Science Advisory Council

Defra Science Advisory Council (SAC)

Minutes of meeting, 07th April 2022

Actions arising

Action number	Action	Owner
April (22) 01	Workplan: The SAC to consider a discussion item on the themes of (i) future security and circularity of fertilizer use in the UKs agricultural system, and (ii) the use and usefulness of 'digital twinning' within Defra.	SAC Secretariat
April (22) 02	Workplan: The secretariat to arrange further SAC discussion around spatial targeting and spatial variability, focusing on the spatial component of the LNR work.	SAC Secretariat
April (22) 03	Workplan: The secretariat to arrange discussions on Defra's research and development science strategy and science review at a future SAC meeting.	SAC Secretariat

1. Welcome and apologies

The Chair welcomed attendees, apologies are recorded in Annex A.

2. Chief Scientific Adviser (CSA) update

The CSA updated the SAC on five important and timely issues:

1. The consultation of the environmental targets has gone live (opened on the 16.03.2022, closes on the 16.05.2022), with targets on water quality, air quality, resources and waste, trees and biodiversity. The CSA acknowledged the SAC's involvement in the establishment of these targets, encouraging them to review the documentation, engage with the consultation, and circulate within their networks.
2. The UK Research and Innovation's (UKRI) full strategy is now published detailing Defra's collaboration with research councils to better align with future research spending.
3. As a result of disruption to the UK's fertiliser imports from Ukraine and Belarus, the UK Government are engaging in efforts to secure future fertiliser supply and transition to a more circular system. The current crisis is triggering a move towards thinking more innovatively around UK fertiliser use in the agricultural system. The scientific discussion might need future SAC feedback. The consideration of energy as a security issue alongside a Net

Zero issue might have positive environmental implications. The potential security of long-term food supply was also considered, specifically regarding implications of increasing costs domestically and internationally.

4. The 'gene editing bill' is likely to change to the 'precision breeding bill', reflecting the use of technology in new ways linked to breeding processes.
5. The rise of digital twins across government; the idea of linking the cyber and real world more closely. While the CSA acknowledged this concept is already familiar in some branches of environmental sciences it is increasingly relevant across government. The CSA considered 'digital twinning' a subject that might be good to get SAC views on. The SAC noted that 'digital twinning' could be synonymous with 'model-data fusion' and thus if it were to bring further support it would be beneficial. The CSA noted that the process gains more potential if the measurement/monitoring needed is delivered and linked to modelling in a meaningful way.

ACTION April (22) 01: The SAC to consider a discussion item on the themes of (i) future security and circularity of fertilizer use in the UKs agricultural system and (ii) the use and usefulness of 'digital twinning' within Defra.

3. Local Nature Recovery (LNR)

The aim of the discussion was primarily for the SAC to review the broad approach to LNR option development (and some projects that will inform this process), comment on the logic and strength of the approach, and identify potential data/knowledge gaps. Defra explained how a broad range of evidence is being drawn upon to develop LNR offers that will help farmers, foresters, and other land managers to contribute to important national priorities.

The SAC considered the 10 LNR option themes (as published in January 2022) and indicative options (which will be used to inform co-design discussions) as comprehensive and well mapped to existing schemes. The SAC discussed several key themes where they felt more focus could be given or further work could be undertaken. Defra highlighted that Environmental Land Management (ELM) comprises three schemes and that LNR will not be working in isolation.

Collaboration and incentives

The SAC considered the schemes' ability to enhance collaboration yet noted that there were no explicit details on the evidence base for incentives for collaboration and that they would like to analyse the reported behavioural evidence review. Defra pointed the SAC towards the Farm Advice Review which details approaches taken to increase engagement. Furthermore, Defra advised they are pursuing the goal of

building intrinsic motivation to engage in schemes and collaboration - that is, participating in them for inherent satisfaction, rather than solely because of financial incentives - by applying behavioural techniques to influence land managers' reflective and automatic motives.

Defra explained a spectrum of measures that could be used to incentivise landowners/managers (e.g. through variable payments or gentle nudging through social science) and advised the SAC of ongoing research on the role of an active and trusted intermediary alongside increased information dissemination. Consequently, Defra is considering the potential to make it easier for land managers to see what others are doing on neighbouring land. Defra considers information dissemination to also play a role in reducing transaction costs for collaboration.

Spatial coordination

The SAC asked Defra to consider which targets would benefit from spatial coordination between landowners and how best can they be incentivised, given they will likely be costly to those landowners.

The SAC raised concerns with some potential actions like paludiculture and forestry given they are relatively new practices in the UK which may require substantial guidance and culture change. Additionally, the means of getting the best return on investment through LNR was questioned as it was thought the opportunity mapping and value for money appraisals appeared to lack a spatial element. Clarity on the spatial variation in economic values that Defra are working towards was sought as it was not clear to the SAC if economic return was going to be used to optimize scheme design and targeting or if modelling was focused primarily on the impact and spatial variability of ecosystem services.

