Theme Paper

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Theme:

Board's Agenda for addressing Climate Change and Environmental Risks

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Preserving the health of the Earth's planetary environment and ensuring the collective survival of humankind and various life forms and systems upon which we depend remain pressing priorities. They should be on the agendas of both leaders and responsible boards (Zakus, 2023; Coulson-Thomas, 2024b). Human activities and continuing economic and population growth are rapidly depleting available natural capital, degrading ecosystems, and resulting in a mass extinction of other species and multiple global risks and existential threats, including global warming and climate change (WEF, 2024c). The State of the Global Climate 2023 report shows that multiple records were again broken, and in some cases by a clear margin, for greenhouse gas levels, surface temperatures, ocean heat and acidification, sea level rise, ice cover in the Antarctic and glacier retreat (WMO, 2024).

Evidence of the impacts of global warming, including upon vulnerable communities and fragile eco-systems continue to mount. A global coral bleaching event is now underway (NOAA, 2024). During recent months record global mean temperatures have been recorded (Copernicus, 2024b). At an annual level of 1.52°C above the 1850-1900 pre-industrial average, they have already exceeded the Paris Agreement target limit of 1.5°C (Copernicus, 2024a). Further increases are expected. Inadequate individual, corporate and collective responses, unsustainable consumer aspirations and lifestyles, and the continuing pursuit of unsustainable growth, suggest that boards should prepare for worst-case outcomes. What can and should directors now do to initiate, enable and support corporate and collective action in response to shared risks and existential threats and progress towards greener societies?

The melting of polar caused by global warning resulting from human activity is now even slowing the rotation of the earth (Agnew, 2024). Given the impact of corporate operations and collective lifestyles upon the environment and eco-systems and the role of humans as a cause of multiple existential threats what wider role could boards play in enabling and supporting transition to more inclusive, responsible and sustainable activities, communities, societies and infrastructures and social and economic transformation to more environmentally friendly ways of working and living in harmony with the natural world (Coulson-Thomas, 2024b)? What models of urban and rural living and forms of infrastructure would make fewer demands upon scarce natural resources? How might these best be encouraged?

The purpose of this Theme Paper is to explore areas on the agenda of the 25th International Conference on Environment Management and Climate Change. It suggests issues and questions that directors, speakers, and other participants might wish to consider ahead of the event and discuss with their peers. It includes references to recent investigations and studies

related to the conference's agenda. When reading claims, proposals and reports relating to corporate environmental and climate action a degree of caution and scepticism is often advisable. Evidence presented may be selected to portray what has been done in the best possible light, and it could be subject to confirmation bias and misleading (Edmans, 2024b). Directors should consider the source and purpose of board papers and other documents and be alert to the possibilities of hidden agendas, ulterior motives, and self-interests.

Recognising Global Risks and Existential Threats

Global risks and existential threats abound (Ord, 2020; WEF, 2024c). When distracted and preoccupied with comparisons and aspirations for more, vulnerabilities may be overlooked. Many decision makers are not aware of the fragility of the conditions on earth that support our contemporary and inter-related societies and collective civilisations and the narrow range of variability within which they remain viable (Mann, 2023). From space it is possible to obtain an overview of our changing planet and look more closely at areas of concern. There are a variety of possible applications of space-air-ground monitoring technology that could be used for natural resources, environmental management and potential geological and climate and weather disaster monitoring (Liu, 2023). How might more boards better keep track of this and other evidence of the global environmental impacts of our collective activities?

The combination of existential risks currently faced have been described as unprecedented and they are likely to persist for the foreseeable future (Ord, 2020). We appear to be in an era of global risks and existential threats (Beard et al, 2023; Coulson-Thomas, 2024). They may not be on educational curriculums or on corporate agendas and dashboards. Many boards are uncertain as to how to assess, discuss and treat them. Scientific, business, political and media views may also vary on whether a risk or threat is potentially existential, according to differing perspectives and considerations such as existential for whom, where and when, and possibilities for response and recovery. However, adverse impacts such as destruction, death, failure or the loss of potential or future prospects of people, organisations, communities and/or institutions may well be considered existential by those affected or likely to be.

While hard to predict, catastrophes and disasters have occurred throughout history and societies and their governing arrangements have often been ill prepared to cope with them (Ferguson, 2021). In relation to the climate and other catastrophes, flexible rather than bureaucratic responses are often required. How prepared are companies for the direct and indirect impacts of climate change and how resilient are they likely to be in the face of extreme weather events? What corporate, local, community and/or societal infrastructures might be at risk in the event of a climate or other catastrophe? Are contingency plans and back up arrangements in place? Have these and related roles and responsibilities been periodically reviewed, and are collective contingency responses up to date?

