From Data to Decision: The role of Scientific Experts in Climate Law

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Introduction

In 2020, the then fledgling Council for the Human Future, chaired by former Liberal leader and treasury economist John Hewson, issued its Surviving and Thriving in the 21st Century report. The Council was established to raise global awareness of humanity's growing existential emergency, comprising ten catastrophic risks, and help devise solutions to them all. The Council's roundtable includes former government department heads, fossil fuel company directors, doctors, university academics, biologists and scientists.

In its report, the Council listed the top 10 risks to humanity. Ranked alongside climate change, nuclear war, overpopulation and unregulated artificial intelligence (AI) was this ….

Science denial

The Council says:

> "The inability of people to understand the deadly threats that now confront us all is the greatest barrier to global action for a safe human future. Disinformation, lies and false beliefs being spread by politicians, corporates and mischievous individuals cause mass deaths and pose a direct threat to our survival."[1]

Bringing 2 mega threats together – science denial and climate change, Rachel Cleetus, from the US Union of Concerned Scientists said this recently about U.S. government cuts to climate science programs and agencies - "It's as if we're in the Dark Ages."[2]

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[1] https://humanfuture.org/megarisks accessed 2 November 2025
[2] Quote of the Day, the New York Times 19 May 2025

It's hard to disagree. The failure of global and local political leadership to effectively tackle that combination of megathreats means other institutions of government are critical. My focus today is on the judiciary, science and expert witnesses. While the Parliament and the courts of social media and public opinion may be dangerous and unfriendly, the courts of law provide a safe haven for scientists.

Today**,** I am going to talk about how science is being used in climate litigation, and then I will talk about the processes for an expert giving evidence and give you some tips base on my experience as a judge and in reforming procedures for the Land Court.

I hope when I finish speaking you will think I have made my case well that courts are becoming science friendly. I hope, also, that you will be encouraged to embrace opportunities to assist courts to make sound decisions about matters with climate change implications, or, indeed, any environmental risks.

Some case law – international and Australian - How Science has been used in climate litigation

I think it is fair to say that science denialism stops at the door of the Court. Scepticism remains, but that is mandated by rules about expert evidence that ensure there is a good basis for the particular expert witness to give evidence.

For example, the evidence must be relevant to an issue in the case. There must be an acknowledged field of expertise that would assist the court to resolve the issue. The person must be qualified by knowledge, qualifications or experience in that field. And the facts and circumstances that the expert relies on must be clear and accepted – either by agreement or by proof by them or someone else. We can get into the detail of those rules in the forum if we need to.

Returning to my science friendly theses - step inside a courtroom, and you are most likely to find the link between human induced GHG emissions, and the global phenomenon of climate change is established and well accepted. You are also likely to find that the science is given significant weight in resolving the case. I want to quickly skate through a few cases to prove my point.

I will start with a trifecta of Advisory Opinions of international courts and tribunals. Because their focus was the legal obligations of States in relation to climate change, their observations about science are about climate science and

about reports done at a global scale encompassing the myriad impacts of climate change.

We have had 3 Advisory Opinions from international judicial bodies in the last 18 months. Advisory Opinions are just that – advisory. That reflects the nature of international law and the lack of mechanisms to enforce obligations against States, without their consent to that. For example, States can, but need not, agree to be bound by decisions of international bodies established to resolve disputes. However, Advisory Opinions have great authority and provide a reasoned framework for international developments, and in the case of climate, for increased ambition and action.

The three are Advisory Opinions of the International Tribunal for the Law of the Sea (ITLOS), The Intera-American Court of Human Rights (the Inter-American Court), which is a regional not a global court, and the International Court of Justice (ICJ).

All 3 gave Advisory Opinions on the obligations of States with respect to climate change, with a different focus. For ITLOS, which delivered its opinion on 21 May 2024, it was the Obligations of States under the UN Convention on the Law of the Sea for Climate Change. Crucially, it decided GHG emission impacts on the marine environment is pollution, establishing a link between actions with climate consequences and the various obligations under the Law of the Sea to prevent harm and protect the marine environment. The Inter-American court went second, delivering its opinion on 3 July 2025. While a regional court that speaks to its member States, it is influential in developing jurisprudence about the link between climate change and human rights. The ICJ, which gave its opinion on 23 July 2025, is at the pinnacle of the international judicial order. Unlike the other 2 opinions, its scope was not confined to a particular region or treaty, but to international law as a whole. Many States, including Australia, urged it to take a narrow approach, confining climate obligations to the specific requirements of the United Nations Framework Convention on Climate Change and the agreements and protocols, including the Paris Agreement, developed under that framework.

