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ARTICLE

INTRODUCTION: CLIMATE SUSTAINABILITY – EVIDENCE AND POLICY

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1. Introduction

Last year saw yet another year of weather extremes. The Copernicus Climate Change Service run by the European Centre for Medium-Range Weather Forecasts on behalf of the European Commission (Copernicus, 2024) measured 2023 as being globally the warmest year since records began in 1850. This was by a large margin (0.17 per cent) over the previous record in 2016, with global surface air temperature at nearly 1.5°C above pre-industrial levels. While last year's observations embodied an El Niño effect, which every few years sees temperatures affected by warmer waters coming to the surface of the tropical eastern Pacific Ocean, changes and anomalies consistently observed over the last few years across the globe are becoming more pronounced. What is commonly labelled "climate change" is turning into a global climate emergency. No economy or society are immune to its effects. Today, we see the global average temperature at over 1.1°C above pre-industrial levels, a rise that has been extraordinarily rapid on a planetary timescale, and one that has been primarily caused through our (humans) burning fossil fuels. Nearly a decade has passed since the United Nations' Climate Change Conference in 2015, COP21, where 196 nations adopted The Paris Agreement – a legally binding international treaty on climate change. Its goal was to hold "*the increase in the global average temperature to well below 2°C above pre-industrial levels*" and to pursue efforts "*to limit the increase to 1.5°C*".

Following a special report by the United Nations' Intergovernmental Panel on Climate Change (IPCC, 2018) that investigated the differences in expected outcomes between global warming of 1.5°C and 2°C, the emphasis has been placed on trying to limit global warming to 1.5°C by the end of the century. The IPCC's modelling suggests under plausible scenarios that this will require greenhouse gas (GHG) emission cuts of over 40 per cent from 2010 emission levels as soon as 2030. Crossing the 1.5°C threshold risks unleashing more severe and extreme events, including more frequent and severe droughts, heatwaves and rainfall. Missing targets will accentuate the myriads of changes already occurring on the planet such as the greater incidence of wildfires, glacial retreat, sea level rise, ocean acidification, the deterioration of coral reefs, desertification, dieback of rainforest and the extinction of species. On current IPCC appraisals, we are falling behind the curve, and the situation is becoming critical.

Millard (2023) edited a special issue of this journal on *Macroeconomics and Climate Change*. It focussed on physical risks and transition risks in the pursuit of net zero, along with carbon taxation and

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its effects on Gross Domestic Product (GDP), and the effects of investment in green technology on the natural rate of interest.[1] The current issue has been planned as a companion, looking beyond the macroeconomy at the higher-level strategic issues on climate over a longer time horizon, with specific reference to UK policymaking within an international environment. Hopes had been high that the United Nations' Conference of the Parties (COP) hosted by the United Kingdom (and Italy) in Glasgow in November 2021 – COP26 – would take on a significance comparable to Paris.[2] Our original intention had been to focus on its achievements and assess its reach and influence a year or two later. Instead, Glasgow put some realities into focus. These included more appreciation of the *extent* of the costs of climate change mitigation and adaption; the *inequalities* in the incidence of climate change on various countries at different stages of economic development; and the recognition that *choices and challenges coming down the line are now on the horizon.* There had been hope for an agreement that would phase out the use of coal but pressures on some countries to sustain their development during energy transition, and without support from China and India, saw agreement only *to phase down* the use of coal (but with South Africa agreeing to shut most of its coal plants by 2030).[3] Nevertheless, we believe we have been able to fulfil our overarching aim in offering a special issue on climate sustainability that provides expert opinion, including economic, social and scientific perspectives on climate change and its mitigation as well as discusses principles and actions that will inform policymakers and influence the policy debate. Our approach resonates with the IPCC (2023a) report, which indicates that while the window is narrowing, there is still time to repair the current situation to a manageable level, provided we act now.