Board's Preparation for COP 29 and Net Zero Action Plans

While there may be much to consider and address that is overlooked, other items might be on board agendas. International and other events and meetings could be planned that might affect them. Stakeholder expectations and Government policies, pledges and plans may relate to them. Are boards monitoring steps taken to deliver past environmental and climate-related corporate commitments and national pledges? What preparations are in place for COP 29 and

what further action needed to achieve Net Zero? The event will occur from Monday 11th to Sunday 24th November in Baku, Azerbaijan. Last year's UN emissions gap report ahead of COP 28 predicted 2030 greenhouse gas emissions would need to fall by 28 per cent for the Paris Agreement 2°C pathway and 42 per cent for the 1.5°C pathway (UNEP, 2023).

The UN did not consider the pre-COP 28 net-zero pledges which had been made to be credible, as none of the G20 countries were reducing emissions at a pace consistent with their net-zero targets (UNEP, 2023). Even in the most optimistic scenario, the likelihood of limiting warming to 1.5°C was judged to be only 14 per cent. Emissions and human populations are continuing to rise. Given prevailing growth ambitions and further coal power stations coming on stream, what will be different this year? Will the rhetoric of concern be matched by more ambitious Government pledges and corporate action? What more needs to be done and what should the priorities be for COP 29? How might concerned businesses encourage Governments to resist self-interests, build upon the direction of travel established at previous COPs, and accelerate progress towards Net Zero?

The pre-COP 28 global UN stocktake of efforts of countries to reduce global-warming emissions following the 2015 Paris Agreement concluded that radical decarbonisation with fast phase-out of fossil fuels without carbon capture is now required and deforestation needs to be stopped and reversed by 2030 (UNFCCC, 2023). It called for widespread system transformation that will need to impact many aspects of contemporary activities, operations, and lifestyles. If the triggering of tipping points after which further global warming will be unstoppable is to be avoided, radical and decisive collective action is now more urgent than ever. Is any progress made in the call for a transition away from fossil fuels and other outcomes from COP 28 enabled us to move towards Paris Agreement (2015) goals, or is the tide of aspirations for ever more carrying us in the opposite direction?

Despite the imperative to do more in the face of existential threats, Governments are often reluctant to pledge more than they believe their economies, and especially their business communities, can deliver, and in democracies electorates will accept. What could and should boards and businesses do to enable Governments to establish enhanced Nationally Determined Contributions (NDCs) by 2025? How ambitious should these be? What should boards do to balance the consequences of further action now and the larger predicted costs and impacts of postponing it? At the same time, how might boards be encouraged and empowered for green decision making and strategy? Is there more that could be done to enable past pledges and commitments to be delivered and future ones to be more ambitious?

Perceptions and Understanding of Existential Threats

How an existential threat is described and compared with others can influence how seriously it is perceived by decision makers. Scientific opinions that portrayed climate change as a security threat second only to nuclear war may be responsible for it being recognised as potentially existential and taken more seriously, including by some politicians and Governments (Allan, 2017). How seriously are boards taking the existential threat of climate change? How might it effect the choices a board makes when discharging its responsibilities to a company and its stakeholders? Views among stakeholders and different interests may vary on what should be done, where and when. Some may argue a board is not doing enough, while others might complain it is too ambitious and over-reacting. What should a board's role be in relation to effective action on climate governance, achieving UN sustainable development goals (SDGs)

and Net Zero? Where does climate action and SDGs rank as a board priority? What guidance should be provided to management? How might climate policies and goals be better integrated with business strategy and objectives?

Physical scientists and economists can have different perspectives. Due to the lack of collaboration between them, estimates of the economic consequences of climate change received by key decision makers can miss the full impacts of extreme weather events, and the potential for cascading risks and tipping points (Royal Society, 2023). Extreme weather events such as heatwaves, floods, droughts, wildfires result in significant disruption, damaged eco-systems, and economic losses, and they undermine food security and socio-economic development (WMO, 2024). How might global preparedness and adaptability be enhanced? What more should boards do in industry or sector related forums, or national and international networks and bodies that are relevant for corporate activities and operations?

General trends can overlook trajectories that are non-linear, and averages can conceal particularly acute impacts in certain locations and contexts (Royal Society, 2023; Coulson-Thomas, 2024). General and collective responses may not always reflect how a particular company or area is affected by climate change. For example, disaster insurance to help fund the cost of reconstruction in the event of catastrophes such as extreme weather events is becoming unaffordable if not withdrawn in many countries (Jarzabkowski et al, 2023). Public-private Protection Gap Entities (PGEs) have been established in some countries to maintain the availability of disaster insurance. How might Governments and insurance companies better work together to increase resilience in the face of extreme weather, terrorist and other threats? What else could be done to better withstand climate change impacts?

