



Defra Science Advisory Council (SAC)

Minutes of meeting, 15 December 2022

Annex A – Attendees and Apologies

Actions arising

Action number	Action	Owner

1. Welcome and apologies

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

2. Chief Scientific Adviser (CSA) update

The CSA highlighted some cross cutting pieces of science in government:

- The [2022 autumn statement](#) has been released, the Chancellor was positive about science funding and recommitted to science funding by increasing the budget on science and technology to £20 billion in 2024/25. The current inflationary pressures in the UK are, putting pressure on budgets
- The new administration has reinstated the [National Science and Technology Council \(NSTC\)](#) as a Cabinet committee.
- [The Net Zero review by Chris Skidmore](#) is progressing well with good engagement across government. The UK remains committed to meeting its carbon budgets as efficiently as possible.
- On climate adaptation Defra have established a cross Whitehall group called The [Climate Adaptation Research and Innovation Board \(CARIB\)](#) which is aiming to draw together adaptation and innovation needs across government departments to identify how to utilise research and innovation to meet these.



- The [2022 Chief Medical Officer's report](#) is focusing on air pollution – an issue of relevance to Defra – owing to the health implications of poor air quality (both indoors and outdoors).
- Defra's new [Secretary of State, Dr Thérèse Coffey](#), has stated that her top three priorities are: the environment targets that are required by the Environment Act (with targets in air quality, water quality, biodiversity, waste, and trees); Net zero and carbon budgets; and the Environment Land Management Schemes (ELMS).
- The Genetic Technology (Precision Breeding) Bill is continuing to progress smoothly through the House of Lords (having cleared the Commons earlier in 2022) and is currently in the [report stage in the House of Lords](#).
- Current areas of science pressure on Defra are around avian influenza and a reinspection of the crustation mortality events in the north-east of England (Note: these are to be discussed as individual items later in the agenda).
- The Defra's Secretary of State is at the fifteenth meeting of the Conference of the Parties (COP 15) to the United Nations Convention on Biological Diversity (CBD; which is currently ongoing), supported by a strong ministerial and senior official presence from the UK, with the UK demonstrating our commitment to biodiversity.
- At the recent [COP 27](#), nations were starting to grapple with issues of climate change related loss and damage payments.

The SAC asked for an update on Horizon 2020, European funding more generally, and the ELMS strategy. The CSA advised that Defra welcomes the EU's recent openness to discussions on UK participation in EU Science Programmes, Horizon Europe, Euratom (Atomic research and training) and Copernicus (Earth Observation science and monitoring), following two years of delays. The EU have not yet made any proposals to address the financial terms of UK association, given we are now over 2 years into a 7 year programme. Additionally, since the publication of the National Space Strategy in September 2021, the Department of Business, Energy and Industrial Strategy (now the Department of Science, Innovation and Technology; DSIT) Space Strategy Team have sought to build capacity to enable delivery of key objectives within the space strategy including Earth observation capability and capacity across the entire value chain. On ELMS, Defra's new Secretary of State (SoS; The Rt Hon Thérèse Coffey MP), is keen to see ELMS deliver positive environmental outcomes. The CSA acknowledged some frustration at the speed of



ELMS rollout but emphasised the need to move carefully towards a much more environmentally focused system.

The new interim Deputy CSA (DCSA) provided a brief introduction and referenced the roll out of the ELMs schemes, and the Precision Breeding Bill.

3. Chemicals Strategy

The SAC Chair opened the discussion by acknowledging the broad scope of the proposed discussion and this was echoed by the SAC who commented on the vast scale of the challenge regarding chemicals in the environment, noting that they consider it to be an issue on par with that of the current climate and biodiversity crisis.

The SAC Chair highlighted what they see as interesting opportunities for the SAC to discuss (specifically around issues of grouping chemicals) and suggested that Defra's Chemicals Strategy would be something the SAC will likely want to revisit in 2023. And the need for clear join-up between Defra and the Environment Agency (EA.)

The Chemicals Strategy

The 25 Year Environment Plan committed the government to publishing a new Chemicals Strategy¹ to ensure the safe use and management of chemicals alongside reducing levels of harmful chemicals entering the environment. While there were some delays to progressing a strategy (owing to the COVID-19 pandemic and impacts of EU Exit), the UK has maintained a robust regulatory regime for chemicals in the face of continued growth of, and innovation in, the global chemicals industry (predicted to double by 2030). Part of Defra's Chemicals Strategy is thus to define an approach to regulating emerging chemicals of concern following the UK's exit from the EU.

¹ Post-meeting note: in January 2023 the [Environmental Improvement Plan](#) was published which commits to government to publishing the Chemicals Strategy in 2023.



