UNIVERSITY OF EDINBURGH
Business School

Dear Dr. Ball, Dear SFC Committee,

We are very much delighted to include our Expression of Interest (EOI) towards the SFC's Alliances for Research Challenges (ARCs) funding program highlighting the very large potential of the multi-institutional, cross-sectoral and multidisciplinary field of **green data science for sustainable developmen**t has for **substantially attracting external research funding in the Scottish research environment** and for building the Scottish green data science and sustainable finance ecosystem as a world leading multi-institutional research program.

Green financial data science is an emerging field situated at the intersection between finance, sustainable development, computer science and statistics which aims to **arrive at conceptual explanations of and practical solutions to sustainable development issues** (with a focus on environmental issues) through data driven approaches. Green financial data science is expected to underpin a high proportion of investment and business decisions related to sustainable development across financial institutions, governments and companies alike as relevant datasets have become more readily available and the advancement in information technology allows for more efficient ways to collect, analyse and model these datasets, some in real time. Green financial data science opportunities include but are not limited to:

- **Supporting the design and deployment of data science infrastructure across financial institutions and sustainable financial centres.**
- **Modelling Impacts on the Sustainable Development Goals (SDGs).**
- **Developing Anti-Greenwashing (AGW) approaches.**
- **Evidence-Based Sustainable Investing.**
- **Engaging in Green AI.**
- **Educating the next generation of green data & technology leaders.**

The above-mentioned areas build on the Scottish Government's priorities in the area of environment (e.g. **Climate Change Plan 2020 Update & The Environment Strategy for Scotland**), the Government's **Inward Investment Plan** which focuses on attracting global investment flows in digital financial services among other key areas, and the Government's Capital Investment Plan which focuses on sectors where Scotland can demonstrate a real international comparative advantage, and marks a pivot in Scotland's approach towards targeting sustainable investments.

Our proposal builds on the strengths of a Scottish wide network of research and innovation institutions on substantially attracting research funding and building Scotland in a **Global Centre for Research Excellence in Green Financial Data Science**. The institutions who have a deep commitment and interest to contributing to the themes above include: The University of Edinburgh as lead (Centre for Business, Climate Change, and Sustainability & Edinburgh Futures Institute), the University of St. Andrews (School of Management and Centre for Energy Ethics), The Global Ethical Finance Initiative (GEFI), The Edinburgh Centre for Carbon Innovation, the Smart Data Foundry, The Data Lab as well as supported by private institutions who carry research on sustainable finance and who have seeded research and innovation projects in the University of Edinburgh on the theme of green data science: Abrdn, Baillie Gifford, Natwest Group as well as institutions such as the Green Finance Institute who convenes the UK Treasury's Green Technical Advisory Group. We would be delighted to build on this EOI towards a fully fundable proposal with an extended consortia building on the capabilities of the institutions above. Thank you very much for considering it.

Dr. Theodor Cojoianu

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Member of the Executive Committee & Impact Officer | Global Network on Financial Geography

Member of the EU Platform on Sustainable Finance (2020 - 2022) | DG FISMA | European Commission
Member of the Green Technical Advisory Group (GTAG) | Green Finance Institute & HM Treasury

Green Financial Data Science ARC

Lead: University of Edinburgh

The sustainable finance field has grown dramatically since the 2016 launch of the UN-backed Principles for Responsible Investment, which currently has over 4,000 financial institutions and financial intermediaries as signatories. These entities have over $US120 trillion assets under management and all pledged to take "due account of environmental and social considerations in investment decision making, leading to increased investments in longer-term and sustainable activities' (European Commission 2018, p.2).

The European Commission further states that "sustainable finance has a key role to play in delivering on the policy objectives under the European Green Deal as well as the EU's international commitments on climate and sustainability objectives." On the back of the financial industry's attention to environmental, social and governance (ESG) issues, the ESG / green data science industry has emerged to serve the needs of asset managers, asset owners, policymakers and other decision makers to assess the sustainability credentials of their investee companies or projects across financial asset classes. The industry is now valued at over US$1 billion worldwide and growing to match the data demand triggered by sustainable investment products.