Corporate action plans and Government pronouncements can reflect perceptions and understanding of existential threats. Sometimes they are not taken as seriously as they should be. They may be distracting smoke and mirrors, rather than evidence based and involving considered assessment of realistic options. The 2024 WEF Global Risk Report ranks misinformation and disinformation as the top risk in terms of likely impact over a two-year period, when a half of the world's population is expected to be involved in some form of election (WEF, 2024b). Scepticism and a willingness to speak up is required in a data driven world in which misinformation can arise that might not be detected by colleagues (Bergstrom and West, 2021). What steps should boards take to identify bias, groupthink, and conflicts of interest, ensure objectivity and diversity.

Environmental Governance for Sustainable Economic Growth

Existing governance arrangements have been unable to prevent certain challenges to international order and contraventions of the UN Charter. What form of integrated governance framework might strengthen multi-lateral governance mechanisms to prevent and reduce risks and address existential threats, including global warming and climate change (Nurse, 2023)? Can any governance arrangements prevent growth that is not sustainable, draws down natural capital that is difficult to replace, contributes to global warming and further degrades the environment where a will do this and behave more responsibly towards the environment and future generations does not exist? What governance factors have the most potential for achieving an environmentally sustainable future? What more could be done internationally? For example, Member States of the International Maritime Organisation (IMO) at a meeting of

the Marine Environment Protection Committee have adopted a revised strategy to reduce greenhouse gas (GHG) emissions from international shipping (IMO, 2023).

How might public sector governance contribute to decarbonisation, sustainable and green growth? Climate change has been recognised as the biggest contemporary health threat, and primary and community care could play an important role in climate adaptation and the protection of vulnerable groups (Litke, 2024). In addition to physical health impacts, such as higher mortality during periods of peak temperatures, there may also be mental health risks such as higher rates of suicide when considering climate mitigation measures from a public health perspective (Thawonmas, 2023). The damaging consequences and negative externalities of current operations, priorities and practices have been known for some time. How might those who contribute to the root causes of the harm suffered by others and the environment be held accountable and penalised, and what mechanisms might represent an effective and fair way of compensating and supporting their victims?

Local and community governance should not be overlooked. Steps taken to operate in ways that are more environmentally responsible, and their impacts, can vary by company, location and sector. What should be done to encourage and support environment friendly industry, sectoral and community initiatives? How might Business Excellence Models take more account of environmental factors? What can be learned from approaches that have been adopted in other arenas, markets and countries? Lessons from global responses to one existential threat, such as the importance of prevention and preparation, global collaboration and rapid response may be relevant for others (Salami, 2022). However, many aspects of the current situation and context are unprecedented. Hence previous experience may not be relevant and could be misleading in relation to estimates of ability to cope and what now needs to be done. For example, past rates of recovery may not still apply.

Ensuring Sustainable Growth

As levels of greenhouse gases in the atmosphere continue to accumulate, unsustainable growth that adds to it and further depletes natural capital resources may also need to be more actively questioned. The quality of growth can be more important than its quantity, and the World Economic Forum (WEF) has established four dimensions or criteria for evaluating its quality, namely innovativeness, inclusiveness, sustainability and resilience (WEF, 2024). Its assessment is that the world economy is only roughly halfway towards the innovative, inclusive, sustainable and resilient growth it considers desirable and necessary (WEF, 2024). Eco-systems and biodiversity are also being significantly impacted by past and present growth ambitions and models (Dasgupta, 2021). How might progress on the four dimensions highlighted by the WEF be accelerated? What emphasis do boards put on them?

Following the Covid-19 global pandemic and adverse consequences of Russia's invasion of Ukraine, the IMF is forecasting steady but slow and divergent growth through 2024 (IMF, 2024a). Growth is only sustainable if it can be accomplished within the finite limits of the environment and the earth's eco-systems and without detriment to them or limiting our future prospects and resilience. Resilience is the ability to cope with adversity and recover from shocks, ideally bouncing forward rather than just back as a situation and context may have moved on (Coulson-Thomas, 2023). Inclusive growth allows all stakeholders to participate in the opportunities it creates. Too often, growth has yielded significant benefits for a favoured few at the expense of negative impacts upon many others (Acemoglu and Johnson, 2023). As

technological and other developments occur, will current growth models and trajectories be capable of absorbing them and evolving in response to them (WEF, 2024)?

