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RESEARCH ARTICLE

Courts, climate litigation and the evolution of earth system law

Louis J. Kotzé[1,2,3] | **Benoit Mayer**[4] | **Harro van Asselt**[5,6] | **Joana Setzer**[7] | **Frank Biermann**[8] | **Nicolas Celis**[9] | **Sam Adelman**[10,11] | **Bridget Lewis**[12] | **Amanda Kennedy**[13] | **Helen Arling**[14] | **Birgit Peters**[14]

[1]Faculty of Law, North-West University, Potchefstroom, South Africa

[2]Law School, University of Lincoln, Lincoln, UK

[3]Research Institute for Sustainability, Helmholtz Centre Potsdam, Potsdam, Germany

[4]Faculty of Law, Chinese University of Hong Kong, Hong Kong, China

[5]Department of Land Economy, University of Cambridge, Cambridge, UK

[6]University of Eastern Finland Law School, Joensuu, Finland

[7]Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science, London, UK

[8]Copernicus Institute of Sustainable Development, Utrecht University, Utrecht, The Netherlands

[9]Fieldfisher: Climate Change, Energy and Utilities Practice, Brussels, Belgium

[10]School of Law, University of Warwick, Coventry, UK

[11]Faculty of Law, Nelson Mandela University, Port Elizabeth, South Africa

[12]Faculty of Business and Law, Queensland University of Technology, Brisbane, Australia

[13]Faculty of Business and Law, Queensland University of Technology, Brisbane, Australia

[14]Faculty of Law, University of Trier, Trier, Germany

Correspondence
Louis J. Kotzé, North-West University, Potchefstroom, South Africa.
Email: louis.kotze@nwu.ac.za

Funding information
Research Institute for Sustainability Helmholtz Centre Potsdam; Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science, London.

Abstract

Numerous scientific reports have evidenced the transformation of the earth system due to human activities. These changes – captured under the term 'Anthropocene' – require a new perspective on global law and policy. The concept of 'earth system law' situates law in an earth system context and offers a new perspective to interrogate the role of law in governing planetary challenges such as climate change. The discourse on earth system law has not yet fully recognised courts as actors that could shape climate governance, while climate litigation discourse has insufficiently considered aspects of earth system law. We posit that courts play an increasingly influential climate governance role and that they need to be recognised as Anthropocene institutions within the earth system law paradigm. Drawing on a set of prominent climate cases, we discuss five inter-related domains that are relevant for earth system law and where the potential influence of courts can be discerned: establishing accountability, redefining power relations, remedying vulnerabilities and injustices, increasing the reach and impact of international climate law and applying climate science to adjudicate legal disputes. We suggest that their innovative work in these domains could provide a basis for positioning courts as planetary climate governance actors.

1 | COURTS AND THE PLANETARY CLIMATE CRISIS

Planet Earth is in peril. Sustained, exponentially increasing human impacts are changing key earth system regulatory functions, which in turn affect planetary resilience at levels not experienced since the dawn of the human enterprise (Folke et al., 2011). Several studies show the alarming extent and depth of planetary transformations, such as the planetary boundaries impact assessment (Steffen et al., 2015). Estimations suggest six of the nine boundaries have been crossed, with humanity on course to exit the 'safe operating space' (Persson et al., 2022; Wang-Erlandsson et al., 2022). Studies on the climate system have identified approximately 15 large-scale climate tipping elements that are showing signs of destabilisation (Armstrong McKay et al., 2022; Lenton et al., 2019). When these tipping points are crossed, their structure and functioning might change from stable to erratic (Winkelmann et al., 2022; Wunderling et al., 2021). Climate change is thus a crucial concern, also for those advocating urgent and thoroughgoing reforms of social and legal–political systems to better mitigate climate impacts and strengthen resilience. A central argument here is that we need better institutions that are *appropriately scaled* to govern more effectively the social–ecological aspects connected to the causes and consequences of earth system transformations (Dryzek & Pickering, 2018).

In this context, drawing on the concept of 'earth system governance' (Biermann, 2007, 2014), the notion of 'earth system law' has recently been developed to connect, from a legal perspective, law and governance with the emerging planetary governance scale (Kotzé & Kim, 2019). Earth system law can be broadly defined as representing a new systems oriented legal paradigm for the Anthropocene that is ultimately geared towards responding to interconnected planetary transformations and the complex social–ecological considerations resulting from such transformations. To date, however, this emerging discourse has not fully recognised, within the context of climate change, the potentially important role that courts could play in shaping the concept, architecture and operationalisation of earth system law. For its part, the burgeoning climate litigation discourse has not yet considered the planetary dimensions of earth system law and what these could mean for climate litigation, law and governance. This represents a knowledge gap insofar as the development of a comprehensive earth system law framework remains incomplete, which in turn could hinder efforts to cultivate appropriately scaled governance interventions that we urgently need to tackle the planetary climate crisis.

With a focus on climate governance, we posit that courts, as key actors in the rapidly growing landscape of climate litigation, are already shaping law and governance trajectories, beyond the narrow confines of domestic law, towards a more comprehensive earth system-oriented legal paradigm. By making the case for reframing courts as 'Anthropocene institutions' (Biermann, 2021, p. 74) that operate in, and are relevant for, earth system law, we argue that courts and the growing transnational climate litigation movement could play an important role in further developing earth system-oriented approaches to global climate law and governance.

Drawing on an illustrative, non-exhaustive set of prominent climate cases in different jurisdictions, we identify and discuss, through a qualitative approach, five interrelated domains that are key concerns in legal debates on governing earth system transformations, and more specifically, climate change (see e.g. Coen et al., 2020; Markell & Ruhl, 2012), and where the influence of courts can be observed.[1] These are: establishing accountability, redefining power relations, remedying vulnerabilities and injustices, increasing the reach and impact of international climate law and applying evolving insights from climate science to adjudicate legal disputes. Through our discussion, we illustrate the potential innovative work of the judiciary in these domains while also further developing the earth system law framework.

Policy implications

- The concept of earth system law offers a contemporary framework for policymakers and scientists to interrogate, from a legal perspective, earth system transformations, their social–ecological impacts and how to respond to these.
- The rapidly developing area of climate litigation, with its predominantly domestic focus, has yet to consider the planetary dimensions of new paradigms such as earth system law and what these could mean for courts, climate litigation and climate governance in both conceptual and practical terms.
- Policymakers, civil society and academics should recognise the potential influential role that courts could play in further developing earth system law.
- Stakeholders in climate law and governance can expand the relevance and impact of courts for global climate governance, from their traditional categorisation as domestic actors to Anthropocene institutions that can respond to the planetary dimensions of climate governance.