Our emphasis is on climate mitigation that is both feasible and sustainable and although the United Kingdom is responsible for less than 1 per cent of global GHG emissions, many of the policy issues discussed here apply more generally. We aim to offer some granularity in areas such as the future of electricity generation, decarbonisation at the individual and household level, decarbonisation at the industrial level, the transition to electric vehicles (EV), batteries, sustainable agriculture and offshore wind farms. Many of these issues gained increasing prominence following recent geopolitical developments, not least the cost of living crisis during 2022-23. All outcomes strongly depend on human behaviour and policymaking, and are therefore very much in the purview of economic analysis. We shall also briefly touch upon an issue about the way in which society is organised and governed. Democracy has tended in practice to force political decision-making and welfare maximisation towards voters in the present, sometimes at the expense of future voters, meaning that there are risks of policies being formulated today that militate against resolving the climate crisis even given the scientific evidence available now.

Section 2 introduces the articles contained in this SI. Each of them in their own way looks to the future, and provides realistic, feasible and sustainable solutions and perspectives on the climate change problem

[1]The connection of climate and transition risks with the financial system and the macroeconomy is of particular critical and topical interest. This is coordinated by the Network of Central Banks and supervisors for Greening the Financial System (NGFS) – a voluntary group including 129 central banks and 21 observers set up at the Paris One Climate Summit in 2017. Its objective is "*to share best practices and contribute to the development of environment and climate risk management in the financial sector and to mobilize mainstream finance to support the transition towards a sustainable economy*". Within the current NGFS setting, global macroeconomic modelling of climate scenarios is developed using the National Institute of Economic and Social Research's macroeconometric model NiGEM (Bertram et al., 2021; Boirard et al., 2022; Menon et al., 2023).

[2]Because of the process of five-year cycles envisaged in the Paris Agreement, COP26 and similar quinquennial COPs going forward would take on extra significance as staging posts in the process of climate change, mitigation and adaption.

[3]The Glasgow Climate Pact (2021) formulated at COP26 did have some successes. There was greater clarity on high-level targets, with the global temperature objective shifted from 2°C to 1.5°C and a consonant target reduction in GHG emissions by 2030. It completed the Paris Rulebook; it made progress in mobilising Climate Finance; in incentivising the private sector; and in Adaption to protect communities and natural habitats. But while nations reaffirmed their duty to fulfil the pledge that richer countries make available £100bn per year to aid the transition of poorer countries (a pledge made in 2009 to be fulfilled by 2020), some trust issues on reporting and recompense to poorer countries emerged.

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we face today. Section 3 discusses some policy implications and Section 4 offers concluding remarks and reflections.

2. Contributions to the special issue on climate sustainability

The purpose of this Special Issue (SI) is to explore some aspects of climate change and sustainability from the economist and policymaker's points of view, aligned with current developments in science and technology, and to discuss how we as a society might respond to the today's context where our window for repairing human-induced climate change is narrowing and the time for action has become critical. Our aim is to offer experts in various fields the space to articulate necessary yet achievable policies and principles that can positively contribute to actual policy development in the immediate future. The SI comprises contributions from some of the presenters at a COP26 fringe event organised at Panmure House, Edinburgh, by Heriot-Watt University and the University of St Andrews, in association with NIESR (see Appendix). Academics and the general public were also given the opportunity to showcase recently developed techniques, innovations and perspectives though an open call for papers held last year.