Sustainable growth paths may require a change of direction, alternative approaches and resources, different business and operating models, innovation and more courageous, caring, responsible and imaginative leadership (Saks, 2023). What environmental governance arrangements and practices might help to bring them about? How might they better enable the development and scaling up of green growth solutions? Those who are better informed about the nature and consequences of climate change are more likely to recognise its harmful health impacts, prioritise climate action over economic growth and act on climate solutions, and less likely to agree that the costs of acting on climate change are too high (Bliss et al, 2024). What can and should boards do to help stakeholders to become more aware of environmental and sustainability issues and engaged with addressing the root causes of global warming and climate change and their consequences?

Promoting Sufficient and Responsible Financing

Given its impacts, many companies are adapting more slowly than one might expect to climate change (Li, 2024). Moving faster and sustainably can involve investment and costs. How can boards ensure they are moving at an affordable and/or financeable pace acceptable to stakeholders, supported by them, and justifiable in relation to possible legal actions? As well as inadequate responses to global challenges and growing threats, opportunities may also be missed. The range of environmental and climate related issues and the imperatives for action are such that market solutions for strategic, operational, and environmental challenges are required. What are the barriers to related innovation and enterprise and how might these be overcome? Overcoming barriers in areas such as the financing of necessary transition and transformation represents an opportunity for enterprise. How might different parties better work together to co-create funding solutions that meet shared objectives?

Climate finance needs to increase sixfold to achieve Paris targets, but the cost of climate inaction is higher than the cost of climate action (WMO, 2024). What new forms of equity and/or loan fiancé are required? How should fund developers influence and address specific ESG issues and investment criteria? ESG and the methodologies of past studies of the impact of ESG on performance and outcomes have sometimes involved the selection and use of evidence to portray what has been done an achieved in a favourable light (Edmans, 2024a). Critical thinking and responsible board leadership are required (Coulson-Thomas, 2022). Given the existential threat that climate change represents, greenwashing needs to be avoided and realities must be addressed at all levels of leadership and across all sectors. (Allan, 2017). How might actionable ESG principles be integrated into climate and environmental agreements at local, corporate, national and international levels?

Leveraging Transformative Technology and Innovation for Green Solutions

Advances in science and technology, if pursued and wisely used, have been identified as having the potential to empower both the developed and the developing world to overcome challenges facing humanity, including climate change (Rees, 2018). Whether or not their progression is desirable and responsible given other possible uses of the resources, especially of the rare minerals their adoption and use might require, will depend upon many factors, including the motivations and goals of those involved and the purpose of applications. Aspirations for green

growth and a desire for progress towards a sustainable future may lead to innovations and breakthroughs that could also be used by bad actors (GOS, 2023). How do boards ensure innovation and uses of emerging technologies are responsible (Medhat, 2023)?

Too often in the past technological advances have initially benefitted a relatively small elite and have sometimes inconvenienced a larger majority (Acemoglu and Johnson, 2023). As rising expectations confront a growing scarcity of limited resources and rare metals the risk of greater inequalities in the allocation of costs and benefits increases. What more should be done to make sure available natural capital is used wisely and responsibly to ensure our survival and that innovations and future technologies are sustainable? How practical, affordable and cost-effective are geoengineering techniques and carbon capture, storage and reuse technologies and how might their development and adoption best be funded, managed and governed? What are the risks and possible unforeseen consequences of their use? How resilient are they and how should the conundrum around technology and cost be addressed?

Continuing adoption of digital technologies and accelerating use of AI is resulting in the rapid expansion of data centres. Their numbers and capacity are expected to increase rapidly, fuelling a voracious and rising demand for energy to power them and water for cooling. The social and economic gap between elites and marginalised communities may widen as a result (IMF, 2024a). Increasingly AI generated or assisted content may influence perceptions and understanding of climate change. While ChatGPT narratives on climate change have been found to be in line with scientific understanding and recognise the impact of human activity as a cause, and although certain aspects including the role of fossil have been absent or underplayed, they have been described as positive and offering hope (Sommer and von Querfurth, 2024). How might applications of AI confront certain existential threats?

Applications of technologies such as cloud computing and AI can be used for the purposes of environmental conservation, global climate protection and sustainability (Kaloni et al, 2023). AI also gives rise to multiple risks with societal-scale impacts (CAIS, 2023; GOS, 2023; HM Government, 2023). These can range from its malicious use and organisations cutting corners on controls in the competitive race to adopt, to accidents resulting from its complexity to certain applications more intelligent than their users going rogue (Hendrycks et al, 2023). Further research is needed into the risks and threats that future AI and other technology developments might cause and pose (DSIT, 2023). How might boards make better informed decisions about the adoption and control of transformative technologies? To whom should they turn for independent and objective advice? Is a review of board membership required?