Defra officials highlighted their engagement with industry, academia, non-governmental organisations (NGOs) and other consultants, via a series of recent workshops. The workshops aimed to test current cross-government thinking on the Strategy and identify priority chemical issues. The paper presented to SAC focusses primarily on two high priority issues of per- and poly-fluoroalkyl substances (PFAS) and endocrine disrupting chemicals (EDCs). Defra officials also noted that Ministers are still committed to delivering a Chemicals Strategy but have not yet committed to a timeline for publication¹

The SAC were highly supportive of the Chemicals Strategy overview and suggested one approach Defra could take going forward would be to question most appropriate next steps.

The SAC suggested Defra should review the monitoring of chemicals in different environments, possibly defining areas where established monitoring could be expanded to intensively look for multiple chemicals. This would improve our understanding of concentration levels, pathways and exposure routes, and potential for chemical mixing. The SAC did, however, caveat targeted monitoring suggesting it may not be possible to know if one is sampling for the right thing in the right place. Overall, there was a unanimous SAC consensus that there was a clear need for improved chemicals monitoring.

The potential for (bio-)accumulation was flagged as something that needs to be assessed fully within the Chemicals Strategy. The SAC suggested Defra introduce a systematic and widespread biomonitoring scheme (e.g. the [predatory birds monitoring scheme](#)). Widespread biomonitoring would help develop a detailed evidence base on which policy and regulation approaches can be adapted to address the most urgent needs. In response, Defra officials flagged Defra's involvement, working closely with UK Health Security Agency (UKHSA), to coordinate UK participation in the Horizon Europe, Partnership for the Assessment of Risks from Chemicals (PARC) which is a major project seeking to develop next-generation chemical risk assessment in order to protect health and the environment. This includes, in part, work on biomonitoring and improvements to monitoring methods.



Non-biological endpoints were flagged, with the SAC linking this to regulation of Chlorofluorocarbons (CFCs). Chlorofluorocarbons have a critical non-biological primary effect that triggers feedbacks with substantial impacts on the living world.

The SAC suggested Defra could investigate the potential for a greater use of citizen science in chemical environmental monitoring and/or biomonitoring. While citizen science data might not provide that which a monitoring station would, it has been shown to produce useful data and has other co-benefits such as raising awareness and interest in a topic. Defra's CSA recognised that the place that citizens care about chemistry is where they interact with chemicals, such as through food and water; the recent increased public outcry regarding water pollution in the UK's rivers and seas was considered a good example of where citizens are invested in pollution issues. As such, the CSA suggested finding areas the public care about it and then providing them with the relevant tools to sample or record could prove most productive. An example was given regarding the rollout of COVID-19 testing and how the lateral flow test revolutionized data acquisition as people could test at home very easily and record it in a simple manner. The CSA did, however, question how citizen scientists could contribute to chemicals monitoring schemes and suggested there was need for innovation in chemicals testing that can be done by an individual at home or in their local environment as a straightforward way to enable widespread data collection (similar to COVID-19 home testing).

The CSA also suggested Defra could engage and potentially collaborate with the Food Standards Agency (FSA; who lead on food testing) to see if there is room for more chemical monitoring in our food as a joint Defra-FSA venture.

Defra officials agreed that there is a gap in monitoring that needs to be addressed. While more is needed around monitoring (e.g. monitoring of more chemicals, more widespread monitoring) they noted that the Chemicals Strategy will likely not be able to resolve this on its own. Any new commitments need to be balanced with financial considerations/limitations. When reviewing the relationship between monitoring and identifying new substances in the environment, the EA's Prioritisation and Early Warning System (PEWS) aimed at identifying emerging substances of concern (which was a commitment in the 25 Year Environment Plan) was highlighted. It was considered that identifying substances is the first step, and the role for the Chemicals Strategy could then be to help decide what to do with new/emerging substances of concern.



The SAC were interested to understand what role industries are playing in Defra's Chemicals Strategy and what industry views are in terms of how Defra could potentially measure and monitor chemicals in the environment, and if there is a role for industry to be involved in supporting the Chemicals Strategy rather than Defra or the Environment Agency having sole responsibility. The SAC thought this particularly relevant given it is in the interest of the chemicals industry to continue to manufacture chemicals for widespread usage. Furthermore, when reflecting on the quality and amount of data for chemical substances, the SAC queried if there was potential for biases in the data, for example, are the chemicals that are focused on, or have most data for, those that are produced in the most volume, meaning others less frequently used chemicals or novel chemical compounds have not been analysed or monitored to the same extent. In terms of industry and their role and potential biases in the data, Defra agreed this is important and highlighted that there is various work ongoing internationally, including through OECD, to produce fair data standards to ensure when data is provided it is robust and of high quality. When considering data sharing and economic and trade aspects, Defra connect with and monitor data through supply chains. Defra remains keen to promote producer responsibility and increased funding from industry to tackle current and future chemicals issues.