I don’t have time to talk to their detail, but I want to say a few words about how they approached science.

First, none of them heard from scientists directly in the way a domestic court would take formal evidence in our adversarial system. Instead, the parties,

referenced it in their submissions, explaining and relying on a vast amount of scientific material and data. The ICJ took a further, and I think important step. In November 2024, it met with IPCC scientists to enhance its understanding of the science. This has both substantive and symbolic resonance. The substantive resonance is that underpinning the Court's reasoning was their acknowledgement that they need to understand the science about climate change and its impacts. I am willing to speculate that this played a role in the ICJ rejecting the very narrow approach to climate obligations that so many States urged it to adopt. The symbolic resonance is that it demonstrates 2 things – that science is critical in developing the content of the legal principles, and that the role of scientists is to advise – to help decision makers, in this case the ICJ – to understand matters outside their own field of knowledge.

Second, the basic science of climate change was uncontested. At the heart of these submissions was the work of the Intergovernmental Panel on Climate Change (IPCC). IPCC reports were referred to in each of the Advisory Opinions, and their findings were accepted as settled knowledge. None of them required formal 'proof' of the basic science of climate change. In its Advisory Opinion, the ICJ said 'the specific character of the risk of significant harm to the climate system is indisputably established' and that all States contribute to and are affected by the cumulative effects of climate change.

Third, in articulating the obligations of States in relation to climate change, all 3 gave science a central and authoritative role. They were not asked to consider specific liability or responsibility. However, the ICJ did refer to the emerging and growing field of attribution science that opens up new possibilities in climate litigation. The Court affirmed that it is scientifically possible to determine each State's contribution to global emissions, enabling the attribution of harm and potential liability.

Fourth, all the Advisory Opinions explore the environmental duties of protection and prevention of harm require States to exercise due diligence. Because of the magnitude of the risks the standard of diligence is strict and vigilant and must be guided by the "best available science". This science must be up-to-date, peer-reviewed, empirically based, transparent in its methods, and clear about uncertainties and assumptions. Where scientific understanding is incomplete, a precautionary approach is required. The Inter-American Court found it would be a violation of the duty of due diligence to ignore or manipulate scientific findings.

Further, to do so might be a human rights violation, as it undermines the evidence base needed to protect environmental and human rights.

Many would have welcomed the reliance on the IPCC reports for those Advisory Opinions. But there are implications. In a recent article, 'The expanding role of climate assessments as legal evidence' the authors (Robinson, Sadai & Evins-Mackenzie) expressed concerns about the implications for the IPCC of their reports being used in climate litigation:

> 'Institutions such as the IPCC were not designed to arbitrate legal claims, yet their scientific assessments become authoritative evidence in such contexts. This blurring of roles places new pressure on the epistemic authority of the panel — an authority long grounded in consensus and claims to neutrality. Its mandate to be "policy-relevant but not policy-prescriptive" was never a shield from politics; it was a strategy for navigating it. However, legal interpretations of IPCC findings are advancing with or without the panel's engagement. As courts cite attribution findings and projected damages, terms such as 'adaptation failure' now carry legal weight. The panel need not expand its mandate to acknowledge this shift, but it may need to clarify the epistemic boundaries of its assessments, including how attribution and harm are framed, especially when these framings shape legal interpretations of science.'

Courts and litigants alike will be attracted by the legitimacy and perceived neutrality of IPCC consensus.

Turning to the domestic courts, I have used the logos of 3 courts that have seen the greatest activity in climate litigation in Australia- the Federal Court of Australia, the NSW Land and Environment Court and the Land Court of Qld. Of course there are others. Like the international opinions, in most domestic cases now, you will find the climate science will either be or derived from the IPCC reports and will be largely uncontested.

In Sharma v the Minister for the Environment,[3] the Commonwealth called no expert evidence at all and did not contest the expert evidence led by Anjali Sharma and her colleagues. In Waratah,[4] I received a joint expert report which

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[3] Sharma by her litigation representative Sister Marie Brigid Arthur v Minister for the Environment [2021] FCA 560

[4] Waratah Coal Pty Ltd v Youth Verdict Ltd & Ors (No 6) [2022] QLC 21

contained no disagreements of substance. In the Living Wonders case[5], again, there was little contest about either the causes of climate change or the relevance of GHG emissions, at least from a scientific perspective. In the recent Pabai Pabai case,[6] although there was some disagreement about attribution science or the precise degree of local impacts of climate change, the foundational propositions were not in contest. Given the science on the phenomenon of climate change, the lack of contest is unsurprising.