Section 2 begins by tracing key conceptual aspects of the emerging debate on earth system law. In Section 3, we highlight our concern about the relative absence of courts in the evolving earth system law discourse. We also note the reluctance of legal scholarship to explore the planetary scale dimensions of earth system law and governance in the climate governance context. Fully acknowledging the extensive existing literature on climate litigation on which we draw (e.g. Peel & Osofsky, 2020; Setzer & Higham, 2023; UNEP, 2023), in Section 4 we argue why courts should be reframed as Anthropocene institutions that are relevant (conceptually and otherwise) for earth system law and for governing climate governance in a planetary context. We do so by canvassing the five domains listed earlier, with a specific focus on what courts have accomplished in each domain and instances in which change is absent or less evident. Our analysis shows that courts are increasingly thrown into the middle of disputes that might, or already do, affect concerns lying at the heart of earth system law, and that they should therefore be recognised as key actors in the evolving earth system law paradigm. Section 5 contains our concluding observations.

2 | EARTH SYSTEM LAW: A BRIEF CONCEPTUALISATION

The idea that Earth is an interlinked, living planetary system is gaining increased purchase and is changing the way we think of and engage with global policy, law and governance. Not simply a matter of mere semantics, the planetary turn in sustainability governance discourse is driven by the realisation that Earth is 'much more than just a ball of rock moistened by the oceans'; it is instead a living embodied organism consisting of multiple interlinked sub-systems constituting *Gaia* (Lovelock, 2000, p. 2). Unsurprisingly, the planetary turn is also undergirded by the maturing Anthropocene debate (e.g. Wallenhorst & Wulf, 2023), which offers, among other things, a (sometimes dystopian and controversial) epistemic framework that provokes, challenges, opposes and reframes traditional socially constructed approaches, concepts, frameworks and presuppositions that are part of global change discourse, and that inform socio-cultural, legal, economic and political thought (Dryzek, 2016; Matthews, 2021).

As a result, new framings and concepts are emerging that accommodate systems thinking at a planetary scale. Some examples are 'earth system science' (e.g. Steffen et al., 2020), 'social–ecological systems thinking' (Ebbesson & Folke, 2014), 'planetary governance' (Young, 2021, 2023), 'planetary nexus governance' (Kotzé & Kim, 2022), 'planetary boundaries' (Rockström et al., 2009), 'planetary integrity' (Kotzé et al., 2022), 'planetary justice' (e.g. Biermann & Kalfagianni, 2020), 'planetary stewardship' (Speth & Haas, 2006) and 'planetary health' (e.g. Horton et al., 2014). An older, and by now well-established, concept is earth system governance, which marks a shift of focus from a narrowly defined, nation-state-oriented 'environmental governance' paradigm to a more expansive understanding of multi-level and multi-actor governance that is emerging on the back of a deeper appreciation of planet Earth as an interlinked system characterised by a telecoupled network of interacting social–ecological relations. Unlike traditional conceptualisations of fragmented, linear, state-driven environmental governance approaches, earth system governance offers an innovative earth system-focused framework for governing complex, interlinked, multi-scalar governance challenges arising from a continuously transforming earth system. In broad terms, earth system governance encapsulates the sum of formal and informal rule systems and actor networks at all levels of human society that are set up to influence the co-evolution of social–ecological systems at the planetary scale in a way that secures sustainability and planetary resilience, now and in future (Biermann, 2007, 2014).

Departing from earth system governance as its root concept, the notion of earth system law was proposed in 2019 (Kotzé & Kim, 2019) as a new legal imaginary that endeavours to align law (as an episteme, practice, and discipline) with an earth system perspective (Kotzé & Kim, 2022). To the extent that it represents a new vision of law in and for the Anthropocene, earth system law essentially urges a critical reflection upon law in an earth system context, thereby attempting to disrupt the foundational assumptions of 'conventional law' and the latter's ability to govern complex social–ecological transformations (Gellers, 2021). This paradigm shift includes considering how law could better respond to earth system transformations (external transformations) caused by, among other things, climate change, and how law itself must transform internally to better govern the social–ecological aspects of earth system transformations.

While earth system law remains a work in progress that endeavours to articulate its identity, boundaries and role as a scholarly movement and roadmap for decision makers (Leach, 2023), the concept is gaining traction. A survey of key publications focusing on this concept suggests that earth system law:

- Discards a reductionist focus on the 'environment' as its primary concern in favour of holistically focusing on a planet-wide earth system as a governable domain.
- Acknowledges the expansion of the human enterprise from very localised areas (e.g. cities), to the highest, all-encapsulating planetary level.
- Departs from the assumption that the regulatory institutions created within a Holocene context might

not all be suitable, in their present form, for governing the social–ecological dimensions of earth system transformations in the Anthropocene, and that these institutions must change to align with and respond to Anthropocene reality.
- Foregrounds Anthropocene complexity as opposed to Holocene stability by recognising the combination and interplay of hyper-connectivity, non-linear dynamics, directional change and emergent properties of the earth system, as evidenced in particular by earth system disruptors such as climate change.
- Acknowledges that ecological dynamism is an inherent characteristic of an interconnected, unpredictable and complex earth system.
- Embraces ecological reflexivity and foregrounds the need for precaution and foresight to anticipate future transformations in the face of uncertainty.
- Rejects the Descartian dichotomy of 'humans' and 'nature' that reduces inherent system complexity.
- Takes a broad inter- and intra-generational and inter-species view of the causes and consequences of earth system transformations and how these impact justice concerns.
- Emphasises the importance of earth system science to inform the overall governance architecture, its shape, norms, actor constellations and objectives.
- Through its coupled social–ecological systems orientation, embraces diffuse forms of agency and dynamic interactions which, in turn, propagates polycentric, multi-level, multi-actor governance interventions that rely on a mix of norms that simultaneously operate and interact in bottom-up and top-down ways and that regulate issues such as accountability, power relations between different actors, planetary harm, injustices and enforcement of norms (e.g. Ahlström et al., 2021; du Toit et al., 2021; du Toit & Kotzé, 2022; Gellers, 2021; Kotzé et al., 2022; Kotzé, 2020; Mai & Boulot, 2021; Petersmann, 2021; Pope et al., 2021; van Asselt, 2021; van Dijk, 2021).

The foregoing suggests that earth system law offers an epistemic lens to identify and craft appropriate regulatory interventions at a planetary governance scale. It is therefore particularly suited as a framework to better understand climate change, its planetary wide social–ecological impacts and, more importantly, how law and legal actors should govern these impacts.

3 | COURTS, THE LAW AND THE EARTH SYSTEM

Because of the 'formlessness of the global political arena' (Jasanoff, 2005, p. 367), a discussion about the emergence of any novel scale of governance is inevitably embedded within the broader issue of the architecture of global governance, which is 'the overarching system of public and private institutions, principles, norms, regulations, decision-making procedures and organisations that are valid or active in a given area of global governance' (Biermann & Kim, 2020, p. 4). The identification of relevant governance actors is a key aspect of the global governance architecture because 'choices regarding the identification of key actors can make a big difference in terms of the nature of the governance system put in place and the prospects that the system will prove effective in solving the problem that led to its creation' (Young, 2021, p. 24). While the inter-state, Westphalian-based political and legal system has been the hallmark of traditional (global) environmental governance approaches, the planetary turn in sustainability governance and its polycentric character specifically are driving initiatives to identify and develop new Anthropocene governance institutions that operate within, outside and across this traditional framework (Biermann, 2021; Dryzek, 2016; Young, 2021). As we have seen earlier, a key characteristic of earth system law is its embrace of polycentric earth system governance and, more specifically, its pursuit of identifying new or reconfiguring existing governance actors that are better able to govern the new Anthropocene reality. A key question we ask here is: assuming courts are key actors in any governance constellation, how are they currently being recognised as possible newly emerging Anthropocene institutions within earth system law and, conversely, is the emerging planetary turn in sustainability governance, as evidenced by frameworks such as earth system law and governance, being taken up in the climate litigation discourse?