Recognising Vulnerabilities and Potential Risks

Addressing and accommodating the incompatibilities of human and machine approaches to reasoning and learning can represent a multifaceted and profound challenge and raises issues that many people and organisations may not be aware of (Muggleton and Chater, 2021). When there is urgency in the search for innovative solutions for the challenges of climate change and a zero-carbon future, and boards and investors see an opportunity for profit, caution and safeguards can be overlooked. How can boards sustain progress while at the same time ensure that as science and technology developments occur steps are taken to foresee and prevent the possible misuse of what is emerging (James, 2019)? By the time legislators and regulators catch up with what is happening it might be too late.

Public and private investments to achieve green growth solutions and decarbonisation funding should be driven by desired and responsible objectives. Words of caution may be viewed as negative or a potential source of unwelcome and unnecessary delays while the cost of inaction increases. Yet the technological developments being sought and to be funded are not always as appropriate, affordable, justifiable and scalable as their promoters and allies might believe and/or suggest (Arvai et al, 2024). Alternatives, including those that work with nature, may be available People, organisations and societies can be at their most vulnerable when in a hurry. Many business interests represent strong and self-interested lobbies, that can hijack funding for a campaign, such as for greater energy resilience or to accelerate the net-zero agenda. When faced with expensive proposals from large and influential players, how can boards ensure that alternative, affordable and viable options are objectively considered?

Care needs to be taken to ensure that the pressure of events does not result in key players who could contribute solutions being excluded from the decision-making process. How can boards also ensure that alternatives such as multiple natural processes for removing carbon from the atmosphere and storing it and possible collaborations including public-private partnerships are considered? For example, central and state Governments can have an important role to play in improving biodiversity in coastal areas and combating sea level rise. Smaller entities may have local solutions to a challenge such as the decline of oxygen producing kelp forests. How might they be included, work with larger enterprises and public bodies, and be supported by green funds? Research on green finance and environmental sustainability has increased exponentially over the past decade (Kahn et al, 2024). Green finance raises a host of issues as options multiply and there may be choices to make (Lehner, 2024). Affordability might have to be weighed against the costs and risks of inaction.

Water and Waste Management

Immediate action is required in crisis areas. Impacts of climate change on nature, natural capital and human health may be overlooked or ignored when the focus is on narrow economic consequences rather than adaptation, social and other considerations (Royal Society, 2023). Required responses to water and waste management challenges and the ability to fund them can vary significantly according to location. A recent literature survey has highlighted issues in developing countries where people at the bottom of the pyramid can be particularly vulnerable (George et al, 2024; Raab, 2024). In relation to water management, impacts that increasing numbers of people can experience, include droughts, shortages of water for drinking, agriculture and industry. The costs of taking water to certain cities and urban areas are also increasingly evident. Satellite observation reveals widespread decline in the world's large lakes due to climate change and human activity (Yao et al, 2023). Climate change also affects river flows and the risk of water deficit and/or flooding as well as water security (Gelfan, 2023).

Water quality as well as quantity is an increasing challenge for Government at different levels as well as for communities, businesses, other and affected publics (Pushard, 2024). In rural areas, water resources can be severely polluted and a water environment management system which addresses water quality and pollution can significantly increase water utilisation (Chen, 2024). In urban environments, significant infrastructure investments may be required and a longer-term approach taken and perspective adopted before these are judged to be cost effective (Jiang, 2024). What impact is the G20 Environment, Climate and Sustainability Working Group

having on water crisis and waste management and what more needs to be done? How aware are boards of water, waste and energy security issues of companies and their stakeholders? How helpful are government and other programmes with water security missions and essential services, and how might businesses contribute to their activities?

How integrated is the management and conservation of water and other scarce natural resources? Is it properly funded and are allocations of costs and benefits fair? What more could be done to conserve water and become and remain water positive? A water deficit can be accompanied by a surfeit of waste. Are public bodies and companies doing enough in the recycling and reuse of water and waste, and making use of circular economy opportunities (Ewijk and Stegemann, 2023)? How might pricing and incentive mechanisms contribute, for example to encourage them? At some point, could water rationing and/or licensing be required? If so, how should what is adopted be operated and policed? What steps should be taken and by what parties to improve waste management and water use efficiency in agriculture, industry and domestic sectors? How might a company become involved?

