the spectrum, datasets are designed to account for everything, collecting as much data as possible (which is rarely practical given resource constraints).

On the other end of the spectrum, a decision maker could collect the most resource efficient dataset possible by collecting very few sources of evidence, then make decisions based on the limited evidence available (which would rarely allow for fully informed decisions).

Inevitably, data collection must fall between the two extremes, so deciding what evidence is needed and how to collect it remains a significant decision within evidence-informed policy making.

The best solution is typically a purpose-driven approach: identify what you are seeking to achieve, what you need to know to achieve it, and how best you can measure that information. Beyond that, it may also be important to collect some additional evidence as a precaution against the unknown, particularly in environmental policy where uncertainty is prolific.

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> "Large quantities of evidence already exist, though much of that evidence is inaccessible."
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Challenges for such an approach arise from how policy making tends to work in practice, where decisions about evidence collection are rarely made at the outset, leading to complex approaches which are built up over long periods of time, without an internal logic or driving purpose behind the datasets being collected.

This can lead to problematic cycles of unintended consequences: we do not know about problems because we do not have evidence, so we do not prioritise those potential challenges. As we do not prioritise those challenges, we do not identify them as areas requiring data collection, so we do not find out about the problems.

Solutions to this challenge may be particularly difficult, given the long-term nature of many targets, which often drive monitoring and evidence collection efforts by government. Additionally, the short-term nature of the terms under which some policy makers often operate can make long-term tracking of environmental trends a lower priority.

To that end, this challenge is linked heavily to the challenges around evidence-informed policy, so both challenges must be addressed in tandem. For instance, efforts to improve cultures of evidence-informed policy across government should account for the importance of consistent logic to inform evidence collection and the construction of datasets.

The way that data is collected and used also has implications for the way that monitoring and evaluation is conducted, so the role of evidence in the policy process should be addressed from the outset with outcomes in mind.

Using existing evidence

Large quantities of evidence already exist, though much of that evidence is inaccessible to the public, policy makers, and professionals.

In particular, datasets are generated for a range of policy and regulatory purposes, with an unexploited potential to reveal significant information about the state of the environment.

This is particularly stark where regulations require the collection of data that is limited to an individual project or site, for regimes such as Environmental Impact Assessment (EIA) or Biodiversity Net Gain (BNG). This can be exacerbated due to intellectual property restrictions around data from past projects, which are often tightly controlled by the private sector, limiting access to a vast array of evidence.

Likewise, there is a vast body of research which is not fully used in decision making. This evidence is often inaccessible, albeit not because it is restricted, but because there are not sufficient efforts or incentives to encourage its adoption.

Similar challenges arise from the novelty of many modern sustainability challenges, where the full lifecycle of an approach or piece of technology has not yet been subject to extensive monitoring or evaluation. Complex projects like offshore wind farms, which interact with many natural and social systems, make these considerations even more challenging.

This creates the same challenge for practitioners, researchers, and policy professionals: how can they access the information they require in order to know what they need to know.

At the heart of these issues are three major challenges:

1. Mapping the evidence landscape to understand what already exists and whether it is accessible;

2. Consolidating the evidence landscape to reduce fragmentation and embed a more coherent approach;

3. Overcoming practical barriers to accessibility, such as intellectual property rights and data curation.

Recommendations

Based on the analysis in this report, there are six immediate actions that could improve the landscape for evidence-informed policy:

1. Develop a culture within government that champions evidence-informed policy making, from the ways that datasets are constructed to the ways that decisions are made.

2. Ensure all policy makers have access to training in evidence-informed policy. Deploy robust competency frameworks to ensure that the policy workforce is fully skilled in the competences and understandings needed to engage effectively in evidence-informed policy making.

3. Provide sufficient resources and capacity for evidence-informed policy making, including training budgets and sufficient time within decision making processes to facilitate a fully evidence-informed approach.

4. Support comprehensive mapping of the environmental evidence landscape, including identifying data gaps and providing a clear picture of what environmental indicators tell us about the state of the environment.

5. Adopt a plan for consolidating environmental evidence, including how project-specific evidence can contribute to the wider evidence landscape. Establish a national centralised database on the outcomes of impact assessments and their underlying raw data.

6. Open up the accessibility of privately-owned data through incentives or regulatory requirements to engage in data sharing as part of planning processes.

These recommendations represent specific solutions to the challenges identified in this report, but must be enacted as part of a wider approach to championing evidence-informed policy across government.

The overarching principle that government should follow is clear:

The Government must recognise the role of evidence-informed policy design and delivery, embracing the full range of scientific insights, whether or not they are politically convenient.

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Conclusion and next steps

Evidence-informed policy is increasingly important, but also increasingly threatened by external factors.

The coming years will represent an important inflection point for the future of evidence in policy making, particularly for environmental policy.

If society makes the correct decisions now, the full potential of evidence-informed government could unlock multiple benefits for people, the economy, and the environment.

Alternatively, if evidence is displaced within policy making, the future could hold increasingly uncertain policy outcomes as people and the environment are placed in unnecessary conflict with one another, jeopardising all kinds of outcomes.

Areas for further research

The analysis and recommendations in this report represent only one step towards a solution. Given the complex nature of the problems at the heart of evidence-informed policy making, many different solutions will need to work in tandem to produce desirable outcomes.

The challenges facing evidence and the use of data for policy apply broadly, though there are many specialism-specific dimensions requiring further exploration.

Across the IES Communities, these questions will remain relevant as the Institution brings together environmental scientists across specialisms to identify responses to these challenges and how they can be addressed strategically.

Further work is also needed to consolidate what we know about the implementation of policies and how to make them successful.

The IES's Environmental Policy Implementation Community (EPIC) is currently engaging in a project on implementation science, seeking to understand what works in environmental policy implementation and why, drawing from a comprehensive range of studies.

Over the coming months, the project will seek to provide evidence-informed guidance to EPIC members and others on implementing environmental policy; advocate for implementation skills to be taught in environmental science higher education; and advocate for

implementation-minded policy making in local and national government.

Ultimately, the future of evidence-informed policy will not be determined by the quality of evidence or the science underpinning datasets. It will be determined by the social - and often political - decisions about how evidence is used in practice.

To that end, multidisciplinary insights will be increasingly important to secure a sustainable future. Close integration of insights from the social sciences and policy will be critical to making an impact.

The Institution of Environmental Sciences will continue to promote these skills as it works to create and sustain a knowledgeable, skilled, diverse, and trusted environmental profession, engaged in the transformation to a sustainable society.

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