I am grateful for the opportunity to provide evidence to the Committee and to contribute to its scrutiny of the draft Climate Change Plan. I have aimed to focus my responses on areas where my own research and collaborative work can most usefully inform questions of delivery, governance, and measurable health and equity outcomes. I would very much welcome any follow up questions from the Committee, and I am happy to provide additional clarification or written evidence where that would support its deliberations.

Dr Andrew Sudmant, Edinburgh Climate Change Institute, University of Edinburgh

Could you provide an overview of the scale of the impacts of emissions on health and the strength of evidence for them

My research does not attempt a full burden of disease assessment of emissions across all sectors, so I would not want to duplicate the epidemiological evidence that other witnesses can present. What I can state confidently is that when we apply standard United Kingdom appraisal methods to mitigation in buildings and transport, the monetised social benefits, including public health related pathways, can dominate the overall economic case for action. In Sudmant et al. (2024), the social benefits form the large majority of total benefits, and include quantified pathways such as physical activity, indoor air quality, excess cold, road safety, congestion, and noise. That result implies that the health related consequences of emission linked systems, particularly transport and housing, are large enough to materially change policy appraisal when they are measured rather than sidelined (Sudmant et al., 2024).

From our recent work assessing the co-benefits associated with the most recent advise the Climate Change Committee has given to parliament finds more than £130 billion in health benefits over the next 20 years across the UK. There are large uncertainties around these figures but that is comparable to the £100 billion the CCC estimates is the cost of achieving these climate actions.

This most recent work can be found here: https://ukcobenefitsatlas.net/

What are the costs to the NHS and public services of the impacts of emissions on health

I am not aware of a comprehensive Scotland-specific accounting of these costs, but this gap itself is important. The evidence that does exist, including my own work on the UK Co-Benefits Atlas and related research by colleagues, points to two clear lines of evidence.

First, the causal epidemiological case is strong for several emissions-linked health pathways, particularly air pollution and cold, inefficient housing. These exposures are associated with avoidable illness and premature mortality and therefore imply ongoing demand and cost

pressures for the NHS and other public services, even if those costs are not currently labelled or tracked as climate-related.

Second, appraisal-based modelling translates these pathways into economic value. In our peer-reviewed analysis of climate action in buildings and transport, we find that most of the benefits arise as social benefits, including public health improvements and improved housing conditions, rather than as direct financial savings alone (Sudmant et al., 2024). The UK Co-Benefits Atlas builds on this by expressing benefits in monetary terms that can accrue to public bodies such as the NHS and local authorities, making visible how emissions-intensive systems shift future service demand and costs.

The key implication for Parliament is that the absence of a precise NHS cost figure should not be interpreted as absence of cost. Rather, it highlights the need for a more systematic approach that links emissions reduction, health outcomes, and public service demand, so that prevention value is recognised in policy design and budget decisions (Sudmant et al., 2024; Phillips et al., 2025).

Do you think that the policies set out in the CCP should explicitly seek to improve population health and reduce health inequalities

Yes, because the magnitude and distribution of co benefits means that health and equity are not peripheral outcomes, they are a central determinant of whether policy represents good value for Scotland. Only a minority of benefits from climate actions are financial, while the majority are social benefits, meaning that a Climate Change Plan framed only around carbon and direct financials risks systematically undervaluing interventions that improve wellbeing and reduce future service demand. The CO BENS and Atlas work extends this logic by modelling co benefits at the data zone level using socio economic attributes, which enables explicit targeting and equity sensitive sequencing. If the Plan makes health and inequality outcomes explicit, it becomes easier to align appraisal, budgets, and accountability with prevention rather than short term firefighting. (Sudmant et al., 2024; Phillips et al., 2025).

Are there any unintended negative health consequences that could arise from emissions reduction policies

Yes, and the key point is that they are often foreseeable and designable out if monitoring is built in from the start. Sudmant et al. (2024) explicitly includes indoor air quality, excess cold, and traffic accidents among the monetised social pathways, which helps keep attention on potential trade offs, particularly in housing retrofit and transport reallocation. The Atlas framework also includes co costs, where negative values represent costs such as time lost under congestion conditions, and the wider CO BENS framing notes that practical barriers and behavioural burdens can matter for adoption and equity. For Scotland, this argues for pairing mitigation targets with health safeguarding metrics such as ventilation and indoor air quality in retrofit, safety and accessibility in active travel networks, and distributional checks so that benefits do not concentrate only where capacity is already high. (Sudmant et al., 2024; Phillips et al., 2025)

Is the draft CCP well aligned to wider health policy

Alignment is strongest when climate policy is treated as prevention policy, with measurable outcomes and clear responsibility for delivery and monitoring. My evidence is that when social benefits are quantified, they become central to the case for action, and that makes integration across portfolios not merely desirable but necessary. Sudmant et al. (2024) explicitly argues that the magnitude of social benefits underscores the need to integrate social and climate challenges in policymaking, and also shows that choices between decarbonisation pathways involve normative decisions, which in a Scottish context should be made transparently with health and inequality objectives on the table.