Securing Funding and Support

Certain ways of increasing water supply such as interlinking rivers, the desalination of sea water, and replenishing water tables could involve significant public expenditures at a time when there are multiple existential threats to face and other claims on resources (Coulson-Thomas, 2024b). How should these projects and other infrastructure programmes such as flood defences be coordinated and funded? What opportunities and challenges do they and aspirations, goals and objectives such as universal and equitable access to safe drinking water present for government at different levels, public bodies, cities and individual companies? What should inform board focus, policies and priorities and corporate objectives relating to environmental issues such as waste management and water and energy security? The science is clear that human activities are a cause of global warming and climate change (IPCC, 2021). What mechanisms could ensure fair accountability and compensation for resulting costs?

The motivation to act to limit greenhouse gas emissions and cope their consequences is critical. An existential threat such as climate change can cause individual anxiety. However, shared concern may moderate it and increase pro-environment sentiments and also pro-environment individual and collective action (Stollberg and Jonas, 2021). Will such changes occur quickly enough to accommodate the increasing pressure and necessity to accelerate climate adaptation and mitigation measures? When changing direction or switching priorities, certain activities might have to be ramped up while others are scaled back or discontinued. If increased awareness, understanding and support, significant disinvestments or other material developments are required, stakeholders may need to be engaged and educated? Are boards and people likely to be involved ready for this? Will new attitudes and skills be required?

How should the people of organisations and others be prepared for a world confronted with an unprecedented number of risks and existential threats (Ord, 2020; Beard et al, 2023; WEF, 2024bc)? The contemporary era represents a challenge for the professions and educational systems and institutions as well as companies. For example, a call has been made to embrace competences relating to climate change and planetary health in medical education, and a curriculum that involves learners and includes well-being and resiliency (Ghosh, 2024). What can and should companies do through working with local communities and professional and

educational partnerships to ensure their and other people have the awareness, understanding, competences and commitment to contribute to corporate action and collective responses?

The role of universities in relation to sustainability and climate change, which represents a complex, muti-faceted and 'wicked problem', has also been questioned, and a plurality of approaches suggested (Stein, 2024). New collaborations may be required, and because most people and organisations are likely to be affected in some way by climate change cooperation possibilities exist. There are also opportunities to learn from other enterprises through networks such as the UN Global Compact and a variety of ways in which companies can derive business benefit from their pursuit of each of the UN's Sustainable Development Goals (SDGs) (UNGC, 2024). What steps could be taken to refocus university and multidisciplinary research team on coping with global risks and existential threats?

Sustainable Energy Options for Energy Security

Reactions to events such as water and energy shortages and disputes and perceived slowness to act can sometimes lead to polarised political responses. For some these might include calls for more radical action and the adoption of alternative frames of reference and philosophies (Flus and Frim, 2022). Reactions can also be defensive to avoid the disclosure of conflicts of interest or risks to other ongoing and desired activities (Wade, 2021). The communique of meeting 287 of the IEA governing board at Ministerial level follows pledges to strengthen energy security and accelerate green transitions to bring average global temperatures back below the Paris limit of 1.52°C above the pre-industrial average level (IEA, 2024). How aware are boards of energy dependency, vulnerability, security and resilience? Does this awareness extend to stakeholders, areas where corporate activities are located and energy infrastructure? Where does energy security rank as a board, corporate and wider priority? What is being done to better understand, assess and support sustainable energy options?

Fostering clean energy transition a global priority. Are corporate, sector and national growth strategies supporting what is needed for energy transition? Does this include related innovation and its funding? Energy generation contributes 75% of greenhouse gas emissions (IEA, 2024). How are conflicts of interest, risks and trade-offs handled? Might faster de-carbonisation, carbon capture and storage and more environmentally beneficial production result in operations, companies and industries becoming uncompetitive if customers and end users have a choice of less responsible but cheaper alternatives? Given financial imperatives, how can carbon removal be incentivised, and claims of removal verified? Should removal be mandated? How might carbon emitters be made to pay for carbon reduction and storage, and could the use of carbon reduction to justify further extraction of fossil fuels be prevented (Arvai et al, 2024)? Since the 1974 energy crisis, and in many countries, there have been massive subsidies of fossil fuels (Black et al, 2023; IEA, 2024). Could these support transition away from fossil fuels, new industries and related and responsible innovation?

Post-Covid and with accumulating geopolitical and other risks and existential threats public debt in many countries is already at a high level. In many countries it is close to the limit that markets might accept at affordable rates of interest. With 80% of global energy still generated by fossil fuels (coal, oil and natural gas), transition to sustainable renewables and the phasing out of fossil fuels needs to be speeded up (IEA, 2024). What will have to be scaled back and discontinued or given up, by whom and when to fund rearmament, energy transition and other

environment and climate related requirements? Will electorates accept the reduction in living standards that may be needed if democratic systems and humanity are to survive?