Defra officials also commented that chemical grouping could support regulation and help promote sustainable chemistry. Linking to this, Defra officials commented that legacy chemicals are still being found in products and the environment. As such Defra considers this something that should be learnt from with regards to which formulations of chemicals are being used and going into products now that could be a future problem.

The SAC raised concern around how future use of some chemicals may make implementation of a circular economy more difficult and emphasised the need to consider a precautionary principle (or three-stepped approach), especially around issues of chemical persistence. Issues of chemical persistence was linked to studies mapping chemical movement through the environment, such as those investigating the transmission and movement of pharmaceutical agents used in livestock production through soils and then their bioaccumulation in crops. The SAC also suggested Defra consider a more in-depth review of non-chemical solutions to some



of the current chemical applications. Defra officials suggested that this is something the strategy team could investigate when looking at new methodologies.

Furthermore, the SAC were apprehensive about the number of chemicals currently on the market that have never been tested and how it would take 10s-100s of years to robustly test them all, without consideration for testing of new chemicals; the issues of chemicals testing was linked to the [EU REACH](#) programme. As such the SAC thought there was a need for a radical rethink on the use and disposal of chemicals.

The SAC agreed that international cooperation and data sharing will be vital and wanted clarity on Defra's international position with regards to the Chemicals Strategy. Defra officials acknowledged there are clear benefits from open access to all the information sitting in the REACH database, however, the UK is still in the process of developing broader cooperation with the EU. Defra will continue to work on its international negotiations acknowledging the current political limitations.

The priority policy areas

Defra officials highlighted two priority topics, polyfluoroalkyl substances (PFAS) and endocrine disrupting chemicals (EDCs), both of which have significant benefits to society across a wide spectrum of uses but are ubiquitous in the environment and linked to considerable environmental and human health risks. Defra officials noted there is, however, limited data on both PFAS and EDCs presenting a challenge in assessing all the policy interventions that might be needed to address the multitude of risks across different life cycles, uses cases, and distinct types of chemicals within these groups.

Defra officials emphasised how one of the challenges from a strategy perspective is around understanding where Defra need a combination of policies addressing individual substances and across the whole class of PFAS and EDCs and the need to provide consistency. The need to understand the implications of different grouping approaches and how these should be applied, alongside difficulties in communicating the implications and the risks of doing so was also noted by Defra officials.



Drawing on their knowledge of pesticides, the SAC highlighted how there have been many years of discussion around the best way to group these types of chemicals (for example, grouping by mode of action, by structure) with the outcome being that there becomes a need to look at individual chemicals against every organism to understand selectivity. As such the SAC noted that when considering groupings, one must bear in mind that it is difficult to do so with any meaning that can be then related to an individual chemical and so far, the pesticide industry has not solved this dilemma. The SAC did however acknowledge that it is unfeasible to legislate or make policy around every possible individual chemical, thus there is limited choice but to apply groupings. Furthermore, reflecting on their contributions to the European Committee's Environmental Quality standards for substances such as PFAS and EDCs it seems apparent chemical grouping is the most feasible solution.

The SAC suggested that mode of action could be considered the best indicator of how something is going to affect a biological system, with the caveat that mode of action will depend on the target which can vary between species and a note that this should not be an exclusive categorisation/grouping. Defra officials acknowledged the suggestion around grouping based on mode of action but noted that their scientific resources might become a limiting factor in making assessments in this way meaning it may be unfeasible. While the SAC acknowledged the importance of grouping, it was also suggested that a phased or staggered approach, starting with one critical criterion and then working down might also help in regulatory assessments.

The dynamics and flexibility of mode of action of certain chemicals was raised by the SAC who noted that the behaviours of an individual chemical may change when placed in different contexts or mixed with different chemicals. The extent to which changing chemical behaviours is understood with regards to grouping could add complexity.

Additionally, the SAC asked if there is room for a systematic investigation of 'natural' groupings of substances approaching this question for all the substances that are of interest within a certain framing (or abrupt bipartite network projection), for example by investigating tags that Defra can associate with specific substances. Tags were defined as elements such as location of use or potential risk and linking these to other variables and assessing how the substances may have clustered. The SAC thought that if 'natural' groupings could be identified then that might help Defra to



choose what approach they might integrate into any given programme. Defra officials thought the natural groupings were an interesting idea and reflected on the work regarding the regulatory management options analysis being undertaken on PFAS that considered the groupings from a structural perspective which reflects that the choice of how to group depends to some extent on the policy aims. Defra considered the idea of natural groupings as something to review and integrate into future policy development in some form within the limitations of data.

The CSA reflected on the need for some fundamental research to be done around new/emerging/future chemicals that might be problematic and how this is an area that should be challenged. It was suggested that bodies such as UKRI could play a role encouraging broader research in the chemicals landscape to work out where the difficulties are and present government targets with regards to managing this. The CSA and SAC Chair suggested that Defra could further engage with UKRI to put some funding behind this research area (e.g. new/further research into EDCs or PFAS).

