Opening Statement to Joint Committee on Climate Action on the 22nd of November 2022 (Dr. James Moran ATU)

I wish to thank the committee for their invitation to present this evidence statement to them today. I am a senior lecturer in Biology and Ecology in the Department of Natural Resources and the Environment at the Atlantic Technological University, Galway. I lead the Agro-ecology and Rural Development (ARD) research group. The group concentrates on sustainable agricultural and land use systems with a particular focus on the Common Agriculture Policy and improving agri-environment policy and practice. In my presentation today I want to concentrate on several key topics related to the demands on our land base to contribute to enhanced climate action and nature restoration, while maintaining viable food and fibre production. To respond to these needs as a society we need to work within an **integrated land use framework** cognisant of the need to adopt an **adaptive management approach** (learning while doing). This will **require large scale changes to our land use system over the next 30 years**, which society can only achieve with clear direction and leadership from government and whole of government supports. This requires substantial **institutional innovation and capacity building**. We have seen local communities and individuals across the country take the lead. We must create an **enabling environment** where local action is fostered, takes place within and contributes to a larger regional and national land use transformation. This needs to take place as part of an integrated land use strategy with clear land use targets and goals over short (5 years), medium (30 years) and long term, intergenerational time horizons.

First, we must start from the fundamental realisation that we have to achieve this for the survival of human society. We must respond with urgent action to the interrelated climate and biodiversity crises, that has been acknowledged by the government declaration on the climate and biodiversity emergency more than 3 years ago.

We must also recognise (as I presented in November 2021 to the Committee) that Ireland is a diverse mix of landscapes characterised by differences in geology, topography, soils, climatic variation and land cover with a wide range in land use capacity. One size does not fit all, and different land types are advantaged to provide a set of particular services (e.g., high quantities of food and fibre, C storage, flood alleviation, space for nature, amenity and recreational value). We need to create a system which recognises the different capacities of our diverse land base and where it is possible for different areas to capitalise on their natural advantages.

In February 2022 we began a 6-month contract awarded by the EPA to undertake a Land Use Evidence Review Research Project[1] as part of phase 1 of the DAFM and DECC national land use evidence review. The project was led by my colleague Dr. Eamon Haughey (ATU) and involved collaboration with Dr David Styles (University of Galway), Dr. Matt Saunders (Trinity Colleague Dublin) and Ms. Ruth Bennett Coady (ATU). The report provides an overview of the current land cover, land use and trends in Ireland; a review of overall agriculture and LULUCF (Land Use, Land Use Change and Forestry) greenhouse gas fluxes; climate change scenarios and their impact on ecosystem functioning; modelling of land use change scenarios for net zero by 2050; possible synergies and trade-offs resulting from land use change for net zero; and options to support policy development.

This report highlights that there are substantial differences in the dominant land cover classes between regions. The agriculture, forestry and other land use (AFOLU) sector was a significant net source of GHG emissions in Ireland during the 2016-2020 period (average = 27,707 ± 888 kt CO_2 eq yr^{-}

[1] Haughey, E., Styles, D., Saunders, M., Bennett-Coady, R. and Moran, J. (in press). Land Use Review: Fluxes, Scenarios and Capacity. Report submitted to EPA as part of the DAFM and DECC led national land use evidence review, September 2022.

[1]). Within this, forest land and associated harvested wood products provide an important net sink despite forest on peatland being a source. Grasslands on mineral soils are also a net sink but are outweighed by emissions from grasslands on peat soils.

The government has committed to achieve net-zero by 2050 and the report explores land use change scenarios to reach net zero in the AFOLU sector by 2050. It must be noted that there are proposals under the EU "Fit for 55" package to amend the LULUCF Regulation to merge the LULUCF sector and non-CO_2 agriculture sector into a new climate pillar. This new pillar would have a target of climate neutrality by 2035 and have a target for negative emissions thereafter.

To explore land use change scenarios required to reach AFOLU net zero by 2050 several scenarios were developed based on the GOBLIN model approach and a set of simplified baseline assumptions. Recognising the inherent simplification in this scenario modelling approach, the exercise highlights the scale of the land use change required to reach net zero in AFOLU by 2050. Even with excluding CH_4, it was only possible to reach net zero in AFOLU by 2050 by including each of the following measures: increased livestock production efficiency (30% emissions reduction); plus ruminant livestock number reduction (up to 30%); ambitious organic soil rewetting/raising water table (up to 90% of drained organic soils) and an additional forest area of 500,000 ha by 2050.