Political and Public Responses

Doing what is required to fund climate adaptation and mitigation, slow and reverse global warming and ensure water and energy security can be especially challenging for democratic Governments. Will they stand up to powerful and well-funded lobbies advocating further delay? Are political leaders promoting the potential benefits of transition? For example, fossil fuel use involves dependency on supplier countries, but renewable power can be generated much more widely (IEA, 2024). Do boards understand business possibilities and advantages of doing more, such as the economies of scale that could result? How many of them are prepared for advocacy in support of SDGs, and actively engaging in favour of climate action? What is being done to justify and secure the investment required for sustainable growth? How do decision makers ensure proposed policies are practical, affordable, and cost-effective?

Wider public responses may depend upon the extent to which people find that they and their families are directly affected by both causes and consequences. Science suggests that ever more of them are likely to encounter extreme weather events (Schiro, 2024). Power cuts can also have direct impacts over affected areas. Energy requirements are inextricably linked to lifestyles. Simpler and less capital and infrastructure intensive ones, might be rewarding in different ways and be healthier, not so stressful and require less energy. They may be increasingly championed by concerned citizens and business and social entrepreneurs looking for coming waves of opportunity. Are boards reading the road ahead and sensitive to better and more sustainable alternatives? Which colleagues, business partners and industry bodies are leaders or laggards? What can be done to avoid moving at the speed of the slowest?

Responsible boards seek fairness and balance. They may need to take wider considerations and interests into account when considering options, weighing principles, and allocating benefits. For example, should sustainable energy for all be an aspiration? Could transition out of fossil fuels and into clean and renewable energy in developing countries by stopping the funding of what is harmful for humans and many eco-systems be regarded as a just transition (IEA, 2024). Directors should be realistic but positive. Rather than worry about the triggering of negative tipping points, what steps could be taken to create positive tipping points that might assist in planetary recovery, whilst protecting people and promoting peace, and supporting a green energy transition (Nurse, 2023)? How do these rank in priority for the parties that may need to be involved, in relation to alternative claims upon resources? Are they affordable and how should they be funded?

Accelerating Transition to Renewable Energy

Renewable energy transition provides some hope. In 2023 renewable capacity additions increased by almost 50% over those in 2022 (WMO, 2024). However, the warmest year and decade on record leaves little room for complacency. Concentrations of CO2 are expected to further increase global average temperature for many years to come. Air pollution from fossil fuels has been estimated to already kill over five million people per year (Lelieveld et al, 2023). Communities in poorer areas can be more vulnerable to climate change (George et al, 2024). As temperatures rise a combination of factors may limit and/or reduce the quality of life of increasing numbers of people. Will additional courts consider the availability of air and/or

water a basic human right. Challenges and possible solutions can be inter-related (WEF, 2024). What strategies could be pursued in areas such as 'waste to energy' technologies? How should companies contribute to India's target of 500GW of renewable energy by 2030? Is the target integrated with other strategies and sufficiently demanding? What initiatives are under-way for solar energy and international solar alliances? How will they affect different companies and sectors and the availability of rare minerals and other resources for various activities? How will their costs and benefits be allocated?

Transition away from fossil fuels and measures to reduce negative externalities such as constraining growth antagonise vested and self-interests. The ownership of some fossil fuel companies is concentrated among a subset of investors, which raises the question of whether or how their influence could be used to support a faster and sustainable transition to renewable alternatives (Dordi et al, 2022). Globally, fossil fuel subsidies have been estimated at $7 trillion in 2022 the majority of which is due to undercharging for global warming and local air pollution (Black et al, 2023). What needs to happen for them to be removed and redeployed and a level playing field established between leaders and laggards, and polluters and victims? How likely is this and how aligned with climate science are government and corporate climate initiatives and policies? Should more emphasis be put upon countering lobbying against climate action and advocacy of subsidy redirection and pricing reform?

Full fossil fuel price reform would reduce global carbon dioxide emissions to an estimated 43 percent below baseline levels in 2030 (in line with keeping global warming to 1.5-2oC), while raising revenues worth 3.6 percent of global GDP and preventing 1.6 million local air pollution deaths per year (Black et al, 2023). Costs and benefits are often unequally allocated. What will be the impact of transition to carbon-neutral energy sources and applications of technologies such as electric vehicles? How feasible are they as alternatives to fossil fuels? What changes of aspirations, activities, policies and lifestyles will be required if they do not succeed? Will some dependencies and vulnerabilities be replaced by others? For example, 80% of lithium and other minerals required for solar power generation is dependent upon China (IEA, 2024). Is strategic independence required?