Socioeconomics

Defra officials raised the limitations imposed by regulations and if a change to regulations would be limiting benefits to society and/or innovation in the chemicals industry and if so is it justifiable?

On measuring the impact on society in terms of socioeconomic costs, the SAC asked for additional details around the role of cost estimates or cost benefit estimates in the regulatory process, asking if any regulatory decision must pass a cost benefit test. Defra officials advised of the elements of economic valuation cost benefit assessments within the chemicals regulation framework which balances the costs (or impact) on industry against the cost of inaction and against the benefits that specific chemicals provide. It was acknowledged that economic valuation is more straightforward to assess in terms of the cost to businesses of reformulation, or business impacts on trade. Whereas there are greater challenges in terms of the benefits of taking that action and putting this into similar economic terms for example attributing levels of chemicals in the environment to any observed effect and the resulting economic (and human health) impacts (including those of disease burden). In addition to improving how we quantify monetised costs, there also needs to be some assessment on the broader social impacts where it is not possible to quantify



impacts meaningfully. The need for Defra to decide how to prioritise or use the regulatory process will require a nuanced approach; simply banning a specific chemical can result in unintended consequences, limiting the overall benefit to society and a better approach might be to encourage transition towards better (safer and more sustainable) alternatives. Defra officials did agree there are several important trades-offs around the socioeconomic context to consider.

Risks and ethics

The SAC raised some additional ethical considerations. One of their main opinions was the need for a social and ethical framing at the forefront of the Chemicals Strategy, not placed somewhere after the scientific assessment of the various chemicals. The SAC challenged the notion of measurable costs and benefits noting that it is not always meaningfully possible either for benefits or for costs to be accurately assessed from a social/ethical standpoint and as such there could be a need to shift away from a weighing up type framework (what the SAC see as a broadly utilitarian framework) towards concepts of duties, obligations, and rights (e.g. those of human affairs). As such the SAC considered there a compelling argument for shifting the framing of a Chemical's Strategy, although acknowledged this might not be possible. The SAC also suggested a review of the Hazardous Substances Advisory Committee work alongside the recently published paper in Environment International on [key actions for a sustainable chemicals policy](#) (Collins et al. 2020).

The SAC discussed the cost benefit analysis whilst recognising hazard and risk assessments. The regulators and public need to understand (and potentially be prepared to accept) risks. Defra officials considered how grouping based around a hazard could prompt action on the highest hazard without consideration to the exposure risk and might not allow for consideration of usage.

Regarding the expectation that the chemical industry will double by 2030 the SAC sought to get a sense around terms of chemical development and pervasiveness. The SAC questioned why the potential exponential increase in the number of products should be allowed, especially if the rate of growth of potentially hazards substances is outstripping the rate at which we can generate scientific evidence on their safety. Defra officials explained how one key challenge is integrating a circular approach and influencing sustainable growth. Defra officials noted government's role



in being a catalyst by regulating products known to be more damaging and encouraging innovation.

The SAC queried why there was no apparent mention of animals with the chemicals policy work. Defra officials clarified that animals are included in the environmental monitoring and environmental impacts including considering impact to wildlife. Similarly, there is consideration of bioaccumulation and better understanding how chemicals may bioaccumulate differently, in different species or up the food chain.

4. Science Policy Panel (SPP)

Defra officials advised how the aim of the SPP is to bridge some of the existing evidence gaps (e.g. those around chemicals, waste and pollution prevention) and highlight the need to gather further scientific evidence to inform policymakers on the third planetary crisis of pollution (alongside climate change and biodiversity loss, which already have intergovernmental science-policy panels in the form of the IPCC and IPBES). The first set of international negotiations is due to take place in January 2023 and will be attended by over 100 Member States with additional attendees from industry, academia, regulation, and civil society. Discussions focus on determining the scope and principal functions of the Science-Policy Panel, which begins the process of preparing proposals for this panel to be established in 2025. Functions include the creation of assessment reports, the sharing of information and data, and horizon scanning for emerging issues which could see more frequent report productions than other intergovernmental panels given the pressing and fast paced nature of chemical issues.

The CSA highlighted their concerns about the process of establishing an international chemicals body owing to the number of existing international conventions potentially limiting the operating space for a new body. The CSA also questioned who the primary audience would be for a new pollution focused body, especially in light of a complex political sphere in which it would operate, and welcomed the SAC's views on this. The CSA suggested the SPP could be thought of as an umbrella that tries to bring together established pollution and chemical endeavours and spreading best practice around the world whilst putting new issues onto the international radar.