Linking the proposed LNR work with understanding gained from the 'Countryside Stewardship' scheme (which the SAC considered as not instigating the scale of change that was required), the SAC highlighted the importance of scale and spatial coordination. Defra advised ongoing modelling projects will inform LNR by assessing environmental impact and value of policy actions on ecosystem services and biodiversity and improve understanding of the spatial distribution and variability of impacts and value.

When optimizing spatial design, the SAC discussed intervention configuration within farmland and the related synergies and interactions. The SAC noted the importance of taking measures to ensure actual spatial arrangement of interventions across themes will maximize ecological diversity and carbon storage. Conversely, the way

the LNR proposals target different habitats was flagged as some interventions are specifically targeted to one specific habitat (e.g. lowland heathland) whereas other interventions group habitats (e.g. lowland peatland, upland peatland, moorland, and areas of rough grazing appear amalgamated). The SAC considered merit in separating these habitats given the considerable difference in interventions required for restoration. As some interventions are habitat/environment dependent, Defra acknowledged further understanding is needed to develop an evidence baseline for accurate targeting.

Discussing successful environmental recovery on high-intensity arable land through targeted intervention, and potential case studies for Defra's LNR scheme, the SAC highlighted recent developments from Iowa State University (USA). The Iowa research investigated developing relatively small buffer strips of rudimental vegetation without specific landscape configuration, which triggered an increase in nitrogen uptake without significantly affecting crop yield. The SAC considered how a similar approach of simply setting aside areas of land for the long term without any management yet targeted to areas with substantial environmental issues (e.g. nitrogen pollution or biodiversity loss), could prove a low cost and low risk intervention where other more active management might be harder and more expensive. It was however, noted that this approach would not be appropriate for specialist habitats requiring active management. Additionally, the SAC discussed how the UK's topography would also play a role in the success of implementing natural vegetative buffer zones, for example it might not be appropriate for uplands and catchment heads, but in flatter more arable areas (e.g. Lincolnshire) they might make a substantial difference.

The importance of identifying places where it would make sense to implement policy was discussed, critically the difference between where policy is most needed versus where policy would be most effective. Defra advised they have been developing overlaying pressure and opportunity maps to assess specific components such as the demand for particular services, a specific environmental pressure that needs to be addressed, and where actions can be best delivered.

Defra noted that there remains a lot of data to incorporate, with extensive analysis still to undertake and as such a further SAC discussion on the spatial component of the LNR work was suggested.

Food production

Reviewing LNR's impact on food production, the SAC was unsure how different LNR schemes are being judged against the effect on food production, specifically as with

regards to scheme targeting. Defra advised that food production has been factored into LNR schemes from the ground up, including analysis from within ELM and other Defra schemes.

The SAC questioned if there was a land sharing model being considered and if the effect on actual food production will be judged as part of any LNR decision. Defra advised they are looking across ecosystem services and the role of land use change actions and briefly detailed their modelling of English food production (conducted from an economic standpoint) and aims to expand modelling for assessment of long-term changes in domestic food production. Though not an explicitly land sharing model, one component of Defra's LNR modelling assesses land values, most likely crop type and expected crop yield, from which they can calculate payment rates necessary for intervention uptake and total calories lost from taking given areas out of production.

Building on the food production discussion the SAC considered there to be a lack of detail regarding the link between LNR and Sustainable Farming Incentive (SFI), noting the proposed stacking of SFI standards with LNR options. Concern was also raised around the potential for things to fall between the gaps during the process of stacking independent schemes or the risk that independent SFI schemes might not always work in tandem, thus stacking them inappropriately could inadvertently have negative consequences. Defra highlighted that from 2024, it will no longer be necessary for people to navigate multiple schemes and forms to access different ways to get paid to produce public goods. Both the Sustainable Farming Incentive and Local Nature Recovery will be accessible through a simple digital service that shows each farmer all the options available to them. Farmers will be able to be paid for undertaking Sustainable Farming Incentive standards and Local Nature Recovery options on the same parcel of land where appropriate, provided the actions are compatible and we are not paying for the same actions twice. Defra also highlighted their work on identifying and assessing specific actions which may result in a positive, neutral, or negative impact; enabling more in-depth modelling to be commissioned.

Defra acknowledged SAC questions around impacts on food production is an area of current research; analysis is being conducted to understand the impact of LNR options on both food production and land use change using agricultural data across England (e.g. assessment of the location and quantity of crops/livestock on LNR eligible land to predict food production and/or productivity changes).

Wildlife and the environment

The SAC flagged a potential issue that most local authorities across England do not have a dedicated ecologist with which to produce their local spatial environmental/biodiversity plan. This could pose an issue to scheme implementation, validation, and success.