As a point of departure, we recognise that courts are important governance actors that can and often do shape the content, course and outcomes of law, policy and governance processes. A recent assessment confirms that 'domestic courts and judges offer valuable and often innovative pathways for governing global challenges' (Angstadt, 2022, p. 222), including general environmental and climate change-specific issues. Although courts are institutions of government, they are political actors distinct from governments and legislatures. They serve as gatekeepers of justice by performing a critical oversight role that shapes broader governance processes and trajectories. They have the authority to administer justice through the interpretation and application of the law, adjudicate legal disputes and resolve conflicts, provide legal remedies for aggrieved parties, protect fundamental rights and freedoms, uphold the rule of law and protect the integrity of a legal system.

In relation to climate change, courts contribute to climate governance by, inter alia, empowering

interested and affected stakeholders and actors; imposing climate change considerations on political agendas; persuading society of the importance of climate action; interpreting and enforcing the growing body of domestic, regional and international climate laws; presiding over the hardening of soft law; adjudicating disputes related to climate-induced injustices and upholding the rule of law more generally (Preston, 2016). Courts thus enable a broad range of stakeholders to use a state's adjudicatory apparatus to resolve climate-related conflicts (e.g. Vanhala, 2013). In doing so, they provide an important 'arena for various actors to confront and interact over how climate change should be governed … [in] an attempt to control, order or influence the behaviour of others in relation to climate governance' (Dubash et al., 2022, p. 1375). These functions are also important considerations in an earth system law constellation that foregrounds a multi-level, multi-actor and normatively plural approach to address a highly interconnected planetary phenomenon that has multiple overlapping impacts on key earth system regulatory functions and on all life on Earth.

Despite an increased recognition of courts as institutions that influence global governance (Whytock, 2009), and as influential climate governance actors in an emerging multi-level climate governance constellation (Dorsch & Flachsland, 2017; Jänicke, 2017), very little effort has gone into exploring whether and to what extent courts are emerging as Anthropocene institutions that could be relevant for the development of earth system law. References to the role of courts, beyond their conceptualisation as predominantly domestic actors, mostly occur in legal discussions about the establishment of an international environmental court and more recently, in the domain of transnational climate law, governance and litigation.

The debate about the creation of an international environmental court is at least two decades old and has attracted as many proponents as it has sceptics (Hey, 2000). This initiative, both as a scholarly experiment and possible governance reform has, however, lost most of its initial lustre. Apart from a few lone and under-theorised examples (e.g. Solntsev, 2019), arguments for an international environmental court have not yet been explicitly situated within the earth system law and governance context in any meaningful way. The growing debates about transnational environmental law, and transnational climate law, governance and climate litigation in particular, seem to be garnering far more support and interest, in part because the 'transnational' lens offers lawyers a useful way to think about the relevance and impacts of domestic courts beyond the jurisdictionally bounded confines of the sovereign nation state, and to recognise courts as global governance agents (e.g. Heyvaert & Duvic-Paoli, 2020). The transnational legal movement is essentially an effort to map the increasingly diffuse geography of law onto the intertwined geography of a complex, globalised social system that it is meant to govern. With reference to climate change specifically, one leading study notes that the 'global expansion in climate litigation gives substance to claims of a transnational climate justice movement that casts courts as important players in shaping multilevel climate governance' (Peel & Lin, 2019, p. 681).

A more explicit attempt to situate courts and climate litigation in an Anthropocene-embedded earth system law context is a recent proposal around the emergence of 'planetary climate litigation' (Kotzé, 2021). Focusing on *Neubauer v Germany* (2021) and explicitly situating the analysis in an earth system law context, the argument is that the German Federal Court's judgment possibly sets an innovative precedent, showing how courts could embrace a holistic planetary view of climate science and impacts, planetary justice and stewardship, earth system vulnerability and global climate law to guide their reasoning and findings. One view on this proposal is that 'Neubauer was rightly dubbed the first example of "planetary climate litigation", possibly spurring an active engagement of courts with earth system science and its legal operationalization' (Colombo, 2023, p. 68; see also Campbell, 2023).

A more recent study that partly draws on the earth system law framework, investigates the capacity of individual environmental courts to support global governance (including climate change issues) (Angstadt & Schink, 2023). The study suggests that more interdisciplinary studies are required to demonstrate the utility and impact of domestic courts on global environmental governance, and that 'opportunities exist to further expand the disciplinary and theoretical reach of environmental court analysis, including by better integrating with efforts in earth system law and global environmental law to conceptualize institutional innovation in systemic environmental governance' (Angstadt, 2023, p. 25). Our conclusion is therefore that while courts are influential governance actors that increasingly shape climate change law, policy and governance, and while there seems to be some interest in framing courts as Anthropocene institutions, they are not yet fully recognised as such in the earth system law domain.

Conversely, it also does not seem that climate litigation scholars and practitioners have yet fully recognised and explored the potential relevance of an earth system law perspective, while the need for further studies in this respect is clearly being called for. This represents an opportunity to fully take courts on board in evolving discussions about earth system law, and for the climate litigation discourse, in its efforts to explore future governance pathways, to orientate itself conceptually and practically towards an earth system perspective

in line with the current planetary turn in sustainability governance.

4 | COURTS AS PLANETARY ANTHROPOCENE INSTITUTIONS?

In this section, we argue that a reflection on courts should be included in efforts to develop the earth system law framework. Doing so would also create an opportunity to introduce a contemporary understanding of earth system-oriented planetary-scale law and governance to the climate litigation domain. As we have noted earlier, climate change is a planetary challenge requiring governance interventions at a planetary scale. These interventions should focus on key concerns that characterise the global climate crisis. We identify five key cross-cutting areas in which courts already influence climate governance to a greater or lesser extent, covering a broad spectrum of concerns lying at the heart of sustainability governance that are also relevant for climate governance, and that represent key themes in evolving debates on law in an earth system context. Moreover, these five themes relate – some implicitly and others more explicitly so – to the broad characteristics of earth system law that we have identified above to the extent that they show: the need for greater accountability for harm to the earth system; the rise of multiple planetary governance actors and shifts in power relations among them; the critical need to address multiple patterns of planetary injustice; practices of innovative and effective enforcement of law, be it hard and/or soft; and reliance on science to shape law and governance.