The first article 'Can the UK Achieve Net-Zero Greenhouse Gas Emissions by 2050?' by Jennifer Castle and Sir David F. Hendry provides a blueprint for how the U.K. can reach net-zero greenhouse gas emissions by its target date of 2050. While the article is primarily about feasibility, it also embodies the urgency being conveyed in recent IPCC reports. Sir David has long been one of the UK's leading econometricians and, through the Climate Econometrics research group at Oxford, he has recently been devoting his energy to climate issues. In the drive to produce evidence and solutions-based analysis, Castle, now the Director of the group, has for some years been his econometric partner in arms.[4] One might have expected, then, their article would have been about the measurement of climate change. But they have been bolder and, firmly in the area of mitigation, they have appealed directly to the policymaker. Their article is hard-hitting. For while they acknowledge the progress and leadership the UK has shown in phasing out coal, their strategy entails an integrated approach that involves a dramatic restructuring of the economy from fossil fuels to renewables, at both individual and industrial levels, over the next twenty-five or so years. It begins with a focus on electricity generation, seeing eventual zero GHG electricity generation as the key step. There is transition through natural gas until there is sufficient non-GHG electricity generation to remove oil. The article discusses transportation, industry and agriculture and includes a section on what the individual should do to decarbonise. Most importantly, the article is fundamentally evidence-based: it takes seriously the need to place quantities and estimates on policy choices and recommendations.

The second article 'Ten key priorities, innovations and actions to mitigate the climate crisis' sees John Ludden, a former Executive Director of the British Geological Survey, team up with Caroline Howitt, Programme Director at Panmure House, to report on the activities and the conclusions of the Hutton Series on Climate Change. The Series is named after James Hutton, geologist contemporary of Adam Smith and another key figure in the Scottish Enlightenment. It comprised talks and deliberations among many leading scientists, policymakers, business leaders and members of the lay public over many months in the run-up to COP26, leading to a set of guiding priorities and actions to inform and guide policymakers and practitioners going forward. The article embodies the same solutions-driven approach towards the mitigation of Climate Change as Castle and Hendry's, but places greater emphasis on the wider scientific issues, especially the geological and ecological. By including this paper, we hope to convey some of the multidisciplinary and multidimensional aspects of the climate change problem and feel their

[4]Castle and Hendry (2020) provide an exposition of their methods in Climate Econometrics. A recent example of their work is given by Castle, Doornik and Hendry (2022).

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conclusions should be available to policymakers.[5] Notable is the breadth and diversity of this contribution – it extends the discussion into biodiversity, actual and potential resources, and the need for co-ordination among stakeholders with different interests, including industry, NGOs, government and the public.

Panmure House, the last Edinburgh residence of Adam Smith, was purchased and then restored over ten years by Heriot-Watt University. Since 2018, it has been a meeting point for academics and policymakers, and a hub for both economic and policy debate and research. Hutton and Smith were near neighbours in Edinburgh, and it is not a stretch to imagine a similitude between the debates and discussions that took place there some centuries ago with those at the same venue in the run-up to COP26.

The third article 'Greener is Cheaper: An Example from Offshore Wind Farm' by Subhamoy Bhattacharya and Daniel M. Kammen provides an authoritative account of the role of offshore wind farming in climate change mitigation. It provides a technological counterpart to Castle and Hendry's article, showcasing a leading example of how scientific and technological development can lead to win-win climate mitigation, where electricity generation can be both clean and profitable. Their work impacts upon economics through the welfare gains implicit in the adoption of the technology: the proof that offshore wind farming as a technology can be self-sustaining and profitable, and can mitigate Climate Change, makes it something policymakers (and even the electorate!) might be prepared to embrace. Bhattacharya and Kammen are both significant members of the scientific community, Bhattacharya as a geomechanical engineer, and Kammen as an expert on energy, resources and public policy who, in 2010, was appointed by then US Secretary of State, Hillary Clinton, as the first energy fellow of the Environment and Climate Partnership for the Americas initiative. Kammen was a coordinating lead author for numerous IPCC reports, including the IPCC (2007) report on assessing human-induced climate change which won the IPCC the 2007 Nobel Peace Prize. Their article here is an advance on the keenly awaited, fully revised and expanded second edition of their book (Fthenakis, Bhattacharya, Kammen and Lynn, 2024), to be released in September 2024.