Responding to Climate Change and Other Existential Threats

Climate change is not the only existential threat that could have a potentially traumatic impact upon the environment (Coulson-Thomas, 2024). The geopolitical environment is fraught with danger. The risk of nuclear war, whether an accidental burst or an extensive exchange, remains an existential threat for much of life on earth and few people will be able to escape its eventual impacts (Diaz-Maurin, 2022). Once triggered, an escalating and uncontrollable nuclear exchange is a possible and perhaps likely scenario (Jacobsen, 2024). Collateral damage from state-to-state exchanges of nuclear warheads could result in the death of up to a half of the world’s population. Longer-term impacts on survivors could include starvation for hundreds of millions and perhaps a billion people. Varying impacts on other species will result in survivors confronting radically different environments and conditions.

Currently a minute proportion of the world’s resources are devoted to assessing existential risks and preparing for them (Ord, 2020). Options for dealing with certain very low probability risks with potentially catastrophic consequences, such as a colliding asteroid have been considered and initial preparatory steps undertaken. Others have been more elusive, and cooperative institutional mechanisms and practical collaborations that embrace relevant areas of scientific

expertise and decision makers have been difficult to agree and sometimes challenging to fund. What if any steps should be taken to safeguard resources and natural capital that might be required in the event of future scenarios involving certain global risks and existential threats? How might corporate purchasing power be used to raise awareness, increase preparedness and enhance resilience?

Too often existential threats are seen as unlikely and remote. Their possible consequences may also be underestimated. Future impacts are often so heavily discounted that they fail to influence contemporary decisions as perhaps they should, if significant loss of options and possibilities is to be prevented (Royal Society, 2023). There is a danger that high impact, but low probability risks may not be considered a priority, leaving organisations, communities and countries struggling to cope with them when they arrive. In the meantime, effort can be devoted to more likely risks that might be relatively easy to manage. What can and should be done to raise the profile of environmental and climate related risks and threats? How might those who feel strongly that greater readiness is required, advocate for system change?

Existential threats can affect most people and organisations to a degree, and some may be more vulnerable and impacted by them than others (Coulson-Thomas, 2024). Ability to fund preparations, responses and coping with consequences can also greatly vary. Who should pay for what in relation to the environmental impacts of existential threats and responses to them? As the cost of adaptation and mitigation in the face of existential threats increases, some voices may advocate expecting people and organisations to accept or suffer greater burdens and/or impacts to limit expenditures. In the case of climate change, could applying the principle of non-regression to the protection of public welfare and individual rights be used to prevent its erosion and the weakening of provisions in areas such as environmental protection and anti-pollution measures (Sullivan, 2023)? As well as moving forward, what can be done to avoid backsliding and a watering down of commitments as short-term self-interests confront the inconvenience and cost of transitions to benefit future generations?

Challenges for Corporate Decision Makers

Low probability risks and threats and slow burn emerging or potential crises have long presented a challenge for decision makers (Omand, 2013). Other priorities, immediate issues and competing claims for time and resources can always be used as rationalisations for avoidance or delay. As the impacts of extreme weather events and other consequences of unfolding threats increase and boards face increased and contending calls from stakeholders for action, will they be able to strike the right balance between considered and detailed deliberation and requirements for quicker and more empathetic reactions (Kahneman, 2011)? The behaviour of directors in the boardman may be less rational than many might expect, and it can be subjective and affected by biases and the influence, power and authority of others (Gopalakrishnan and Jayakumar, 2023). Are directors aware of biases, conflicts of interest, and groupthink, calling them up and advocating greater diversity of thinking?

In the discharge of their duties and responsibilities more directors are having to look beyond familiar boardrooms, ensure buy-in from C-suit executives, and collaborate with like-minded allies and partners. A challenge for business and political decision makers in a divided and fracturing world is to identify and understand where and how competition and confrontation can coexist with cooperation (WEF, 2024a). In some circumstances a

common external threat can bring those affected together. It may encourage co-operation, where perspectives of its drivers or causes and appropriate, desired and affordable responses are shared. Throughout the ages external threats have been exploited or even imagined by tyrants to achieve greater internal unity. Perhaps the key question now is whether in democracies and competitive markets with electorates and customers demanding ever more, business and political leaders will have the courage to take difficult decisions that will enable us to survive in the face of multiple environmental risks and existential threats.

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Further information

Details the 25th International Conference on Environment Management and Climate Change, including the agenda, can be obtained from the website of the organiser: India's Institute of Directors (www.iodglobal.com): https://iodglobal.com/upcoming_events/details/25th-international-conference-on-environment-management-and-climate-change

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