Theme 1 Impacts of emissions on health, air quality and cleaner air

Do you think that the policies and proposals set out in the CCP will improve indoor and outdoor air quality, are they drawing on the best available evidence

The mechanisms are well understood for the sectors my modelling focuses on, notably transport and buildings. The CO BENS dataset description sets out that electric vehicles reduce air pollution and that retrofitting homes can reduce cold, damp and mould, with downstream health improvements, and Sudmant et al. (2024) includes indoor air quality among the monetised social pathways in its appraisal of interventions. The implication for the Plan is that air quality improvements are credible where policy reduces combustion exposure and improves building performance, but delivery needs accompanying measurement to confirm that realised indoor air quality and exposure outcomes match expected benefits. (Sudmant et al., 2024; Sudmant & Higgins Lavery, 2025).

Could there be any unintended consequences for health or inequality from these policies

Yes, and distribution is the central risk pathway. Sudmant (2024) shows that co benefits vary dramatically between places and scenarios, and highlights that air quality benefits are much larger in busy urban centres than in rural contexts, so interventions that are not geographically targeted can inadvertently widen gaps in realised benefit. The Atlas poster also emphasises that densely populated areas benefit more from air quality improvements because more people experience the health gain, which means that equity outcomes depend on whether high burden communities receive timely and high quality implementation. Monitoring therefore needs to disaggregate by place and deprivation, and governance needs to be clear about how adoption barriers are addressed in less resourced communities. (Sudmant, 2024; Phillips et al., 2025).

Theme 2 Other co benefits

Transport and physical activity

Is there sufficient focus in the CCP on active travel

From the perspective of quantified co benefits, active travel is one of the clearest routes to large health and wellbeing gains, particularly in urban Scotland where inactivity, congestion, and poor air quality intersect.

To what extent does the draft CCP make use of the modelling carried out by ECCI and how could the Co Benefits Atlas be used to support the Scottish Government, local authorities and NHS Boards in planning or reconfiguring services, for example transport strategies

The most immediate value of the Atlas is that it translates technical modelling into place specific information that can be used in business cases and service planning discussions. Phillips et al. (2025) describes the Atlas as linking 11 co benefits and co costs for 46,000 data zones with 17 socio economic attributes and expressing impacts in pounds, including amounts gained or lost by public organisations such as the NHS or local government. This enables the Scottish Government and delivery partners to identify where active travel and public transport investment is likely to yield the largest combined carbon and health returns, and to identify distributional patterns so that planning addresses inequalities rather than treating them as an afterthought. I would suggest formalising a pathway where local authorities and NHS Boards use the Atlas as an initial screening tool, then combine it with local service data to prioritise corridors and communities where health gains and reduced demand are plausible, and where safeguards such as safety and accessibility are needed. (Phillips et al., 2025; Edinburgh Climate Change Institute, n.d.).

Dietary improvements

Will the policies in the CCP deliver health benefits associated with the growing and eating of more vegetables and reducing meat and dairy consumption

This sits somewhat outside the core scope of my published co benefits modelling, which focuses primarily on buildings and transport and uses established appraisal methods for those pathways. My contribution here is methodological and governance related: if the Plan expects dietary change to deliver health benefits, it should specify measurable intermediate indicators and equity checks, and it should be explicit about which bodies hold responsibility for

delivery and for monitoring outcomes. The wider CO BENS framing is that mitigation actions have local and tangible impacts on lives, and that those impacts can be made visible and governable when data and accountability align, so the same logic applies to diet even if it is not yet quantified in my dataset at the same resolution. (Edinburgh Climate Change Institute, n.d.).

Buildings, heat, cold and dampness

Will the policies in the CCP achieve the health and health equity co benefits associated with building energy efficiency

The evidence from my work is that building interventions can generate substantial social value through pathways that matter directly to health and inequality. Sudmant et al. (2024) includes excess cold, indoor air quality, and home comfort among the social benefits monetised in its appraisal of climate interventions, and the CO BENS dataset description highlights how retrofitting can reduce cold, damp and mould with improvements in health outcomes. The equity question then becomes one of sequencing and targeting: if delivery prioritises households with the greatest exposure to cold and damp, and if measures are paired with ventilation and quality assurance, the likelihood of health and inequality gains increases. The Atlas gives a practical way to identify where these benefits may be largest and where costs or barriers may impede uptake, which can support a more prevention oriented allocation of retrofit capacity. (Sudmant et al., 2024; Sudmant & Higgins Lavery, 2025; Phillips et al., 2025).