Importantly, we do not aim to reproduce or synthesise the extensive body of literature on climate litigation, nor do we present a detailed or comprehensive discussion of specific climate decisions. Our analysis instead offers a thematically arranged view of judicially led advances in climate governance, which we argue illustrates the potential of courts to shape the evolution of earth system law and for climate litigation to start considering earth system-oriented law and governance approaches. In short, this section offers a starting point from which to frame the gradual conceptual progression of courts as domestic actors with limited, localised impacts, to a much broader view of courts as Anthropocene institutions that are relevant for, and that could contribute to, the development of earth system law, in the specific context of climate litigation, law and governance.

4.1 | Increasing accountability

Accountability is an important way in which power, whether private or public, can be constrained (Grant & Keohane, 2005). Courts play a critical role in creating, increasing and imposing accountability on and for public authorities and private actors for climate and related harms caused by their actions or their failure to act. Courts do so generally by 'making power-holders accountable to the democratic rules of the game, and ensuring the protection of human rights … These are central premises in contemporary democratic theory - assumptions that underlie political reform efforts throughout the world' (Gargarella, Gloppen & Skaar, 2004, p. 1). Courts perform this function in relation to climate change by imposing accountability on public and private actors for their failures to take adequate action on a range of issues including mitigation, adaptation, state and corporate negligence and violations of the human and constitutional rights of current and future generations.

First, the accountability of private corporations can be and has been sought based on the emissions directly caused by or emissions that they enable beyond their own operations, for instance by selling fossil fuels or financing high-emitting activities (Solana, 2020). Their accountability can be based, among others, on specific statutory rules such as a duty of care or violations of human rights law in regional and international human rights instruments (Savaresi & Setzer, 2022). These bodies of law underpinned a rare and therefore significant success against a carbon major in *Milieudefensie v Royal Dutch Shell* (2021), in which The Hague District Court ordered Shell to reduce the carbon dioxide emissions resulting from its global operations by 45% by 2030 compared to its 2019 emissions.

Second, climate litigants are seeking to impose accountability on governments for policies relating to their own emissions (e.g. infrastructure investments, military activities), their financial support (e.g. through fossil fuel subsidies), their approval of infrastructure that is not fit for a changing climate, their failure to implement climate action or their failure to hold private actors accountable under domestic law. In *Urgenda v The Netherlands* (2019), the Dutch Supreme Court interpreted the state's obligation to protect human rights as implying an obligation to mitigate climate change in the light of the impact of climate change on the enjoyment of human rights and ordered the Dutch government to reduce domestic emissions by 25% by 2020 compared to 1990 levels. This was the first decision by any court in the world ordering a state to reduce its carbon emissions other than on the basis of a statutory mandate (the decision was based on the Dutch Civil Code and the European Convention on Human Rights).

In other cases, national courts have ordered governments to legislate on climate change (e.g. *Shrestha v Office of the Prime Minister*, 2018); to define sufficiently ambitious mitigation targets (e.g. *Klimaatzaak v Belgium*, 2021); to develop a clear long-term emission-reduction strategy (e.g. *Friends of the Irish Environment v*

Ireland, 2020) or a realistic long-term emission reduction pathway (e.g. *Neubauer v Germany*, 2021); to present complete information on how it plans to achieve its statutory carbon budget (e.g. *Friends of the Earth v Secretary of State for Business, Energy and Industrial Strategy*, 2022); to comply with a statutory carbon budget (e.g. *Grande-Synthe v France*, 2021) or to take appropriate measures to achieve a statutory carbon budget (e.g. *Oxfam v France*, 2021). The multiplication of cases ordering action on climate change mitigation suggests that courts are increasingly playing an active role in articulating what it means for public and private actors to be accountable in relation to climate (in)action. Yet there are also cases that have been dismissed, whether due to lack of standing (e.g. *Carvalho v Parliament and Council*, 2021) or due to the limits of judicial functions under the doctrine of the separation of powers (e.g. *Juliana v United States*, 2020).

There are several benefits arising from judicially enforced accountability. Importantly, governments may be forced to overhaul their climate laws and policies and even to scale up the level of ambition of their climate governance efforts. For example, in *Neubauer v Germany* (2021), the German Constitutional Court declared the Federal Climate Protection Act partly unconstitutional because it did not sufficiently protect young people against future infringements and limitations of their existing fundamental rights because of climate change (Buser, 2021). The Court held there is an obligation on the state to revisit the inter-temporal distribution effects of its climate laws and to equitably distribute allowable emissions over time and generations, which required the legislature to change existing climate laws by setting out clear provisions for reducing emissions from 2031 onward by the end of 2022 (Peel & Markey-Towler, 2021). For private sector actors, the spectre of accountability triggered by litigation raises the cost of carbon-intensive businesses and can potentially accelerate the transition away from fossil fuels (Sato et al., 2023). In successful cases, courts can impose significant direct and indirect costs on private actors in the form of compensation orders and legal fees and more broadly, by creating reputational damage and operational uncertainties that may hinder corporations' access to finance or affect their share price valuations (Setzer, 2022).

However, it is also worthwhile considering potential negative impacts of successful cases – sometimes referred to as 'backlash litigation' (Setzer & Vanhala, 2019). As the number of successful cases increases the transition risk to some companies operating in high-emitting sectors, it is possible that they will challenge government action on climate change, for example, by arguing an alleged breach of international investment agreements even if governments' actions were taken to comply with a judicial decision. An example is the pending case of *RWE v The Netherlands*, in which RWE, a German energy company, filed suit against the Dutch government under the Energy Charter Treaty, alleging that the government failed to allow adequate time and resources to enable the company to transition away from coal (Tienhaara et al., 2022).

Notwithstanding the risks of backlash litigation, courts have a unique role to play in bridging the so-called 'accountability gap' in climate governance (Bache et al., 2015). It is likely that recognition by civil society and by courts themselves of their unique role, and its potential to increase accountability, will grow as climate litigation keeps expanding. This trend bodes well for efforts globally to enforce accountability for activities that threaten the integrity of earth's ecosystems and it might raise the level of private and public compliance with legal and other obligations in relation to climate change.

4.2 | Redefining power relations between climate governance actors

Courts are uniquely placed to redefine the power relations between climate governance actors in an increasingly polycentric governance constellation. First, their influence is clearly visible vis-à-vis the other branches of government. When analysing the relationships between courts, climate litigation and power, there is a tendency to focus on the extent to which climate cases challenge the legal principle of separation of powers (Nedevska, 2021). Traditionally, climate laws and policies are developed by the legislative and executive branches of governments, and they retain considerable discretion to shape climate laws and policies as they wish, with courts having limited powers to directly influence the content of climate law, even in common law jurisdictions (Burgers, 2020). Although there are notable exceptions in so-called strategic climate litigation cases such as *Neubauer v Germany* (2021), *Milieudefensie v Royal Dutch Shell* (2021) and *Urgenda v The Netherlands* (2019) (Peel & Markey-Towler, 2021),[2] courts have historically tended to be conservative and to confine themselves to ensuring that government agencies comply with existing statutory requirements instead of instructing these agencies in detail how climate laws and policies should look (e.g. *Friends of the Irish Environment v Ireland*, 2020; *Gloucester Resources Limited v Minister for Planning*, 2019).