Defra officials agreed that the SPP is not about duplication of preestablished legislation and international treaties, rather it is about intelligence and solutions sharing, with an aim to focus on providing options for solutions. This was agreed during the UNEA resolution that requested the establishment of this panel. The target audience of the SPP are, therefore, national governments with a view to help develop policy to make a difference on the ground in their respective countries, without being policy prescriptive.

Defra wants the SPP to link with established panels to offer solutions to chemical issues. Defra officials highlighted how the SPP can focus on rapid assessment of emerging priorities, addressing the chemicals of concern to find a solution that also works to positively impact on biodiversity and climate change issues. The SPP could also recognise that many of the legacy issues that have been dealt with, particularly in the UK and the Global North more generally, are now starting to become emerging chemicals in the Global South. As such SPP will also be a means to share best practice in terms of how to mitigate impacts.

Insight from experience with other scientific panels

Offering their insight from working on the Intergovernmental Panel on Climate Change (IPCC) the SAC advised it would be prudent to avoid the SPP from becoming large and cumbersome. Rather than having lengthy reports published infrequently, the SAC suggested the SPP could look to be much lighter on its feet, responding more quickly as information is updated and thus being more responsive to current issues. The SAC acknowledged that there is a balance to be struck but that by having slightly fewer people involved and ensuring those involved are properly resourced the proposed chemicals panel could be more responsive than the IPCC. Comparing the proposed SPP with bodies such as the IPCC the SAC considered how chemicals, waste and pollution is often considered a driver of change to ecosystem services and that it also needs to fully integrate all the human health aspects. The CSA agreed that the chemicals issue is distinct from the climate and biodiversity issues owing to the immediate impact on human health that chemical pollution causes. As such, for the public the primary concern of the chemical pollution impacts will likely be those on human health followed by those that cause ecosystem damage. Published work on the IPCC and their modes of operation, detailing what has worked and what has not worked, was suggested as a guide to preliminary stages of the SPP.



The SAC suggested Defra consider how to incentivise involvement, noting sometimes simple actions (e.g. official nomination invites) can provide a sense of status or prestige alongside the post which may be enough to encourage engagement. The SAC did however acknowledge that it can be difficult to find a strong leader for big international projects (often owing to the workloads). Furthermore, to have a global impact the SAC suggested the SPP would need to be globally representative with nominated officials to be part of the writing team, agreed upon by national/international governments to best avoid political issues.

To address questions around SPP makeup, Defra officials provided extra detail around the chairing of the technical advisory group and lines of communication with the process for creating the panel. It was noted that currently an open ended working group is consulting with experts to help inform that process and how the panel will collaborate with established international bodies.

The SAC suggested a first goal should be for the panel/body to reach a point where it can identify the measuring requirements and respond to issues, enact monitoring, provide somewhat automatic updates and continually work to identify what remains important and promote action on such items.

The SAC discussed how, within an international body, achieving complete consensus on key issues is extremely difficult. Noting that when there are insights from different disciplines, they cannot always be condensed into a simple consensus because they view issues from different lenses.

The SAC thought getting the SPP's conceptual framework right at the beginning may potentially speed up the process making it more agile in the longer term.

Finally, the CSA shared their concerns around the panel name, stressing the regularity with which the names of these sorts of panels and organisations get shortened and abbreviated. The CSA was concerned that in the case of the Science Policy Panel, SPP will mean very little to most people because it does not have any description of what the panel will do. The CSA suggested the title will have to capture the full scope of the programme and thus need further consideration. Defra officials highlighted that the name is still to be determined, and it will likely mirror



those of the IPCC and IPBES, with suggestions such as “Intergovernmental Science-Policy Panel for Chemicals, Waste and Pollution (IPCWP)”.

Scope of the panel and international relevance

The SAC noted how chemical pollution is often localised with only small elements becoming globally transported which was thought to be a challenge for an international panel. The SAC thought Defra would need to find a way of balancing individual nations’ needs whilst establishing best practices nationally before translating it into global relevance.

Linking with earlier discussions the SAC highlighted how one of the bigger challenges is dealing with chemical mixtures of pollutants, suggesting chemical mixing in the environment would be an area that such a group could potentially be very influential.

Addressing the issues of chemicals that are already embedded in products traded across the globe (where there may be different arrangements for waste management), the SAC suggested the SPP should consider work to address how certain chemicals remain in a product in one geographical area but might get separated in another. The SAC Chair welcomed the discussion around embedded chemicals, noting it was an interesting area of development given the places where chemical waste ends up may not necessarily be where the products are manufactured or consumed. It was suggested that in terms of a global model, the pathways (or opportunities) to damage need to be clearly mapped out as the SAC were unaware of anybody having already done this work. The Defra officials agreed that including an assessment on the progression of chemicals into products and finally into waste could be useful, with these assessments to include insight from independent experts and product manufacturers.