The report explores the potential impacts of this land use change on biodiversity and water resources and without effective spatial targeting and subsequent land management there is potential for substantial trade-offs for biodiversity and water (see Table 1). This level of change in the AFOLU system is urgently required and we must not delay in putting plans in place to deliver the required change. We have already put ourselves in a position through lack of action that our emissions have risen in the AFOLU sector in recent years, rather than decline. This makes the required changes even more difficult to achieve and increases the risk that in meeting net zero targets that there could be major unintended consequences for water quality and biodiversity, as well as many other provisioning and non-provisioning ecosystem services. Ultimately making the situation worse in the medium and long term. In relation to land use in Ireland, we cannot move from a situation of production tunnel vision to carbon tunnel vision. We must have an integrated land use developed by government in 2023. Continued biodiversity loss has the potential to limit the effectiveness of mitigation measures and will further reduce the resilience of ecosystems to climate change extremes. The report highlights that for successful climate change mitigation and for measures to have significant co-benefits for biodiversity, water quality and water regulation, a range of site-specific conditions must be considered. This ultimately requires site by site planning and management with land use targeted to meet multiple goals, cognisant of the baseline condition and capacity of the site. This must be cognisant of trade-offs and synergies to balance environment, social and economic outcomes.

Analysis of some key current policy documents highlights that in many cases various existing policy targets are not aligned or consistent with the level of land used change required to meet AFOLU net zero by 2050. There is scope for climate actions to be deployed across the land use sector but there must be more effective knowledge sharing and innovation development with land managers, to enable effective and timely climate actions. An enabling environment is required and important knowledge gaps that hamper rapid progress across multiple sectors must be addressed. These include the need for more detailed data on land cover/land use (new high resolution national land cover map from OSI/EPA expected in November 2022) and soil carbon fluxes, uncertainty with regards climate impacts on the land system and the contribution of areas of semi-natural vegetation to climate mitigation.

It is clear from the above, that there is currently no carbon credit nationally in the AFOLU sector as we have a significant debit on our AFOLU GHG balance sheet. Given current land cover and land use practices, and even with improved measurement and significant land use change, we are unlikely to have any carbon credits in the AFOLU sector in the medium term. However, this national AFOLU GHG

balance sheet masks the substantial variation between individual land parcels and farms across the country which have different land cover and land management practices. To enable and incentivise positive land use management we must urgently create an enabling policy environment for action by local communities across the country.

I want to finish with some observations on Carbon Farming (agriculture practices that remove carbon from the atmosphere and store it in soil), and to highlight that we are further along the development pathway in relation to Carbon Farming initiatives in Ireland than is generally understood. Understanding what we know from above evidence, these carbon removals should not be traded in the carbon markets (allowing other sectors, outside AFOLU, to offset their emissions and potentially avoid emissions reductions within their sectors). One of the most promising carbon farming measures is the conservation and restoration of peatlands, which has also significant potential co-benefits for biodiversity. It also has significant potential for climate change adaptation, building resilience of catchments to flooding from predicted more frequent extreme weather events, associated with climate change. Ireland has currently a number of pilot results-based payment programmes underway e.g., the Wild Atlantic Nature LIFE Integrated Project[2] (Targeting Blanket Bog Landscapes in West and North-West) and the Farm Peats European Innovation Partnership[3] (Targeting Raised Bog Landscapes in the Midlands). DAFM are also in the progress of rolling out the ACRES cooperation project which includes results-based payments for peatlands together with supporting actions and landscape measures to enhance their quality. The results-based approach is highlighted as a promising and feasible mechanism to incentivise Carbon Farming in a recent technical guidance handbook on results-based carbon mechanisms produced last year for the EU Commission [4]. This handbook specifically highlights the potential of the hybrid results-based model, and references development work in Ireland, spearheaded by the Burren programme for biodiversity and water. The guidance handbook also highlights the possibility for and potential of quantifying co-benefits for other ecosystem services besides C storage, via bundling and grouping of ecosystem services together in one package. The locally adapted results-based payments projects in Ireland have already adopted an integrated approach with field scoring systems designed to incentivise nature, water and carbon ecosystem services within 10-point field scoring systems. This is set to be rolled out across peatland areas within the eight ACRES cooperation project areas under Ireland's CAP Strategic Plan 2023-2027. ACRES is not without its challenges, but Ireland is demonstrating ambition in this area, and we must all work to ensure that a proven impactful approach at local scale can now be scaled up within a national framework. More work is needed to quantify the exact Carbon benefits associated with individual field scores, but we can combine more extensive monitoring with existing field scoring systems. Essentially "learning while doing" and adopting an adaptive management approach. We must build on this work and not start from scratch with carbon farming initiatives.

Thank you.

[2] https://www.wildatlanticnature.ie/rbps-target-area-maps/

[3] https://www.farmpeat.ie/

[4] COWI, Ecologic Institute and IEEP (2021) Technical Guidance Handbook - setting up and implementing result-based carbon farming mechanisms in the EU Report to the European Commission, DG Climate Action, under Contract No. CLIMA/C.3/ETU/2018/007. COWI, Kongens Lyngby.