The fourth article is 'The Role of Batteries and Fuel Cells in Decarbonising the UK Economy' by Stephen Pollock. Although better known as an econometrician contributing to the areas of Time Series Analysis and Signal Processing, Pollock has maintained an interest in Environmental Economics throughout his career. Over the last thirty or more years, first at Queen Mary University of London and then at the University of Leicester, he has influenced many students and future policymakers through policy-based lectures on the Environment, taking the approach of the quantitative social scientist long before such an approach was fashionable. As Viscount Hanworth, he is also a member of the House of Lords where he was sitting on its Science and Technology Select Committee at the time of COP26. In his Panmure House talk, he provided a critical assessment of whether planned investment in energy would be sufficient to facilitate a Green Revolution; his contribution here is based on a revised version of a second paper he submitted at the time, discussing the role of EV and batteries in decarbonising the UK economy. The article is both science- and policy-based and sits alongside Bhattacharya and Kammen's in the area of green technology, and Castle and Hendry's in terms of UK net zero policy, although Pollock's tenor is less optimistic. A baseline for the article is a somewhat critical report *Battery Strategy Goes Flat: Net Zero Target at Risk* prepared by the House of Lords Science and Technology Committee (2021)[6] into the role of battery and fuel cells in meeting the government's net zero target by 2050. While there have been significant recent developments such as the announcement in July 2023 that Jaguar Land Rover's owner, the Indian conglomerate Tata Group, would build a giant "gigafactory" in Somerset to produce batteries,

[5]While the article here is a summary document, full details about the programme and its deliberations are available at the website: https://www.panmurehouse.org/programmes/hutton-series-on-climate-change.

[6]The debate on this report took place on 23rd November 2022. Supporting documents for this debate, including the Government's response to the report, are available at: https://lordslibrary.parliament.uk/battery-strategy-science-and-technology-committee-report/.

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he reckons the UK government could and should be doing more. Pollock also calls into question the adequacy of the UK's future supplies of energy and its limited recent investment in nuclear power.

The fifth and final article is 'Climate Related Discussions on Social Media – Critical Lessons for Policymakers' by Anandadeep Mandal, Akshay Kaushal and Animesh Acharjee. It offers an example of how new approaches to data are providing policymakers with information that allows them, in principle, to align policy better with the public response to it. Machine learning methods are used to analyse climate change discussions on social media over the last 14 years. Policymakers can in principle use analysis of this type to assess the public's concern with climate change priorities and, on this basis, if they so wish, adjust communication strategies and/or policies accordingly. It brings a unique synergy between views and actions of citizens with that of policymakers that is surely necessary to bring tangible progress towards Climate Change mitigation.

3. Policy implications

The articles in the SI offer expert views on various aspects that underlie human-induced Climate Change and Climate Sustainability, written at a time where the window for acting on Climate Change is narrowing should we wish to build a sustainable future according to the goals of the Paris Agreement. We would encourage readers to see the articles as summary contributions that offer a route for policymakers to deepen their knowledge through further reading that the authors themselves have provided. For example, Castle and Hendry's plan is developed by Castle and Hendry (2022) and has been communicated to Parliament.[7] The link to the Hutton Series on the Panmure House website provides more details of the deliberations, and about the participants around whom the Series was centred. Bhattacharya and Kammen's contribution is developed in their forthcoming book; and, while Pollock writes here as an individual, his article is underpinned by evidence produced around work on batteries and fuel cells undertaken by the House of Lords Science and Technology Committee *inter alia*. Mandal, Kaushal and Acharjee give an example of how new research methods are being brought to bear on climate issues, applying methods developed by Kaushal, Acharjee and Mandal (2022).

The articles emphasise feasible climate change mitigation. Apart from Ludden and Howitt's article, the proposed approaches involve strategies of abatement that essentially boil down to reducing GHG emissions through a switch from fossil fuels to renewables of various types. In his Nobel lecture, Nordhaus (2019) compared abatement with two other potential approaches to slowing climate change: carbon removal and geoengineering (meaning offsetting warming by increasing the planet's reflectivity). Given the latter is untested and that, as of now, we have no technologies that can remove the amount of carbon needed at reasonable cost, he saw abatement as the only current realistic option, even given the expense. This does not mean, of course, that suitable carbon removal technologies will not be developed in the future or should be discouraged in any way from being developed and applied, but his view is that we have already reached a critical juncture and that from today's standpoint they cannot be relied upon as alternatives to GHG emission reduction.