There was considerable SAC member discussion around whether the SPP is intended to be an expert body or a stakeholder body, or some sort of mix of the two. It was suggested the SPP could mix big panel meetings with small task and finish groups that look at specific issues and then report back to the panel. Noting that with this subject area there is a delicate balance needed between transparency and inclusion, particularly around industry and non-governmental organisations (NGOs).



As such, the SAC thought Defra needs to be imaginative in its methods of balancing stakeholder views, levels of expertise and the role of industries and NGOs.

The SAC thought the proposals for the panel undertaking a global study of the economic impacts of pollution similar to that of the [Stern Review](#)² were worthwhile. It was, however, suggested that the pollution problems that the Global North would be most focused on would not necessarily be the same as those of the Global South, thus the SAC recommended that Defra consider what a good starter topic would be.

Both Defra and the SAC agreed that greenhouse gases and other pollutants (e.g. light and sound) are covered in other policies/panels/regulations and thus this will need to be explained in the conceptual framework. Supporting documentation should highlight how in the SPP context, pollution is defined.

Horizon scanning

On horizon scanning, the SAC gave an example of their experience with horizon scanning in the emerging risks network and how they utilise various questionnaires, online consultations, and joint discussions. The emerging risk network also assessed methods for the automatic identification of emerging risks through processes such as text mining and contextual and textual horizon scanning. Defra officials advised their aims for horizon scanning are in recognizing where chemicals are being manufactured, where life cycles can change in terms of circular and waste management, and development of alternative 'green' chemicals (e.g. alternative detergents that are 'greener' or degrade better in the environment).

One of the key elements the SAC considered was the need for any chemicals panel to be fast moving on clearly defined challenges or issues so that it becomes possible to identify either new members or experts very quickly and pull them into the framework early.

² The **Stern Review: The Economics of Climate Change** is a report released for the UK Government in October 2006. The first half of the Stern Review focuses on the impacts and risks arising from uncontrolled climate change, and on the costs and opportunities associated with action to tackle it. The second half of the Stern Review examines the national and international policy challenges of moving to a low-carbon global economy. Citation: Stern, N. (2007). *The Economics of Climate Change: The Stern Review*. Cambridge: Cambridge University Press.
doi:10.1017/CBO9780511817434



Circular economy

On the idea of a circular economy model, the CSA considered there is greater need of circularity around energy and minerals, rather than the circularity of any given chemical. The CSA suggest there is a critical question around the framing of the SPP as if it is focused on chemicals and chemical pollution then the scope needs to be rather narrow. The Defra officials advised the concept of the SPP should cover the whole value chain as this provides an opportunity for diverse knowledge sharing to avoid gaps in communication that lead to chemicals or chemicals in products ending up in waste management regimes that are unaware of the diverse chemical mixtures within the waste streams. As such Defra consider the SPP to be thought of more holistically. For example, early models of electric vehicles are now coming to the end of their life and there is a need to recycle the batteries, which contain rare earth elements and a range of other chemicals the disposal of which might not have been considered at the time of the design. As such Defra consider there to be a need to build waste management into the design to mitigate wasteful end products and lessen waste concerns hence prompting circularity in terms of mitigating chemical pollution.

5. Science Advisory Council subgroup - Update

The SAC Exotic Diseases (SAC-ED) subgroup

A provisional update was given, by the SAC-ED Chair, on the Exotic Diseases subgroup work addressing highly pathogenic avian influenza (HPAI) H5N1, as part of a new, time-limited, standalone scientific advisory group (HPAI-SAG) to address the current state of HPAI across Great Britain (GB).

The SAC were advised that over the past three years (2020, 2021, and 2022) a rise in the number of HPAI infections across Great Britain has been recorded with the number of infected poultry premises increasing dramatically with infections reported/recorded on sites not seen in prior avian influenza outbreaks. Furthermore, H5N1 has maintained its prevalence over the summer of 2022, which is unusual for avian influenza; the oversummering may be the result of changes in the virus's environmental survival.



The HPAI-SAG aims to assess if they can predict the future trajectory of the outbreak, if Defra can do more to protect the wild bird populations across GB owing to the conservation issues HPAI currently presents, and if there is potential involvement of other animal reservoirs for HPAI and if this presents implications for human health.

The HPAIG-SAG chair informed the SAC that there is a knowledge gap around the gene sequences for many wild animals, the mechanisms for distribution of HPAI across new geographical areas, and the potential of mammalian spill over (e.g. the common risk through scavenging of infected bird carcasses by foxes, dogs, and harbour seals). The SAC were informed about additional surveillance strategies that could be instigated by Defra/APHA which will help address the questions around monitoring. The HPAIG-SAG also intend to recommend increased collection and sequencing of genetic data to get a better understanding of what is happening at the farm and wildlife level. Increasing genetic sequencing would have practical implications for laboratory capacity as all samples are currently analysed in one laboratory. As such the HPAI-SAG consider increasing laboratory capacity (not just in testing for avian influenza) as a priority now and into the long-term (especially in light of national emergencies).