Nearly every judgment addressing climate change in Australia begins with a recitation of sobering and agreed facts about climate change, such as these.

- The science on climate change, its causes and (at a global scale) its effects, is largely settled.
- There is a near lineal relationship between GHG emissions and increased global temperature.
- The greater the increase in global temperature the more severe the impacts.
- Every tonne of emissions matters, or as Justice Wigney put in in Pabai Pabai, every fraction of every tonne of emissions matters.

Yet, by and large, such recitations are followed by the reasons why, ultimately, the claim must fail because of the legal requirements of different types of actions. Well that has been the experience in the Federal Court where climate litigation has, largely, failed at least in overturning administrative decisions with climate change impacts.

There has been more success in climate litigation in State courts. The contribution to and consequences of climate change impacts was one of a few grounds that led the NSW Land and Environment Court to overturn the approval of the Rocky Hill mine[7] and the Land Court of Qld to recommend refusal of the application by Waratah coal to mine in the Galilee Basin. In both cases the court could consider the merits of the proposed development. Merits review is not discretion at large. A merits reviewer must apply the law that governs the decision. But there is greater decisional scope when dealing with concepts like public interest. Merits review allows for science informed decision making about where the public interest lies.

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[5] Environment Council of Central Queensland Inc v Minister for the Environment and Water [2024] FCAFC 56
[6] Pabai v Commonwealth of Australia (No 2) [2025] FCA 796
[7] Gloucester Resources Limited v Minister for Planning [2019] NSWLEC 7

In other types of cases, like claims for damages for losses caused by climate change, there are significant barriers from legal tests of causation. But the law is fast developing, and climate litigators are not going away. Climate litigators can be expected to continue to test existing legal norms. As Dr Wesley Morgan, a fellow of the Climate Council recently observed "this is how legal norms change. When they are challenged repeatedly by those who are impacted by the deepening climate crisis, legal norms will need to shift to meet that need."[8]

And science has an important role to play in shifting the legal norms. Some observations from the Inter-American Court are instructive. It said that States must conduct comprehensive, detailed, and forward-looking assessments of how climate change affects the enjoyment of human rights. The assessment must consider current and projected risks. And it must use disaggregated data by territory, population group, gender, age, and other factors that shape vulnerability. A general or aggregate evaluation is not sufficient. What is required is a clear mapping of how specific individuals, communities, and ecosystems are affected, particularly those who have historically been marginalized or overlooked in public policy.

I will add that climate science is not the only game in town. The coal mining cases show what is required is for every discipline to be conversant in the consequences of the global phenomenon in their discipline and to specific people, places, and aspects of the environment. In both cases the court heard from experts in a range of disciplines who localised and specified the particular consequences of the global phenomenon of climate change for those who would be most affected by the proposed mine.

In the Waratah Coal case, I heard evidence from experts in 13 disciplines. With the exception of experts dealing with the subsidence impacts of the proposed underground mine, every scientist had to explain the impact of climate change in their field. This included coal market economists opining about the likely market for coal during a transition away from fossil fuels, health and social impacts on people in different parts of the State, actuarial assessment of health, social and physical costs associated with climate impacts, the economic case for the mine,

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[8] Lisa Cox, *'Torres Strait leaders lost their landmark case. How can governments be held to account on climate?', The Guardian* (17 July 2025). Available at https://www.theguardian.com/australia-news/2025/jul/17/what-happens-next-after-torres-strait-islands-climate-case-against-government-dismissed

and physical impacts on the Torres Strait from sea level rise and associated loss of cultural rights for Torres Strait Islander peoples.

This sort of evidence has a closer focus than the IPCC reports can bring to bear, particularly to demonstrate causality at a granular level. So I see the immediate challenge for climate litigation is to go beyond the IPCC reports and to approach climate impacts in a way that localises and makes specific to a time, a place, an environmental value, and a development, the consequence of the global phenomenon, taking into account the project's potential contribution to that phenomenon. Understanding the physical, social, environmental, economic, health and cultural impacts of a development in the context of climate change engages nearly every scientific field, not just climate science.

I will turn now to expert evidence processes.

Expert evidence is important.

I speak as a former judge and tribunal member with over 24 years' experience deciding cases. I have heard expert evidence in every jurisdiction I have sat in, criminal, children's court, contract claims, personal injury matters, building disputes, guardianship proceedings, professional disciplinary prosecutions, and, most important for our topic today, environmental matters.