On 20 September 2023, the then UK Prime Minister Rishi Sunak announced in a Downing Street press conference that some commitments on the U.K.'s transition to net-zero in 2050 would be changed. Notably, a ban of new petrol and diesel cars would be put off from 2030 to 2035; households would be given more time to replace gas boilers with heat pumps, with only 80 per cent having to do so by 2035; a ban on oil and petroleum gas boilers would be delayed from 2026 to 2035; and requirements on landlords to make their properties energy efficient would be scrapped. The Boiler Upgrade Grant to help people afford heat pumps would be increased by 50 per cent to £7,500 and there will be a reduction in the time it takes to hook up wind farms, solar farms and battery plants to the National Grid.

[7]See Castle and Hendry (2021).

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Sunak's announcement raises a number of issues that we shall discuss only briefly. The policy revision reminds us that no strategy is set in stone, and indeed that strategic plans *per se* are but one element in the process of policy formulation and implementation. Plans like Castle and Hendry's may proffer feasible climate mitigation, but they can only reach a stage of implementation if policymakers and other stakeholders are persuaded of their merit in the light of their own interests. However, offering a feasible plan within a realistic, if challenging, time frame imbues such a plan with an intrinsic element of persuasiveness, and on this basis can help give it position within the policy debate. As noted, the plan Castle and Hendry outline herein has already been communicated to the UK Parliament. Similarly, the actions and principles proposed in Ludden and Howitt's article can help persuade policymakers of the urgency to act and provide them with a framework in which to operate. Nevertheless, the Government's policy revision has exposed deficiencies in the UK's current preparations towards net zero. As Pollock argues, we need to go farther in setting up and developing an EV charging infrastructure. Data from the European Heat Pump Association (EHPA, 2023) indicates that heat pumps per 1,000 households sold in the UK is at the bottom of the list of OECD countries.

Of course, there are always economic arguments for delay that can be made from a consideration of optimal timing. In this regard, we note that policies in the UK do still seem to be formulated using civil service advice that still bases cost-benefit analysis on net present value rather than real option value which today's economists and finance practitioners might prefer. EV and heat pump technologies and infrastructure will continue to improve, and costs will fall. For example, replacing gas boilers with cleaner, helium-based heat pumps, without having to tear out existing radiators, would represent an improvement on heat pumps based on a fluorinated-gas refrigerant installed today, and could be further improved by home insulation subsidies. If 2050 is taken to define the time horizon to secure net zero, most cars, boilers etc will need to be replaced by then, and so the net costs can be small if targeted sensibly.

There are also behavioural arguments to be made for delay based on net zero coercion, where forcing further costs on individuals and households during a "cost-of-living crisis" risks policy revision or even reversal down the line from political backlash. All this said, we cannot help but surmise that a consequence of the UK government's policy change created a wedge issue between it and the then Opposition, which in Government has so far not made significant strides towards lowering GHG emissions than under previous policy. The Prime Minister's announcement was followed by an announcement by the then Opposition leader and current Prime Minister Sir Keir Starmer in February 2024 to pare back its intention to provide £28bn per annum in investment to facilitate the transition to a green economy.

Current UK domestic policy contrasts with current US policy, where the Inflation Reduction Act (IRA, 2022, 2023) contained the largest ever piece of legislation to address climate change. Within their overarching policy aim of net-zero GHG emissions no later than 2050, substantial new tax incentives, grants and loans are provided for in a vision that seeks to unleash investment in new, green technology, facilitating American-made technology and job creation to drive and support the low-carbon energy systems they envisage will characterise the future. The continuation of such policies is, of course, subject to the vagaries of elections. Indeed, to revisit an issue raised in the previous special issue by Millard (2023), deficit spending while the US economy continued to surprise and the inflation rate remained well above the Federal Reserve's 2% target, may reflect a neutral interest rate that is higher than is currently assumed. Costs may eventually have to be borne elsewhere in the US economy. And if GHG emissions worldwide are not reduced drastically by 2030 as per IPCC scenario analyses, the 1.5°C target is very likely to be breached down the line. Therefore, *different* technologies, based on carbon removal, may need to be developed, and urgently.