Defra highlighted the relevance of this comment for the Local Nature Recovery Strategies (LNRS) which are closely connected to but separate from ELM. However, learning from LNRS pilots suggested that when this expertise is not available within a particular local authority, partners can be drawn upon to provide the required resource.

The SAC questioned to what extent Defra have considered and examined the secondary and tertiary impacts of wildlife (re-)introduction on that wider web, offering an example of increasing zoonotic disease transmission. Looking beyond the target species Defra may be trying to (re-)introduce to ways in which the target species interact with other species needs to be done either on a focal species by focal species basis or in terms of considering risk factors in each area. The SAC suggested Defra need overlapping maps of farming types and areas of planned wildlife (re-)introduction and offered to feed into this work if needed.

Defra agrees that this is an important area for research and points to the "England Species Reintroduction Task Force" which aims to consider the reintroduction of species which have been lost to England in relation to the 25 Year Environment Plan (25YEP) to provide opportunities for the reintroduction. The task force will provide independent advice on species reintroductions in England and will be comprised of statutory bodies, experts, and stakeholders to provide a collective evidence-based view on potential species for conservation translocations in England. Defra also notes the opportunities for further work on this subject within ELM, specifically related to LNR.

The SAC noted that soil health was not explicitly mentioned in the LNR paper. Although improving soil health is an implicit component of habitat restoration, the SAC suggested that there are also situations where specific interventions for soil health are needed.

Defra notes that soil health is one of the priority areas and a key review area for the existing Agri-environment schemes, additionally Defra confirmed that ELM is actively considering land management actions that prioritise soil health and once again highlighted the interplay between LNR and SFI.

Social science

The SAC questioned the framing of the social science aspects of LNR – specifically regarding how insight is oriented around individual behaviour, rather than cultural or structural factors. Defra officials advised that although the LNR paper does focus more on behavioural elements the LNR team are examining a broad range of social science questions trying to assess how Defra achieves the necessary structural changes across the land management sector. Defra briefly introduced some ongoing work to map out different social relationships between individuals and groups within the sector, from which Defra hope to be able to understand how individuals and groups influence each other and how cultural change can be achieved through these relationships.

Systems change and evaluation

Defra's CSA challenged the SAC to consider if the proposals are bold enough to instigate systems change raising two key considerations:

- Systems change is needed to achieve Defra's desired outcomes around biodiversity, Net Zero, and water quality. An emphasis on biodiversity, could add up to trigger system change, but actions around Net Zero and water quality should also be considered.
- How Defra will need well-grounded incentives and LNR process that are adaptable to future developments and to measure outcomes and assess success of new measures there needs to be an understanding of how measures are evaluated.

To address systems change, Defra acknowledged the importance of not focusing on one scheme in isolation but considering the potential of LNR offers together with SFI, Landscape Recovery scheme, and other Defra scheme offers. It was noted that while the list of themes appears biodiversity heavy, this is because creating, managing, and restoring various habitats will have significant benefits for biodiversity, Net Zero and water quality, as well as other desirable outcomes.

ACTION April (22) 02: The secretariat to arrange further SAC discussion around spatial targeting and spatial variability, focusing on the spatial component of the LNR work.

4. Work plan and any other business

Reviewing the workplan, the SAC highlighted the items of Defra's (i) research and development science strategy and (ii) science review. The SAC thought there could be considerable mileage in ensuing Defra is reaching the right parts of the academic landscape in these two areas. No other business was raised.

ACTION April (22) 03: The secretariat to arrange discussions on Defra's research and development science strategy and science review at a future SAC meeting.

Annex A: Attendees and apologies

SAC members

Louise Heathwaite (Chair)
Peter Cox
Lin Field
Rosie Hails
Lisa Collins
Nick Hanley
Susan Owens
Richard Bardgett
Felix Eigenbrod

Defra's Chief Scientific Adviser's Office

Gideon Henderson – Chief Scientific Adviser
Rob Bradburne – Deputy Chief Scientific Adviser
SAC Secretariat

Devolved administration observers

Defra officials in relation to specific agenda discussion

Deputy Director for Food and Future Farming Evidence
Head of Natural Science Strategy for Environmental Land Management (ELM)
Policy lead on Local Nature Recovery (LNR) Option Development
Principle Natural Scientist for LNR
Senior Natural Scientist - ELM
Senior Natural Scientist - ELM
Higher Natural Scientist - ELM
Economist - ELM
Social Scientist - ELM
Data scientist leading the transitions model - ELM
Data scientist leading the modelling strategy – ELM

Defra observers

Defra UKRI PhD intern
Higher Natural Scientist in ELM

Apologies

Rowland Kao – SAC member
Matthew Williams – Scottish Government Observer
Caryl Williams – Welsh Government Observer
Alistair Carson – Northern Irish Government Observer