Reflecting on the impacts of climate litigation and power *beyond* its effects on the other two branches of government suggests that courts influence power dynamics at the local, national and international levels between government agencies and civil society actors. From this perspective, courts are empowering stakeholders – such as communities, non-governmental organisations (NGOs), social movements and citizens

– to influence mitigation and adaptation policies by allowing them standing to directly confront governments and corporations (Stevenson & Dryzek, 2014). Such judicial support is especially important in countries where limited possibilities exist for active and inclusive civil society participation and representation in, and influence over, government-dominated climate governance processes. Courts are often the only available institutional means through which civil society may influence climate change governance, as was the case in *Earthlife Africa v Minister of Environmental Affairs* (2017), where a prominent South African NGO successfully halted the approval of a coal-fired power plant (Kotzé & Du Plessis, 2020). National courts can also give standing to individuals who have no voting rights, such as children, with *Neubauer v Germany* (2021) offering a prominent example (Kotzé & Knappe, 2022).

Courts are further able to promote public engagement that may influence society–state power dynamics. Public opinion can alter the context in which courts operate, which is an essential element in litigation, along with case strategy and the adjudication process itself (Donger, 2022). But public opinion can also influence and change, if sometimes only indirectly, climate politics and governance trajectories. An example is *Notre Affaire à Tous v France* (2021), a case brought by four French NGOs with the support of over 2.3 million members of the public who signed a petition submitted with the court filings. The judicial finding against the French government was used in political campaign strategies by opposition parties in subsequent elections.[3] The Belgian case of *VZW Klimaatzaak v Kingdom of Belgium* (2021) had almost 60,000 citizens registered as co-claimants and *Friends of the Irish Environment v Ireland* (2020) had more than 20,000 supporters, evidencing broader public support for climate action. As a counterpoint, however, some argue it is not clear that the Dutch population showed increased support for mitigation following the *Urgenda* judgment (Mayer, 2023c; Spijkers, 2018).

At the same time, there remain huge inequalities across actors, and courts are unable to address or rectify these concerns. Davids and Goliaths given equal standing before judges do not have the same resources or expertise. NGOs also often actively support cases and could be among the plaintiffs in climate cases. This potentially raises a problem of agency: NGOs may be dependent on donations or contributions from wealthy educated middle classes in a few Northern countries whose views do not necessarily align with the interests of the vulnerable communities that NGOs purport to represent (Iyengar, 2023). The agency problem is compounded by a concern that those whom NGOs represent might not always have a say in the framing of NGO strategies (Sénit & Biermann, 2021). Another risk is that NGOs may favour prominent cases likely to boost donations over nitty-gritty cases that might also achieve structural improvements in climate governance (Bouwer, 2020; Mayer, 2022a). The vested interests of NGOs may explain why more cases are filed against fossil fuel producers (with diffuse economic impacts at best, and often overseas) (e.g. *Milieudefensie v Royal Dutch Shell Plc*, 2021; *Sharma v Minister of the Environment*, 2021) than against national meat producers, for example, because proceedings against the latter are more likely to result in a public opinion backlash.

At the international level, some United Nations human rights treaty bodies, which act as quasi-judicial bodies, have the possibility to hold states to their legal obligations towards other states and vulnerable communities. This offers an opportunity for a shift in the power relations between powerful and less powerful states, and between states and vulnerable people; though one must also acknowledge that states can and often do ignore decisions by treaty bodies, and even where a state accepted compulsory jurisdiction, that is a voluntary act that remains revokable (Squatrito et al., 2018). For example, in *Sacchi v Argentina* (2019), the Committee on the Rights of the Child heard several children argue that Argentina, Brazil, France, Germany and Turkey had interfered with their human rights by failing to implement sufficient action to mitigate climate change. The Committee recognised the plaintiffs as potential 'victims' that gave them standing in the proceedings. However, it rejected the communication on the ground that the children had failed to exhaust domestic remedies before bringing the case to the Committee.

Vulnerable small states are now also able to bring cases before international courts against large greenhouse gas-emitting countries on the basis of the prevention principle, whereby a state must not allow activities that would cause significant harm to other states, at least when such harm would cause peril to the territory, environment or development of those states (Duvic-Paoli & Gervasi, 2022; Mayer, 2023a). For example, the Commission of Small Island States on Climate Change and International Law, an organisation established by two small island developing states, requested an advisory opinion from the International Tribunal on the Law of the Sea (ITLOS) in December 2022. Furthermore, in March 2023, the United Nations General Assembly requested an advisory opinion from the International Court of Justice (ICJ) (Bodansky, 2023; Freestone et al., 2022; Mayer, 2023b; Tanaka, 2023). Although their short- and medium-term significance and potential impact remains uncertain, these initiatives might signal the start of a gradual destabilising effect on inter-state power relations by challenging historic and structurally embedded Northern dominance, privilege and hegemony in international relations and in the uneven global climate governance constellation (Walker-Crawford, 2022). This could contribute to evolving debates about the reconfiguration of the global governance constellation at the planetary scale

(Biermann, 2014), and how law could facilitate the empowerment of developing states and vulnerable people that often suffer the most but contributed the least to earth system harm (Rockström et al., 2023).

4.3 | Addressing climate vulnerability and injustice

Courts can address certain vulnerabilities and injustices caused by climatic harms, or at least confer greater recognition and promote social awareness of these oft-neglected issues in global governance (Grear, 2014; Heri, 2022). Claims related to the impacts of climatic harms on future generations, on global justice and on human and non-human welfare can often only be brought to courts indirectly through human rights claims by (or on behalf of) plaintiffs (Savaresi & Auz, 2019). For example, youth claimants have sought to act as proxies for claims about intergenerational justice as a subgroup more vulnerable than the general population to the long-term effects of emissions. This strategy was instrumental in *Future Generations v Ministry of the Environment* (2018), in which the Colombian Supreme Court ordered the national government to stop deforestation to protect the right of children to a healthy environment. In *Neubauer v Germany* (2021), the German Constitutional Court held that the state cannot delay mitigation action if this would have the predictable effect of aggrieving future generations. Other cases have addressed specific vulnerabilities, including those of Indigenous peoples (e.g. *Daniel Billy v Australia*, 2022), the elderly (e.g. *Verein Klimaseniorinnen v Switzerland*, 2017), migrants (*Teitiota v New Zealand*, 2016) and people with disabilities (*La Rose v Attorney General of Canada*, 2020; see Jodoin et al., 2020). These cases contribute to a much stronger and long overdue focus on the protection of vulnerable beings against climate change while informing global action on climate mitigation and adaptation (Lin, 2012).