Theme 3 Financial costs and benefits

Could you comment on the Scottish Government's financial assessments of the co benefits of the actions described in the draft CCP and how they can be used and understood alongside the modelling done by the ECCI

My main caution is that financial assessments alone may materially understate the case for action if they omit social benefits that are both large and policy relevant. Our work has found that only a minority of benefits are financial, while 79 percent are social benefits such as public health, congestion, and thermal comfort, meaning that a narrow financial appraisal can mis rank interventions and systematically bias decisions away from health promoting options. The ECCI and CO BENS approach complements financial assessment by providing a structured quantification of additional benefits and co costs that accrue to public bodies and households, expressed in monetary terms for comparability. I suggest the two should be used together, with transparent treatment of uncertainty and clear avoidance of double counting, to support decisions that reflect the real distribution of costs and benefits across government. (Sudmant et al., 2024; Phillips et al., 2025).

How should the Scottish Government ensure that budget allocations explicitly account for the health co benefits of proposed policies and in a way that is targeted to deliver health equity and not just carbon reduction

The first step is to require that major Climate Change Plan programmes include quantified social and health related benefits in their business cases using consistent appraisal methods, not as qualitative narrative. The second step is to make distribution explicit, using place based modelling and deprivation disaggregation so that budgets can be targeted where preventable ill health and exposure are highest. The third step is governance: where benefits accrue to the NHS or social care from investments elsewhere, budgets should include a mechanism for cross portfolio accountability and, where feasible, reinvestment in prevention. The Atlas and dataset provide a practical platform for generating the place based estimates that can underpin this discipline. (Phillips et al., 2025; Bissett, n.d.).

What role do local authorities, integration authorities and health boards have in realising co benefits and what resources, or further resources, financial and other, do they require to support national policy identified in the CCP

Local authorities and integration authorities shape many of the delivery levers that determine whether co benefits are realised, especially in transport, housing, and spatial planning. SCIS has described how local authorities can monitor delivery through indicators such as the number of heat pumps installed, and the CO BENS team has worked with SCIS to make co benefits legible to local decision making, which offers a model for Scotland wide implementation support. Health boards and social care bodies are essential partners because they hold outcome data, can validate whether expected reductions in demand materialise, and can help define what outcome shifts are meaningful and timely. The resource requirement is not only capital for projects, but analytic capacity, data sharing arrangements, and staff time to integrate evidence into planning cycles and to sustain monitoring beyond pilot phases. (Bissett, n.d.; Phillips et al., 2025).

What mechanisms could be used to support prioritisation and the balance of preventive over short term cost pressures

A practical mechanism is to institutionalise a prevention oriented appraisal requirement so that interventions are prioritised based on combined carbon, health, and social value rather than on short term budget silos. A second mechanism is to use place based screening, such as the Atlas, to identify high value interventions for specific localities, which supports targeted prioritisation when budgets are constrained. A third mechanism is to adopt explicit cross portfolio governance so that portfolios that pay for action are not penalised when other portfolios capture the savings, which is a recurring reason prevention is underfunded. (Sudmant et al., 2024; Phillips et al., 2025).

Theme 4 Inclusiveness, engagement and inequalities

Do the government's current communication approaches and language around the CCP help people to understand both the potential impacts on and benefits for health

The risk in public communication is that decarbonisation is framed primarily as sacrifice, which can weaken social mandate and obscure the near term local gains that matter for households and communities. The Atlas was created in part to make complex modelling accessible and explorable by diverse audiences, which can support more concrete local conversations about health benefits and service implications. I suggest that health framing becomes more credible when paired with place specific numbers and when it is honest about trade offs and distribution. (Sudmant, 2024; Phillips et al., 2025).

To what extent has the Scottish Government engaged with the health and social care sector in developing this draft Plan, what more should be done to ensure that engagement empowers communities to take action and to benefit from it

I cannot speak authoritatively about the internal engagement process for the draft Plan. What I can recommend, drawing from the practice of developing the Atlas through interdisciplinary collaboration, is that engagement should focus on shared problem definition, shared metrics, and shared governance, rather than consultation at the end of the process. Communities are more likely to feel empowered when engagement is linked to visible decisions and when local data shows how benefits can accrue to their area, rather than relying on national averages.

What data, research and intelligence would be essential for local authorities to have access to in order that they can mitigate for any unintended consequences for inequalities

Local authorities need three layers of intelligence. First, delivery and uptake data for interventions, disaggregated by place and population group, so that adoption gaps are visible early. Second, exposure and intermediate outcome data, such as cold homes, indoor air quality proxies, traffic danger, and access metrics, that link interventions to plausible health pathways. Third, a place-based evidence layer that contextualises expected co benefits and co costs against socio economic conditions, which is precisely the contribution of the Atlas linking 11 co benefit and co cost metrics with 17 socio economic attributes at data zone resolution, including methods that group households into archetypes using statistical learning. The data scaling work also warns that the scale and geography of data can shape priorities and equity outcomes, so consistent geographies and transparency about aggregation are essential.