Table 1 Assessment of synergies and trade-offs across the land use change measures included under the set of scenarios to reach AFOLU net-zero by 2050 in the Haughey et al. report. The assessment is qualitative and based on the expert opinions of the authors.

Land use change	Mitigation	Adaptation	Biodiversity	Water quality	Notes / Comments
Afforestation					Forest carbon sinks saturate over time and there is a significant risk of sink reversal due to unsustainable future management or natural disasters (e.g., wildfire). These risks increase due to climate change. Afforestation in unsuitable areas (e.g., organic soils) is a concern. The trade-offs and synergies with biodiversity and water is dependent on existing ecological condition of afforested site, species selection and afforestation practices,
Conifer dominated	+++	±	±	±	Afforestation where planting is dominated by non-native conifer species can have a potential negative impact on biodiversity and on water quality and is dependent on-site specific characteristics and landscape context.
Broad leaved dominated	++	++	++	+	Afforestation with more slower growing broadleaved species can have a positive impact on biodiversity and water quality.
Agriculture optimisation					
Increased production efficiency	++	++	=	++	Widely beneficial but could have a net negative impact on mitigation where rebound effects result in increases in absolute emissions.
Increased livestock density on grassland	=	−	−	−−	Likely negative impact to water quality where density of grassland livestock is increased. Actions can be taken to reduce negative impacts on water quality (such as removing access of livestock to water ways).
Decreased livestock density on grassland	=	±	±	+	Likely benefits to water quality where density of grassland livestock is reduced, however this is predicated on appropriate management of livestock (i.e., even a lower density there is potential for adverse outcomes).
Peatland restoration					Potential future vulnerability with these benefits/synergies under future climates. Drought periods and warmer winter temperature are likely to increase C losses from the systems. Also, greater risk of wildfire during summer drawdown events, which could lead to significant short-term emission and impact future ability to assimilate C and resilience climatic variability
Exploited peatland	+++	+++	+++	+++	Expected to be widely beneficial, noting the vulnerability of the carbon sink under future climate. Also, there are likely to be site specific constraints on successful implementation.
Organic soils under grassland	+++	++	++	++	Expected to be widely beneficial, albeit dependant on the level of land use intensity following rewetting. There is considerable uncertainty with regard the loss of grassland productivity and impact of rewetting on land management (i.e., trafficability for livestock and machinery).

Land use change	Mitigation	Adaptation	Biodiversity	Water quality	Notes / Comments
Additional Land Options					Note that to ensure the land to conduct these measures is available they were modelled as additive to Scenario S4d.
Space for nature (S5)	++	++	+++	+++	Expected to be widely beneficial. There is considerable uncertainty with regard the loss of grassland productivity. There are likely to be co-benefits for the long-term sustainability of agroecosystem productivity, with positive impacts on nutrient cycling and pollination services.
Bioenergy from grassland (S6)	++	±	±	±	Significant potential for mitigation benefits by displacing fossil fuels with bioenergy, which is a renewable source, especially in the case of woody perennial species and perennial grasses. However, more variable in the case of anaerobic digestion.
Additional cropland (S7)	−−	++	±	±	Cultivation will result in soil carbon losses from soil currently under grassland. Impact on biodiversity and water quality could be positive if best practice implementation occurs. Where the additional land is used for annual bioenergy crops, the mitigation potential could improve. Implementing carbon mitigation practices such as minimum tillage could also improve the mitigation potential.

Table Legend:

Indicator	Description
+++	Large positive – synergy
++	Moderate positive - synergy
+	Small positive – synergy
=	Neutral or low confidence in direction
−	Small negative – trade-off
−−	Moderate negative
−−−	Large negative
±	Variable – may be positive or negative

Areas of Expertise-Dr. James Moran (Atlantic Technological University - ATU)

I am a senior lecturer in Biology and Ecology in the Department of Natural Resources and the Environment at the Atlantic Technological University, Galway. I lead the Agro-ecology and Rural Development (ARD) research group which concentrates on sustainable agricultural systems with a particular focus on the Common Agriculture Policy and improving agri-environment policy and practice. I am particularly interested in the potential of innovative local partnerships to realise a sustainable future for their area. Current projects include a range of national and international collaborations on EU LIFE Projects; EU Erasmus plus - Innovation Education for Sustainable Development in Peripheral Rural Areas; Design of agri-environment schemes both in Ireland, the UK and Europe; Farmland and Forestry Systems for Biodiversity; and collaborations with a range of European Innovation Partnership operation groups across Ireland. I am currently a member of the National Biodiversity Forum; a member of the Expert Advisory Group of the Citizens' Assembly on biodiversity loss; and board member of European Results Based Payments Network. I am a cofounder and team member of the Farming for Nature not-for-profit initiative established in 2018.