However, not all vulnerabilities and injustices fit comfortably within the language of institutional justice, and some judges have questioned the possibility of defining children or youth as a specifically vulnerable class of plaintiffs (e.g. *Minister for the Environment v Sharma*, 2022; *Environnement Jeunesse v Procureur Général du Canada*, 2021). A few climate cases have also highlighted a possible tension between the identity of the plaintiff and their justice claims when children claim to represent future generations (e.g. *Juliana v United States*, 2020). Some courts thus tend to emphasise individual vulnerabilities at the expense of diffuse but interconnected, collective, global and long-term injustices that will inevitably affect present and future generations around the world.

While justice arguments are also at the core of the current advisory proceedings before ITLOS and the ICJ, similar arguments face substantial hurdles in domestic courts (Setzer & Benjamin, 2020). Human rights law defines territorial obligations that apply extraterritorially only in 'exceptional' circumstances (*Advisory Opinion OC-23/17*, 2017; *Al-Skeini v UK*, 2011). Generally speaking, if arguments for injustice at the international level are made before domestic courts, it will be through submissions made by nationals in that jurisdiction. Such claims can be relevant when assessing a defendant state's obligations to deal with climate change in line with the principle of common but differentiated responsibilities in the light of different national circumstances (e.g. *Urgenda v The Netherlands*, 2019; and in cases concerned with the provision or mobilisation of climate finance (e.g. *R (Friends of the Earth) v Secretary of State for International Trade*, 2022). In *Neubauer v Germany* (2021), the court found no breach of Germany's climate mitigation obligations towards complainants living in Bangladesh and Nepal. Similarly, Dutch courts have refused to consider the impacts of climate change beyond the Netherlands in *Urgenda v The Netherlands* (2019) and in *Milieudefensie v Royal Dutch Shell* (2021). A rare exception is the case of *Luciano Lliuya v RWE* (2016), where a Peruvian plaintiff was recognised to have standing in a German court under tort law. These territorially bounded decisions may be consistent with the state-centric Westphalian system, but they might ignore the impacts of local emissions that also have consequences for interlinked global justice concerns, especially when viewed through an earth system lens (Gupta et al., 2023; Rockström et al., 2023).

Courts will also have opportunities to address injustices against the non-human living order and thereby to shape the emerging rights of nature movement that is increasingly confronting the anthropocentric orientation of neoliberal sustainable development and the predatory patterns of exploitation that the latter worldview perpetuates (Kotzé & Adelman, 2023). Anthropocentrism is a deep-seated problem in most jurisdictions, leading many governments to view nature primarily as natural capital and the source of ecological services rather than as having an intrinsic value (Dancer, 2021). Ecosystems harmed by climate change do not generally have standing before courts, and claimants have not yet pursued justice for nature with the same vigour as they have for future human generations. While some (especially Latin American and South Asian) courts are increasingly open to recognising rights of nature more generally (e.g. *Resident Marine Mammals of the Protected Seascape Tanon Strait v Secretary Angelo Reyes*, 2015; *Mohd Salim v State of Uttarakhand*, 2017), in the climate change context specifically, only in very few jurisdictions have there been efforts towards recognising personhood to nature or some of its components.

The Colombian Supreme Court in *Future Generations v Ministry of the Environment* (2018)

recognised the Amazon ecosystem as a subject of rights and imposed corollary duties on the national government, ordering it to draft an intergenerational pact for the life of the Colombian Amazon with the participation of interested and affected stakeholders, with a view to also reducing deforestation and implementing climate mitigation measures. In 2017, Colombia's Constitutional Court ruled that the Atrato River possessed rights to protection, conservation, maintenance and restoration, and established joint guardianship arrangements shared between Indigenous communities and the national government (*Center for Social Justice Studies v Presidency of the Republic*, 2016). The Court further ordered the government to consider the impacts of climate change when developing mining and energy policies (Wesche, 2021). In *D.G. Khan Cement Company v Punjab* (2021), the Pakistan Supreme Court justified adaptation action by holding that the 'peaceful co-existence' between humans and their environment 'requires that the law treats environmental objects as holders of legal rights' (ibid, para. 16). Such radical developments, while still peripheral and probably not indicative of a more general trend towards protecting rights of nature in climate jurisprudence, outline the potential for courts to increasingly start destabilising the prevailing human-focused global climate governance approach and to transform it into one supported by earth system law, where ecological integrity and a planetary ethics of care and stewardship stand at the centre of collective concern (e.g. Burdon & Martel, 2023).

4.4 | Increasing the reach and impact of international climate law

An important function of courts is to interpret and apply international climate law to promote compliance by states and corporations and drive more effective global climate action. This is true not only for international courts whose function is to apply international law, but also for national courts, including those in 'dualist' jurisdictions where international law does not automatically form part of domestic law[4] or where international law forms part of the legal context within which courts interpret national law.

This important function should be viewed against the background of developments in international environmental and climate law, most notably the adoption of the Paris Agreement in 2015 (Mayer, 2018a). Mirroring the gradual change in norm diffusion trends in the context of earth system law and governance noted earlier, the Paris Agreement marked an important shift away from the top-down legally binding emissions targets for developed countries under the Kyoto Protocol, to a more explicitly bottom-up, voluntarist approach (Falkner, 2016). The core obligation in the Paris Agreement is a procedural one, namely, to prepare, communicate and maintain successive nationally determined contributions (NDCs) (Article 4.2), that is accompanied by an obligation of conduct to pursue domestic mitigation measures with the aim of achieving the objectives of NDCs (Mayer, 2018b; Rajamani, 2016). The Paris Agreement defines mitigation goals: to holding global warming to 'well below 2°C' and 'pursuing efforts to limit [global warming] to 1.5°C' (Article 2.1a), and to 'achiev[ing] a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century' (Article 4.1), but it does not explicitly create an obligation for states parties to realise these objectives (Mayer, 2022b). However, there are signs that these long-term goals are being interpreted by some courts in ways that 'harden' the 'soft' obligations of the Paris Agreement (Preston, 2021a, 2021b) and bolster the global reach, impact, and effectiveness of international climate change law (Wegener, 2020).

To date, the Paris Agreement has rarely been relied upon in climate litigation as a direct source of legal obligations (Voigt, 2023). Instead, the Agreement has generally been indirectly invoked and has influenced the outcomes of a range of cases in which plaintiffs relied primarily on tort law (e.g. *Milieudefensie v Royal Dutch Shell*, 2021; *Urgenda v The Netherlands*, 2019; *Grande Synthe v France*, 2021; *Thomson v Minister for Climate Change Issues*, 2017); statutory law on environmental or climate impact assessments (e.g. *Earthlife Africa v Minister of Environmental Affairs*, 2017; *R (Friends of the Earth) v Heathrow*, 2020); climate change legislation (e.g. *Friends of the Irish Environment v Ireland*, 2020) or constitutional and human rights law (e.g. *Neubauer v Germany*, 2021; *VZW Klimaatzaak v Belgium*, 2021). The Paris Agreement has also been instrumental in altering the factual considerations of climate change by demonstrating an almost general agreement, globally, on the links between anthropogenic greenhouse gas emissions and a changing climate (Preston, 2021a, 2021b).