Scottish Leadership in Green Financial Data Science Research & Innovation

In the Scottish Government's "Investing with Purpose: global capital investment plan", the government recognizes that Scotland is already in a strong position to pivot towards Impact/ESG investment. Research by the Ethical Finance Hub found that Scotland-based investment funds manage 11% of the UK's responsible investing market, compared to a 7% share of the conventional market; and that this had formed a significant part of the sector's strong growth in recent decades. The areas Scotland needs investment in are attractive to investors looking to increase their exposure in responsible investing. These include the Scottish growth sectors which offer strong ethics (data, digital and health), Net Zero and a business environment in Scotland focused on fair work and equalities.

The Scottish Government looks at meeting Scotland's Investment Plan (including on research & innovation) by:

- Promoting Investment opportunities that will be benchmarked against ESG investment criteria.
- Enabling the companies and projects that the government supports to report climate-related disclosures in a standardised and transparent way with flows of ESG monitored via a new metric which will cover environmental and social impacts.
- Building on existing ESG investment activity and work with Scotland's investment management industry, using events such as the Ethical Finance Summit to make Scotland a leading globally established hub for ESG investment.
- Proactively engaging with ESG investors and with sources of capital new to Scotland, such as green bonds, to help us achieve our Net Zero and Wellbeing ambitions.

In this respect, Scotland's Investment Plan, together with its Net-Zero Strategy (which includes nature based solutions and thus expands in the area of biodiversity), Environment Strategy, Energy Strategy, Land Use Strategy, mean that Scotland has a ripe regulatory environment and support towards solving environmental issues and attracting funding for:

Supporting the design and deployment of data science infrastructure across financial institutions and sustainable financial centres. As major financial centres, have committed to mobilise investment and capital into projects that are sustainable and tackle climate change, there is a good opportunity to engage with policymakers and city-regions that are looking to lead on sustainable development based on sound, contextual datasets.

Modelling Impacts on the Sustainable Development Goals (SDGs). The exponential growth of sustainable finance ($22.89 trillion AUM in 2016 across different investment strategies) and the commitment of financial institutions worldwide to invest towards achieving the SDGs implies that there is a big analytical challenge and opportunity in tracking and analysing the impacts of finance on the SDGs.

Developing Anti-Green-Washing (AGW) approaches. While thousands of companies worldwide report a number for their Scope 1 (direct) GHG emissions, collecting 100.0% GHG emissions is technically and practically very challenging for most corporations. In fact, only 43 firms worldwide disclosed 100.0% Scope 1 GHG emissions in 2016, with over 30% of these from the financial sector. This is a development which significantly hinders the progress of country, investor and business initiatives addressing climate change and looking to accelerate the transition to a low carbon economy, and hence, developing ways to detect and deal with green washing can help focus national and international efforts towards delivering real change.

Evidence-Based Sustainable Investing. As investors are taking the lead in quantifying the effects of finance on sustainable development, green data science can help the financial community assess risks and opportunities in the context of a low carbon transition, as well as innovate towards the provision of new financial services which support the growth of the green economy.

Engaging in Green AI. Advances in machine learning and artificial intelligence applied to both environmental issues and to financial datasets means that there are both opportunities and challenges in testing and scaling data & analytics innovations.

Educating the next generation of green data & technology leaders. The shortage of data scientists globally means that there is an opportunity to training and retaining the top talent in data science applied to sustainable development issues. Published along with 2020 CCP, ScotGov's Climate Emergency Skills Action Plan (CESAP) emphasised a focus on green jobs via training and re-/up-skilling. Of the underpinning skills highlighted for a successful green recovery, digital and data skills will play an important role in green data science. The proposed research not only further develops Scottish academic capabilities in the areas of data science, but also results in research that further strengthens Scotland's appeal to those with data and digital skills. Leveraging an alliance focused on green data, Scotland can further develop specialist knowledge around data science and analytics, including AI and ML. This can be further disseminated through private sector partnerships to utilise research results of green data.