What evidence is there that cutting emissions will help address health inequalities rather than widen them further

The evidence from my work is conditional rather than automatic. Co benefits vary substantially between places, and policy choices determine whether high burden communities receive early, high quality delivery, or whether benefits accrue primarily where capacity and uptake are already high. Densely populated areas can see larger health gains from air quality improvements, which implies that distribution depends on where and how interventions are implemented. In practice, emissions reduction can support inequality reduction when it is paired with targeted investment, barrier reduction for lower income households, and monitoring that surfaces distributional outcomes early enough to adjust delivery.

Theme 5 The CCP and rurality and access to services

Are you satisfied that the CCP does enough to consider and address health equity in rural and island communities

The modelling work shows that some co benefits, such as air quality gains from reduced traffic emissions, are likely to be much larger in dense urban centres than in rural areas, which means rural and island communities may experience a different bundle of benefits and costs. A fair Plan would make those differences explicit and ensure rural priorities such as affordable warmth, energy security, and access to services are reflected in intervention design and monitoring, rather than assuming that urban benefit pathways generalise. The Atlas and CO BENS approach, which models impacts across all places with local context, provides a tool for making that differentiation visible. (Sudmant, 2024; Sudmant & Higgins Lavery, 2025).

Theme 6 Governance, delivery and monitoring

What monitoring is required of climate action and emission reduction policies to ensure that the inequality gap does not increase as an unintended consequence

Monitoring needs to connect delivery to outcomes through a small set of linked indicators, disaggregated by place and deprivation, and governed as a shared accountability system rather than as separate portfolio scorecards. SCIS provides a practical example of delivery monitoring through indicators such as number of domestic heat pumps installed, which can then be linked to expected co benefits such as fewer cold and damp homes and lower illness related absences. The Atlas provides a way to estimate expected spatial distribution of co benefits and co costs, which can be treated as a benchmark against which observed uptake and outcomes are compared. Data scaling research cautions that aggregation choices can shape perceived priorities and equity implications, so Scotland should define common geographies and publish transparent methods for aggregation and reporting.

There is no dedicated section on governance in the draft CCP. How should the Scottish Government ensure that co benefits are embedded in policy design and budget decisions, and what mechanisms should be put in place to hold Directorates accountable for delivering measurable co benefits over time

The starting point is to treat co benefits as measurable outcomes with named owners, not as secondary narratives. Sudmant et al. (2024) shows that social benefits can dominate the case for action, implying that appraisal and decision systems that omit them will bias budgets and accountability away from prevention. I would suggest that each major policy package in the Plan should have an explicit logic model that links emissions actions to quantified health and social outcomes, and that annual reporting should include both delivery metrics and outcome proxies, disaggregated by place. The Atlas provides a practical infrastructure for quantifying and communicating these outcomes, including benefits expressed for public bodies such as the NHS, which creates a basis for cross portfolio accountability where costs and benefits sit in different places. (Sudmant et al., 2024; Phillips et al., 2025).

Should local health and care bodies have a role in further developing the approach to monitoring and evaluation set out in the draft CCP

Yes, because health and care bodies are both beneficiaries and stewards of the data needed to validate whether benefits are realised. The CO BENS and Atlas framework explicitly expresses benefits in pounds that can accrue to organisations such as the NHS, and SCIS summarises that the modelling estimates savings in future spend for the NHS, local authorities, and social care providers over time, which implies that health system actors have a direct stake in monitoring design. Health and care bodies can help specify which outcome shifts are plausible within Plan timescales, can interpret service demand data, and can help ensure that evaluation accounts for inequalities and unintended consequences. This is also consistent with the governance insight from data scaling research, which emphasises that coordination across scales depends partly on shared data practices and transparency, so health bodies should be involved as partners in the measurement architecture. (Phillips et al., 2025; Bissett, n.d.; Sudmant, 2024).

Phillips, S., Bach, B., & Sudmant, A. (2025). The UK Co Benefits Atlas: Poster summary. University of Edinburgh.

Sudmant, A. (2024). Data scaling: Implications for climate action and governance in the UK. Environmental Management. https://doi.org/10.1007/s00267-024-01991-5

Sudmant, A., Higgins Lavery, R., Fulkner, J., Boyle, D., & Williamson, J. (2024). Climate policy as social policy? A comprehensive assessment of the economic impact of climate action in the UK. Journal of Environmental Studies and Sciences. https://doi.org/10.1007/s13412-024-00955-9

University of Edinburgh, School of GeoSciences. (2025, July 4). UK Co Benefits Atlas launches to highlight social value of climate action