When relying on the Paris Agreement, domestic court decisions have predominantly focused on its mitigation goals (Wegener, 2020). Despite the absence of a binding mitigation obligation, some courts have approached the temperature goal in Article 2 as a benchmark and have held that a state's failure to take measures consistent with this goal is a violation of mitigation obligations arising, for instance, from tort or human rights law (e.g. *Milieudefensie v Shell*, 2021). At least one court has considered the importance of reaching net zero in the second half of this century when deciding to reject approval for a long-term coal mining project and held that the project was not in the public interest after weighing costs and benefits of the project, including its climate change impacts (*Gloucester Resources Limited*

v Minister for Planning, 2019). By contrast, other courts have stressed the non-binding nature of the Paris Agreement's goals (*R (Friends of the Earth) v Heathrow*, 2020; *Bushfire Survivors for Climate Action Inc v Environment Protection Authority*, 2021).

Overall, although judgments based purely on the enforcement of international climate law against states or corporations are few and far between, prominent cases relying on the Paris Agreement have had legal and political influence, for instance by inspiring the filing of other cases or the adoption of new laws and policies globally, thereby arguably 'ratcheting up ambition in climate change mitigation efforts' (Wegener, 2020, p. 36). Importantly, these cases also illuminate innovative efforts outside of the formal multilateral, state-led governance arena that are now gradually being spearheaded by the judiciary to increase the reach and impact of international climate law, possibly even beyond a level of what states have initially intended during treaty negotiation processes.

4.5 | Applying insights from climate science to adjudicate legal disputes

Courts have an important role to play in further developing the climate science–policy interface and, more specifically, by emphasising the importance of climate science for climate governance. The need to align global governance with earth system science is increasingly recognised in an earth system law context (Biermann, 2022; Kotzé, 2021), and for climate science to inform, shape, legitimise and improve climate governance (Beck & Mahony, 2018; van Berkel, 2020). It is clear that '[s]cience plays a central role in climate change cases' (Setzer & Vanhala, 2019, p. 9), with several courts relying on scientific evidence to assess the causes of climate change, its impacts and potential response measures or strategies (McCormick et al., 2017). Courts, after all, have long engaged with 'external' disciplines such as psychiatry and developed ways of weighing uncertainties, deciding what types of knowledge and facts a court accepts and how scientific evidence is presented (Fisher et al., 2017). Scientific evidence is increasingly likely to be central at various stages of climate litigation proceedings, from establishing standing (e.g. determining whether the claimant has a personal interest in climate action) to the merits (e.g. determining whether a set of measures on mitigation or adaptation are likely to achieve a commitment), and the remedies (e.g. determining the quantum of compensation, if any). Rules on the admissibility of scientific evidence differ between jurisdictions (Pfrommer et al., 2010), but courts have repeatedly been able to rely on Intergovernmental Panel on Climate Change (IPCC) reports (e.g. *Urgenda v the Netherlands*, 2019) or on expert testimony (e.g. *Sharma v Minister for the Environment*, 2021; *Thomson v Minister for Climate Change Issues*, 2017).

A prominent example showcasing an instance where the judiciary comprehensively explored the climate science–policy interface and embraced a science-based reasoning strategy is *Neubauer v Germany* (2021). The court relied, among other things, on IPCC reports, which it believed 'present the state of scientific research on climate change in a comprehensive and objective manner, thereby providing a basis for science-based decisions' (ibid, para. 17). These reports suggest that 'the rapid acceleration of global warming that is currently observable in comparison with historical levels is essentially due to the change in the material balance of the atmosphere caused by anthropogenic emissions', and that, '[w]ithout additional measures to combat climate change, it is now considered likely that the global temperature will increase by more than 3°C by 2100' (ibid, para. 19). By relying on the IPCC reports, the Court managed to construct the larger scientifically informed context for its legal reasoning that enabled it to identify and evaluate the deficiencies of Germany's climate law and to order government to revise the law (Kotzé, 2021). Decisions such as these are important because, '[i]n law and policy making, having a baseline understanding of climate science and the capacity to engage with technical scientific material is seen as a critical foundation for the development of successful climate protection policies' (Setzer & Vanhala, 2019, p. 10). Moreover, and though there are also risks and dangers inherent to such a development, '[t]his strategy has helped elevate climate science – especially IPCC science – to the level of unchallenged "fact", while at the same time paving the way for transnational spread of accepted factual understandings of the climate problem through climate jurisprudence' (Peel & Markey-Towler, 2021, p. 1492).

Beside the interpretation of mitigation obligations, science could play a role in cases on compensation for climate harm. When such cases are found admissible, claimants are required to demonstrate that a certain harm can be attributed to climate change or to the conduct of the defendants, and the determination of this causal link is then left to the courts. For example, in the pending case of *Luciano Lliuya v RWE*, a Peruvian farmer is arguing that the German energy company is partly to blame for the melting of a glacier on the ground that RWE emitted 0.5% of historical industrial carbon dioxide emissions. Studies tracing global greenhouse gas emissions to a handful of fossil fuel corporations could facilitate further litigation, but only if courts accept the legal relevance of historical emissions and the remedial obligations of corporations for the emissions most directly caused by their customers (Heede, 2014; Meyer & Sanklecha, 2017). If they do, courts could radically destabilise the

prevailing hands-off global climate governance approach with respect to many carbon majors the world over (Benjamin, 2016).

Relying on weather-event attribution science, however, could be more challenging. While several studies have shown the causal relation between climate change and some extreme weather events (e.g. Burger et al., 2022; Marjanac & Patton, 2018), the complexities arising when using climate attribution in litigation are also sufficiently clear (e.g. Minnerop & Otto, 2020). Some expect that science will 'fill … the evidentiary gap' (Stuart-Smith et al., 2021, p. 651). Yet others show that critical evidentiary issues will remain, first with regard to the attribution of social harm to the physical event (rather than, for instance, to ineffective disaster-reduction policies), and second, with regard to the attribution of climate change to one individual respondent (Lusk, 2017).

That said, the engagement of courts with climate science is likely to reinforce the epistemological power of science at the apex of contemporary knowledge and in climate governance, even though science is never entirely unambiguous, uncontested and unequivocal (Biber, 2012). Since all responses to climate change must be based on the best and latest available science, scientists play an increasingly important political role in shaping climate law and governance, also in the courtroom. Within the domain of earth system law with its emphasis on the importance of science and emergence of multiple, non-traditional governance actors, climate cases that interact with climate science can possibly gain 'legitimate' power from the 'expert' power introduced by science. At the same time, court decisions can validate the science and grant new 'political' power to scientists.