We would also call attention to the central point made in Nordhaus's (2019) lecture, relating to the public good aspect of climate change. GHG emissions are a global externality, with the implication that the problem of climate change is above and beyond the level of national governments. We have already seen examples of policy design and implementation, such as the forced replacement of domestic oil and gas boilers with heat pumps, or of petrol or diesel cars with EVs, that ask voters who have a stake in

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policymaking to bear costs. Voters of today must give up consumption and welfare for future generations, even though it is they who grant democratically elected governments the electoral mandate to do so. The international dimension only compounds matters because the benefits from the actions of individual governments are dissipated across the globe. Governance becomes a central issue. And then we see, for example, that there are no penalties on nations from withdrawing from the Paris Agreement or failing to meet its obligations. Nordhaus argues that only by designing "*cooperative multinational policies*" can nations ensure effective climate-change policies.

In a subsequent book, Nordhaus (2021) outlined an approach to Climate Change in which those responsible for carbon emissions and other environmental damage pay the full costs rather than pass them to others, including future generations. Within his approach to policy design, he offers four principles for world citizens. First, that people are educated to understand the impacts of global warming on the human and natural world. Second, that nations must establish policies that raise the price of carbon and other GHG emissions. Third, that actions need to be global and not local. And fourth, that there needs to be publicly supported, rapid technological change that advances science and technology *in the context of a high carbon price*, including support for negative-carbon technologies. While here we have more narrowly focused on UK policy, our perspective is that if every country operates under a feasible, bespoke plan of credible and understood nationally determined contributions, many elements of the global problem would be solved.

4. Concluding reflections

The COP process has continued after Glasgow. COP27 in Sharm-el-Sheikh saw a dedicated fund established to provide losses and damages for vulnerable countries hit by floods, droughts and other climate disasters; increased accountability in holding polluting businesses and institutions to account; more financial support mobilized for developing countries; improved steps toward implementation; and a "*clear intention*" to keep the 1.5°C temperature rise within reach. Indonesia agreed a major deal to reduce its investment in new coal plants and to start reducing power emissions by 2030. The Dubai COP28 agreement was advertised as signalling "*the beginning of the end*" of the fossil fuel era by "*laying the ground for a swift, just and equitable transition, underpinned by deep emissions cuts and scaled-up finance*" (UNFCCC, 2023). It does not, however, compel countries to act, and no timescale was specified. COP28 contained the first quinquennial global stocktake where the parties' nationally determined contributions are collectively assessed against the 1.5°C limit, although the conclusion reached is that we are currently *offtrack* against IPCC scenarios suggesting that GHG emissions must peak before 2025 at the latest, and decline by 2030, to limit global warming to 1.5°C. Progress was made in the operationalization of the "*loss and damage*" fund established at COP27, allowing it to begin handing out funds, with around £600 million having been raised.

While this is not sufficient, it is a beginning. There was a pledge to triple the world's renewable energy generation capacity to at least 11,000 gigawatts by 2030, which 118 countries signed up to, and an Oil and Gas Decarbonization Charter, in effect a "*big oil clean-up charter*" that, though a voluntary agreement, saw oil and gas companies pledge to cut emissions to stop routine flaring of excess gas by 2030 and eliminate all leaks of methane. Saudi Aramco, Petrobras – national companies that typically face less pressure to decarbonize – and publicly traded companies such as ExxonMobil and BP were among 50 of the world's top fossil fuel producer signatories.