The HPAIG-SAC chair shared some potential strategies to protect birds from HPAI including vaccination and combatting the scavenging issue in wild birds (by increasing carcass removal) and developing alternative feeding sites as a way of diverting birds away from places where they might get infected.

The SAC-ED chair informed the SAC that there is evidence of viral diversity being generated within GB from other countries, which is considered a strong indicator that local circulation is enough to generate local virus populations. Further investigations into a broader range of species is however needed to address questions of endemic spread. In response to the CSA's query about new variants, the SAC-ED chair noted that new variants are always arising and two of the big questions are addressing high susceptibility because of lack of exposure and changes in the immune profile of the population. The expectation is eventually something will come in to replace any currently circulating virus, with the time until this occurs being categorically unknown.



The SAC asked some general questions around the current H5N1 variant affecting different species of birds at the same rate, the general mortality rate, if some or all birds have become more susceptible due to other stresses, and if HPAI can be carried without symptoms. These questions were answered in brief; not all species will be affected or affected at the same rate, the infection fatality rate is currently unknown, environmental stressors are likely contributing to increased fatalities, and yes avian influenza can be carried without symptoms (for example the frequently globally circulating low pathogenic avian influenza that is the baseline from which HPAI emerges and is a problem that scientists are unlikely to resolve). It was thus highlighted that these combined factors are one of the reasons why pandemic flu has been viewed as the most likely next pandemic, with the scientific community still broadly in agreement that influenza will be the most likely virus causing the next pandemic.

The Crustacean Mortality Expert Panel (CMEP)

The CSA advised that following a major incident of crustaceans, particularly a couple of species of crabs, dying on the coast of the north-east, England around Teesside in 2021 an independent expert panel has been established.

Initial [investigations](#) by Cefas had not managed to conclusively identify a cause, but an algal bloom present at the time was being considered as being of significance. The CSA noted this prior assessment was a plausible interpretation of the cause of the death, but not completely convincing. Additionally, the CSA advised that at the same time there was a developing school of thought, supported by some measurements and analysis by universities, that the mass mortality could have been caused by pyridine released by dredging activity.

The Secretary of State had since asked for an independent expert panel to assess the available evidence. To this end a group of 12 experts have been recruited, from organizations that have had no previous engagement with this issue, establishing the CMEP.

The CMEP will look at four different possible aspects: a potential disease or parasite, a harmful algal bloom, chemical toxicity (including pyridine), and dredging which could have released a toxic chemical.



Biodiversity Expert Group

The CSA provided a quick update on the proposed Biodiversity Expert Group, which would provide a cross-cutting science forum for policy areas to engage with. The remit of the group is being established with Defra still working out the terms of reference and membership.

6. SAC focused discussion

The CSA offered some initial thoughts on the value of the principal meetings given the opportunity for SAC members to connect and engage with Defra officials in person, alongside getting feedback from SAC members regarding their thoughts on priority areas for future meetings (both teleconference and principal meetings). The CSA emphasised the importance of gathering suggestions from SAC members around key themes for SAC discussions. On addressing challenges, the CSA noted that there is a need to ensure the SAC engage with Defra at the start of a workplan or project, so that the SAC can add most value. Finally, the CSA raised concern around the duration of individual meeting items and questioned if there should be a focus on a greater number of shorter items at a principal meeting. The SAC raised counterpoints to this final point and emphasised how they enjoyed having more time for discussion. Although, the SAC Chair did acknowledge that at times in the sessions there were points where discussions were slowing down but given there was time outstanding it gave the opportunity for the Chair to push SAC members more which in turn started to provoke some quite innovative and exciting thoughts. As such the SAC Chair thought that sometimes extra time and extra encouragement allows for more in-depth and original contributions.

Thinking about alternatives to chemicals, as raised in the meeting, the SAC considered pesticides and the ongoing work trying to replace or do away with them altogether. It was noted that this has not been discussed within a SAC meeting yet might present a big topic of substantial importance to Defra in terms of food security and food sustainability. The SAC briefly reflected on how it is easy for a company to decide to move away from chemical pesticides, however, most of them are very slow acting and require continual management, yet they were unsure if anyone's investigated the principles behind this approach as a blanket removal of pesticides might complicate the picture.



Reflecting on discussions around monitoring and data acquisition, the SAC considered how UKRI have peppered the UK academic community with multiple Artificial Intelligence opportunities that could be influential in terms of how we think about monitoring and data acquisition. It was considered there is an underpinning around nationally joining up a little more, breaking out of silos and assessing interconnected systems in greater detail. The SAC thought Defra, and other Government organisations could do better in their combined approach to tackling wicked problems (such as those presented by chemicals) and not making decisions or taking actions in isolation. Highlighting two key elements around innovation in the monitoring space and innovation in terms of utilising what we already have.