5 | CONCLUSION

Courts are playing an increasingly important role in shaping climate governance. The value of their contribution, however, and despite some minor exceptions that we have highlighted, seems to be appreciated mostly within a domestic context. This is unsurprising considering that climate litigation mostly occurs in a localised domain, notwithstanding the recent turn to international climate litigation. Ongoing efforts to situate courts and climate litigation in a transnational context are encouraging impulses towards recognising the broader multi-level and cross-jurisdictional relevance and impact of courts. So too is the recent introduction of terms such as 'planetary climate litigation'. But collectively considered, these developments do not yet evidence a clearly emerging trend that links the important work that courts do as climate governance actors with the Anthropocene's earth system-oriented law and governance context.

The emergence of earth system-focused law and governance paradigms is reflective of efforts to reform discursive framings, institutional arrangements and law and policy approaches that are 'needed to cope with the novel challenges of earth system transformation', and to instigate 'institutional realignments to prepare for the worst impacts of earth system transformations that we cannot stop' (Biermann, 2021, p. 75). Earth system law provides a useful, if not uncontested, episteme to reframe the role of law and law's key actors – in this instance courts – as Anthropocene institutions that can contribute to govern some of the social–ecological impacts of earth system transformations that are being caused by climate change.

Although courts are unlikely to offer a silver bullet for the planetary climate crisis (at least not in the short term), this article has shown that some courts have not shied away from asserting themselves more deliberately as important actors that have the power to influence climate governance and to address several of the key challenges that earth system law focuses on. Drawing on several prominent climate litigation cases from jurisdictions spanning the globe, we observe emerging evidence of judicial assertiveness in the five domains we have discussed in this article. A general conclusion is that courts could mediate, translate, strengthen, transpose and 'legalise' climate governance into globally intertwined political processes, forcing and advancing policy and norm adoption or adjustment by states and rendering transnational corporations subject to standards they may ignore, or law that does not traditionally regulate them. Their contribution in this respect is attracting increasing attention, throwing courts – whether they like it or not – in the middle of the evolving debate on earth system law and making them impossible to ignore when considering the planetary turn in sustainability governance.

The discussion in this article can offer a springboard for further research into the role of courts as Anthropocene institutions. In particular, empirical analyses of court cases could shed light on how specific characteristics of earth system law – such as the interconnectedness and non-linearity of planetary processes, or consideration of future generations and non-human species – have informed or could inform litigation strategies and judicial decisions. Such analyses could focus on individual cases, adopt a comparative angle (e.g. building on research on the special nature of climate litigation in the Global South; see Peel & Lin, 2019) or seek to cover a wide range of cases to identify trends. Future research can also shed light on how state-of-the-art knowledge in the field of earth system science can inform climate litigation practice. Finally, although climate litigation may offer the clearest indication that courts are becoming important actors in the Anthropocene, they also play a role in adjudicating other issues relevant

for sustaining the earth system, including biodiversity loss and air pollution. Further work to better understand the variety of issues courts are confronting would offer a more complete picture of the role of courts as Anthropocene institutions.

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ORCID

Louis J. Kotzé https://orcid.org/0000-0001-5820-168X
Benoit Mayer https://orcid.org/0000-0002-0669-7457
Harro van Asselt https://orcid.org/0000-0003-3028-0659
Frank Biermann https://orcid.org/0000-0002-0292-0703
Sam Adelman https://orcid.org/0000-0002-2896-6996
Bridget Lewis https://orcid.org/0000-0002-1940-5548
Amanda Kennedy https://orcid.org/0000-0003-4383-1907
Helen Arling https://orcid.org/0009-0006-5171-0768
Birgit Peters https://orcid.org/0000-0002-2414-7176

ENDNOTES

[1] Several compressive empirical and other studies, on which we also draw for the purpose of our article, have been conducted that analyse the detail and complexities of the growing number of court cases dealing with climate issues around the world. See as one example, most recently, Setzer and Higham (2023).

[2] Although admittedly, the real-world impact of a case does not always necessarily depend on its strategic nature: strategic cases may achieve little effect and cases focusing on more minute questions can sometimes be impactful.

[3] See https://laffairedusiecle.net/rendez-vous-le-13-mars-sur-twitch-pour-le-debat-du-siecle/.

[4] South Africa is an example of a country following a dualist approach. See sections 39 and 231–233 of the Constitution of the Republic of South Africa (1996).

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AUTHOR BIOGRAPHIES

Louis J. Kotzé is Research Professor at North-West University, South Africa; Senior Professorial Fellow in Earth System Law, University of Lincoln, UK; and Project Leader at the Research Institute for Sustainability, Helmholtz Centre, Potsdam, Germany. He has published widely in the area of earth system law and environmental and climate law and justice.

Benoit Mayer is Associate Professor at the Faculty of Law of the Chinese University of Hong Kong. His research focuses on the law on climate change. He is the author of *The International Law on Climate Change* (Cambridge University Press, 2018) and *International Law Obligations on Climate Change Mitigation* (Oxford University Press, 2022).

Harro van Asselt holds the Hatton Professorship in Climate Law at the University of Cambridge. At Cambridge, he is also a Law Fellow at Hughes Hall. He is also a Professor of Climate Law and Policy at the University of Eastern Finland Law School, a Visiting Researcher with the Copernicus Institute of Sustainable Development at Utrecht University and an affiliated researcher with the Stockholm Environment Institute. He is the editor of the *Review of European, Comparative & International Environmental Law*.

Joana Setzer is an Assistant Professorial Research Fellow at the Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. She leads the Climate Change Laws of the World project – the most comprehensive global resource on climate policy and legislation.

Frank Biermann is Research Professor of Global Sustainability Governance with the Copernicus Institute of Sustainable Development at Utrecht University, The Netherlands. He is an internationally leading scholar of global institutions and organisations in the sustainability domain.

Nicolas Celis is a senior associate in the Climate Change, Energy and Utilities practice in the Brussels office of Fieldfisher. He holds an LLM in Global Environment and Climate Change Law from the University of Edinburgh and a PhD in environmental law from the University of Lincoln, UK.

Sam Adelman is Professor of Law, Warwick University and Research Associate at Nelson Mandela University, South Africa. He has written extensively on climate change and climate justice.

Bridget Lewis is an Associate Professor in the School of Law, Queensland University of Technology, Australia. Her research focuses on environmental rights, climate change and intergenerational justice. She is the author of *Environmental Human Rights and Climate Change: Current Status* and *Future Prospects (Springer, 2018)* and *Environmental Rights for Future Generations (forthcoming Cambridge University Press)*.

Amanda Kennedy is Professor of Law and deputy head of school at Queensland University of Technology in Brisbane, Australia. She is the Co-Chair of the IUCN Academy of Environmental Law's Teaching and Capacity Building Committee. Amanda's research interests fall predominantly within the area of agri-environmental law and include environmental justice, resources and land use conflict and food systems governance.

Helen Arling is a doctoral candidate and research associate in the Chair of Public Law, International Law and European Law (Prof. Dr. Birgit Peters) at Trier University, Germany. Her PhD project focuses on rights of nature and principles of public international law.

Birgit Peters is a Professor of Public Law, International Law and European Law at Trier University, Germany. She specialises in international and European environmental and human rights law. A recent project is: 'Law and Nature: Towards a new legal approach'.

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