I have always been assisted by expert evidence, sometimes more than others. In an environmental context, expert evidence is critical. It goes to the merits of the decision about whether to approve a development taking into account the potential impacts. That is not a legal question, although there are legal tests, many of which constrain or distort the process. And the law imposes a framework that differs from the scientific method. But that is for the lawyers, not the expert witnesses to worry about. Where expert evidence is called, it is because a party seeks to ensure the decision-making is rational and grounded in evidence. It will likely be crucial to the resolution of at least one issue in the case.

Qualities of the Expert – Expertise, Integrity, Utility

Expertise is a given. You have to have relevant knowledge and qualifications, even if through experience, to express an opinion. The harder qualities to entrench are integrity and utility. As a judge my concern about the integrity of expert evidence was the extent to which an opinion was truly independent of, and uninfluenced by, the interests of the party who engaged the expert. My concerns about the utility of expert evidence were twofold. Firstly, its comprehensibility,

and, secondly, the extent to which it directly engaged with the evidence of any other expert witness of similar expertise giving evidence on the same topic.

What are the risks – biassed?

Alliance Australian Insurance Limited v Mashaghati **[2017] QCA 127 at [90].**

President Sofranoff stated:

- *"Experts occupy a special position as witnesses. With irrelevant exceptions, no other witness can give opinion evidence. An expert's opinion often, perhaps usually, relates to disciplines that are unfamiliar to a judge hearing a case. Consequently, unlike the position of a witness of fact whose duty is merely to answer questions in a responsive way, an expert has a duty positively to assist the Court. This duty may require a level of candour and voluntary disclosure on the part of an expert that might involve prejudicing the case of the party that called the expert. Nevertheless, the duty to the Court, that is to say the duty to assist the Court in finding the truth of the matter, overrides any obligations owed to the party who pays the expert's fees*".

What are the risks – impenetrable?

I sincerely hope I have not been impenetrable, but any discipline has its own terms of art, methods of expressing complex matters in shorthand that their colleagues understand. An expert witness must be a translator. You don't have to understand the law, but you do have to be able to communicate with the law, or more specifically the lawyers and the judge. This means you have to understand the utility of your evidence. What purpose is it serving in the case?

This is not a matter of style, though this is a fear for many experts and lawyers. Lord Woolf observed that judges may be "influenced by factors such as the apparently greater authority of one side's expert's relative fluency and persuasiveness in putting across their arguments."[9]

That may be so, but for a court to be persuaded by the opinion, rather than bedazzled by its manner of delivery, the expert must be able to explain their

[9] Lord Woolf MR, *Access to Justice, Final Report to the Lord Chancellor in the Civil Justice System in England and Wales* (1996) 138.

opinion to laypeople, including judges and lawyers. Further, where conflicting expert opinions are offered, the court must be able to understand the nature and the reasons for the disagreement and the consequences of that disagreement for the issues in dispute.

What are the risks – misses the point?

Sometimes your evidence will be background evidence setting the stage for others, but rarely is this so. In a climate context, climate scientists are most likely to be in that position, unless they are giving attribution evidence. For all expert witnesses, the more specific and direct the link is between your evidence and an issue in the case, the more helpful it is going to be. This means that you need to understand what assistance is required. I will come back to this later.

What are the risks – ships in the night?

In the olden days when I entered the legal profession, expert evidence was conducted as a jousting contest, but with the riders operating in different tiltyards. One expert fully ran their course without their lance encountering the other expert's, who gave their evidence at a different point in the trial, being asked different questions and, most often, on different information. This meant the experts passed like ships in the night.

That phrase has been attributed to Henry Wadsworth Longfellow who wrote *Tales of a Wayside Inn* in 1863:

> *"Ships that pass in the night, and speak each other in passing, Only a signal shown and a distant voice in the darkness; So on the ocean of life, we pass and speak one another, Only a look and a voice, then darkness again and a silence."*

Left to their own devices, experts often pass like ships in the night. Judges who regularly hear evidence from experts will be familiar with the *look* and *voice* in passing and then *darkness* and *silence*. In my experience, even when experts produce what is loosely called a joint expert report they manage to avoid each other, sometimes entirely.

Best Practice for courts using expert evidence.

Earlier I said I was sometimes less assisted than others. By and large, I put this is down to the legal system, rather than the experts themselves. I want to talk to you

about what I think is a best practice system. Perhaps we can talk in the forum about what you can do if you find yourself in a court process that doesn't ensure these practices are in place.