The significance of the role of the COP process going forward will depend on its ability to formulate and secure agreements that sees countries prepared to bear increasing costs. But it will also depend in part on the returns to the green investment made by various countries, notably the US and China, and whether technology and markets can solve the climate crisis. COP29 was held in Baku in Azerbaijan, on 11th – 24th November 2024. COP30 will be held in the Amazonian city of Belém do Pará in Brazil in 2025. This is likely to be a significant and emotive conference since the Amazon rainforest accounts

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for approximately a quarter of global carbon emissions owing to land use change (Bullock and Woodcock, 2021; Araujo, Assunção, Hirota and Scheinkman, 2023; Assunção, Hansen, Munson and Scheinkman, 2023). It could well be that by then the climate crisis will be about finding a way back from the path to breach the 1.5°C limit that we have set ourselves, with all the negative consequences that follow.

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Appendix

Programme of the COP26 Fringe Event "*Evidence-based Approaches Towards Economic and Environmental Sustainability: A Discussion of Some COP26 Themes*" at Adam Smith's Panmure House, Edinburgh, on 4th November 2021* organised by Heriot-Watt University and University of St Andrews in association with NIESR

SESSION 1

1115-1200: Bettina Laville (President and founder, Comité 21; Conseiller d'Etat, France; advisor on environmental issues to French Prime Ministers Bérégovoy and Jospin, and President Mitterrand) in person
Themes and Development of the COP process

1200-1245: Sir David F. Hendry (Nuffield College & Climate Econometrics, University of Oxford) online
Can the U.K. achieve net-zero emissions by 2050?
(joint with Jennifer L. Castle, Magdalen College & Climate Econometrics, University of Oxford)

SESSION 2

1400-1445: John Ludden (Heriot-Watt University, Executive Director of the British Geological Survey, 2006-19) in person
The Hutton Series on Climate Change at Panmure House

1445-1530: Subhamoy Bhattacharya (University of Surrey)
Offshore Wind Farming
(joint with Daniel M. Kammen, Chair of the Energy and Resources Group at UC Berkeley & a co-ordinating lead author for numerous IPCC reports since 1999, including the one awarded the 2007 Nobel Peace Prize)

SESSION 3

1545-1630: Susana Campos Martins (Nuffield College, University of Oxford)** in person
Geo-climate, Geopolitics and the Geo-Volatility of Carbon-*Intensive Asset Returns*
(joint with Sir David Hendry)

1630-1715: Michael Cohen (Chief U.S. Economist & Head of Oil Analysis at BP plc) online
BP Statistical Review of World Energy in 2020: The Year of Covid ***

1715-1800: Stephen Pollock (The Viscount Hanworth) (University of Leicester) online
Will We Have the Energy to Pursue a Green Industrial Revolution*?*

1800-1830: PANEL DISCUSSION (chaired by Umit Bititci, Acting Executive Dean, Edinburgh Business School, Heriot-Watt University)

* Contributors' affiliations and positions represent their affiliations and positions then, not necessarily their current affiliations. The hope had been that those attending COP26, and MSPs and civil servants working in the adjacent Scottish Parliament Building, would have been able to attend the talks and

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sessions on a drop-in basis, but pandemic restrictions limited in-person attendance to just a suitably distanced fourteen persons supplemented by online participants.

** Campos Martins also released advanced copies of the first booklet in the series *The Fabulous Fables of Laurabee*, which she co-authored with the support of both the Lindau Nobel Laureate Meetings and Climate Econometrics at Nuffield College, Oxford, *The Fables* are intended to be a series of booklets designed to increase scientific knowledge and awareness of climate change issues through direct communication to a young audience. The series was formally launched two days later at COP26 in Glasgow.

*** *The BP Statistical Review of World Energy* provided for more than 70 years a freely available, timely and comprehensive analysis of data on world energy markets using the previous year's data. The analysis pertained to energy production, consumption, trade and emissions, and the compilation of the data used in the report discussed at Panmure House was undertaken by Heriot-Watt University. The Energy Institute became the new custodian of *The Review* in 2023.

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