UK-wide Regulation Context for Green Financial Data Science

In October 2021 the UK government set out its Greening Finance strategy, which aims to unlock the capital needed to scale-up the green economy. One of the primary tools underpinning the Green Finance strategy is UK Green Taxonomy. The UK Taxonomy is a is a classification system, which aims to clarify for the benefit of investors and companies, which economic activities are sustainable, and substantially contribute to at least one or more of the following environmental objectives while not harming the others: 1) climate change mitigation; 2) climate change adaptation; 3) the sustainable use and protection of water and marine resources; 4) the transition to a circular economy; 5) pollution prevention and control; and 6) the protection and restoration of biodiversity and ecosystems.

Thus, the UK government is planning to create reporting requirements for UK companies that fall under the remit of its Sustainability Disclosure Requirements regulation, where certain companies will be required to disclose the percentage of their capital expenditure, operational expenditure and turnover that relates to Taxonomy-aligned activities. This finance policy aims to attract substantial financial flows in UK-based circular economy business models and innovations (in addition to those that fall under the other five environmental objectives).

Given that the UK Taxonomy will be on-shored from EU legislation in 2023 and further modified to suit the UK context, it is crucial to understand to what extent the Scottish economy is covered by the economic activities proposed under the EU and UK Taxonomy which requires a significant amount of

rigorous green data analysis and research. Implications on the Scottish financial sector, including new regulations under the Financial Conduct Authority.

Scottish Taskforce for Green and Sustainable Financial Services

Initiated by the Scottish Government and the Global Ethical Finance Initiative, and with support from Scottish Financial Enterprise the taskforce aims to coordinate and enhance Scotland's sustainable finance cluster and develop its position as a leading global centre of excellence for green and sustainable finance. The Taskforce presents a unique opportunity for Scottish financial services to work together and create a globally recognised centre for sustainable and green financial services.

Our initiative, as well as the taskforce rely on the fact that over 160,000 people are employed in finance related jobs and £9.5 billion of responsible funds are already managed in Scotland.

Green Financial Data Science Consortia

The institutions who have a deep commitment and interest to contributing to the themes above include: The University of Edinburgh as lead (Centre for Business, Climate Change, and Sustainability & Edinburgh Futures Institute), the University of St. Andrews (School of Management and Centre for Energy Ethics), The Global Ethical Finance Initiative (GEFI), The Edinburgh Centre for Carbon Innovation, the Smart Data Foundry, The Data Lab as well as supported by private institutions who carry research on sustainable finance and who have seeded research and innovation projects in the University of Edinburgh on the theme of green data science: Abrdn, Baillie Gifford, Natwest Group as well as institutions such as the Green Finance Institute who convenes the UK Treasury's Green Technical Advisory Group.

Funding Opportunities

In addition to pursuing traditional research funding opportunities in green financial data science from bodies such as UKRI or the EU Commission, the consortia will seek to substantially bring in private sector funding as well as foundations who can sustain a strong research & innovation pipeline in Scotland. These models have already been successful on the topic of sustainable finance / green financial data science as shown by the University of Edinburgh's recently funded projects with abrdn and the Natwest Group:

- abrdn and the University of Edinburgh have formed an industry-academic partnership to deliver innovation in the investment sector. The partnership will establish the Centre for Investing Innovation with funding of £7.5 million over five years from abrdn, the global asset manager. It will be based within the University's Edinburgh Futures Institute, which is focused on addressing the critical challenges facing society. The Centre will focus on green financial data science trying to understand how outcomes associated to environmental, social and governance (ESG) factors relate to investment processes. It will also explore how innovative investment practices can deliver societal benefits. The centre will further guide and embed technology, data science and artificial intelligence towards building state-of-the art investing capabilities in Scotland.
- The University of Edinburgh Centre for Business, Climate Change and Sustainability (B-CCaS) has formed a new three-year partnership with NatWest. The £1.5 million partnership will facilitate the delivery of a climate education and green data programme to more than 16,000 people employed across the NatWest Group by the end of 2024, and will also support the delivery of the in-depth Climate Change Transformation training programme for those in priority roles who require a broader level of knowledge.

The consortia already has connections and expressed interest to work with US (MIT), Irish (UCD), Luxembourg (University of Luxembourg) and Brazilian research institutions on the topic to avail of more than £3 million in funding from UKRI for cross border research collaborations. In addition, we have identified research grant opportunities at the intersection between finance, sustainability and data science of over an additional £10 million of funding from private donors, foundations and the EU Commission which the consortia can access in the next 3 years.