All the reforms in Australia are going in the same direction, although some courts, like the Land Court of Qld, have a high degree of court involvement at every stage of the proceeding.

The objectives of expert evidence procedure are to reinforce independence, prevent miscommunication between the experts and between the experts and the court, and to address all the issues that the expert advice can assist with.

There are 4 stages of the process – briefing, conferencing, reporting and giving evidence. Most procedures require a collaborative approach at every stage. This makes sense given the expert is not an advocate and their role is to assist the court, not make the client's case.

Briefing

It is essential that experts giving an opinion on the same matter have the same material. That is such an obvious proposition that it might surprise you that most courts do not require that. The lawyers for each side will give their experts the material and instructions that they think are relevant to the expert's work. Spoiler alert! It usually favours their case theory. In the Land Court, a single brief is provided to both experts in the one field. It identifies the issues the expert is asked to address, any agreed facts or assumptions (that is agreed between the parties) and any material either party considers relevant. The result – they are not giving opinions on a different basis. Now my tip for you is this. Whether the court requires it, you can. When you speak with the other side's expert, the first thing you should do is to compare notes. What information do you each have. What have you been asked to address? Make sure you are really on the same page before you start. This doesn't mean you have to agree about the matters or whether they are relevant, or matter, just that you both have to express your opinion about them.

Conference

You will be asked to meet with the other expert to discuss your opinions with a view to producing a joint report. The temptation is to use technology – I have seen discussions take place by video-conference, phone, or, worst of all, exchange of emails. Miscommunication is best avoided by face to face discussion with all

the material to hand. The Land Court goes a step further and requires at least some of the experts' meetings to be facilitated by a member of the Court (not the one who will hear the case). We found this incredibly effective and efficient. It ironed out misunderstandings, got the experts on the same page and filled a gap in the conference process in many other courts. Once in conference, to avoid influence by the party that has engaged the expert, communication with their lawyer is strictly limited. This can be difficult for experts who want to ask for more information or to clarify their instructions. My tip if you don't have a conference chair to do it, is to do it together. That is, the experts should make a joint enquiry directed to both parties. And, for transparency, it should be in writing.

Report

The purpose of the joint report is to reveal what the experts agree and disagree about. What they agree upon doesn't have to be revisited in oral evidence and the court can focus on what you disagree about. This is not simply a matter of setting out contrary opinions on a topic. The court expects you to engage in detail to each other's reasoning process. For example, you might think the other expert has not taken into account data that you rely on, or have misunderstood its significance, or used a flawed methodology. Whatever it is, you need to be sharp in identifying not only what you disagree about, but also why.

Again, the reforms I implemented in the Land Court go one step further – to require the experts to say whether and how their disagreement matters to the central issue they are considering. For example, most impacts will have uncertainty about range, and scope and experts may disagree about their assessment of them. But if the range is narrow, does the disagreement matter?. If the matter of degree is insignificant in the ultimate outcome, such as land inundation or habitat loss, you must tell the court that. In a facilitated process in the Land Court, the member will make sure you do. But you can do that yourself.

And please remember, the process is not about making you reach some sort of compromise with a colleague. It is to ensure that what is uncontroversial is noted so the judge can take that as proved. And so the real contest can be understood in its proper context.

Evidence

Most courts dealing with environmental cases now use concurrent evidence, with the notorious exception of the Planning and Environment court in Qld.

You might have heard the term hot tubbing. I don't think that conveys anything useful about the process and can create fear that it is a harder process than giving evidence on your own.

Essentially, it is based on a collegiate discussion, albeit mediated through the lawyers, but most importantly the judge. The idea is that both experts have the opportunity to answer the same questions on the same material and knowing what the other has said on the topic.

My anecdotal evidence is that experts prefer it when they are properly prepared for it. As a judge, I loved it. It reinforces the role of an expert as an adviser to the court.

Lawyers who might want to control the discussion of the science and manipulating how it is presented, are less comfortable. But the best lawyers in this field have learned to work effectively in the process. And it is a pleasure when it works that way.

A warning, giving evidence is taxing. You need to be well rested. You need to tell the judge when you need a break. You are 'on' the whole time, and this can be exhausting.

But my experience is that you will leave the courtroom more confident that the judge has understood your opinion, even if you can't be sure they will act on it.

I could talk on this topic forever, but it's time to stop and I may weigh in during the panel discussion. I will end with some headline tips.

My **tips – expertise – stay within your rails, integrity – expert not advocate, utility – make it useful.**

Thankyou and now it is over to the experts.