The SAC were particularly interested in exploring three-way connections between the biodiversity targets, carbon targets, and the levelling up agenda at future meetings. Considering where biodiversity restoration offers benefits to health and well-being for a large population alongside driving nature recovery and carbon benefits at a nexus point of positive interaction. Furthermore, for biodiversity the SAC considered there to be some cases with large scale implications at the landscape scale and that future discussions could investigate, linking such themes with those of emerging threats (including threats from infectious disease). Issues of biodiversity was also linked to a potential future review of how Defra is working internally and the policies that are being developed or drafted (e.g. the issue of tree planting targets and how they are being informed), although it was noted that this might require engagement with Defra Teams or Officials outside of a single SAC meeting.

The SAC flagged that they have not reviewed or discussed any topics in relation to air quality. The SAC are aware that there have been significant developments within this space both within and external to government, highlighting the example of how in 2021 the first case of a person in the UK to have air pollution listed as the cause of death on their death certificate was announced. The SAC requested a return to a chemicals focused discussion in the near future, as they considered the conversations today to only have scratched the surface of a vital topic that has not had the level of scrutiny they might have had expected over the past several years. They were also interested to hear a bit more about is how Defra are getting on with developing indicators of soil health, a known big issue internationally (highlighting the EU source strategy announced for 2030 for legitimate legislative proposals regarding soil health law). The SAC would like to review the soil research within Defra to see where Defra are in terms of developing an index for soil health.



In the whole chemicals field, the SAC consider how these issues are often largely social and ethical, yet there can be difficulty in integrating a social science perspective into that agenda. As such the SAC thought it important that Defra work hard to bring in the social science and humanities, getting them to recognise that they should be interested in this subject.

Reflecting on the day's discussions, the SAC noted how one thing that seemed a reoccurring theme (from chemicals to avian influenza and other areas like biodiversity) is the issue of multiple stressors and the potential for cumulative effects. Although it was appreciated that it can be difficult to assess just looking at individual chemicals and environmental responses to them, it was considered there is a sort of overwhelming evidence that cumulative effects and synergistic effects are those that are having the biggest ecological impacts. As such the SAC wondered if these issues relate to the general 'systems thinking' approach assessing how these stressors might interact and thus how that might be integrated into policy. The SAC acknowledge cumulative impacts are a large and very complex area, especially for ecology now and into the future.

The SAC raised very strong support for Defra to further investigate the integration of public and private data to improve monitoring, alongside how regulators can bring in data from industry and companies into the public data sphere. The CSA considered a future meeting to discuss data sharing and data access could be interesting.

Returning to the discussion on infectious diseases, there was acknowledgment that they are exacerbated by the very mechanisms the UK is trying to promote to increase biodiversity, to increase commercial value, and to increase efficiency because of system connectivity. It can, therefore, seem that the things that Defra are trying to do to do good will also probably make infectious disease worse with increasing potential for infectious diseases to have capability to derail national agendas. It is this theme of connectivity and disruption that the SAC also consider worth exploring as a systems problem and a point of potential conflict, at a future meeting.

Having recently reviewed the evidence from the Parliamentary Select Committee in November, where the minister was reporting on to the progress in ELMS, the SAC noted how they talked there about wanting to incentivize farmers to cooperate with



each other to generate greater connectivity of conserved landscapes. The SAC were unclear how it is that Defra intend to incentivise corporation. The CSA was supportive of this challenge and noted that this is an interesting way of posing it, and one that the SAC might wish to take to the ELMS Team asking how they are going to deliver it.

The discussion was brought to a close and on doing so the SAC Chair raised a final item from the March 2023 SAC meeting regarding a brief conversation that was had on developing an opinion piece around 'systems thinking'. Given that no SAC member has offered to lead on writing any such opinion piece, the SAC Chair suggests this idea is shelved. The CSA agreed with this approach., further suggesting that if SAC members wish to raise items regarding 'systems thinking' that time would be better spent in direct engagement with the relevant Defra teams.

9. Any other business

No other business was raised.



Annex A – Attendees and apologies

SAC members

Louise Heathwaite (Chair)

Richard Bardgett

Lisa Collins

Felix Eigenbrod

Lin Field

Rowland Kao

Rosie Hails

Susan Owens

Marian Scott

Peter Cox

Nick Hanley

Defra CSAO

Gideon Henderson – Chief Scientific Adviser

Lucy Foster – Interim Deputy Chief Scientific Adviser

SAC Secretariat

Devolved Administration Observers

Caryl Williams – Welsh Observer

Matthew Williams – Scottish Observer

Defra officials in relation to specific agenda discussion

Apologies

Alistair Carson – Northern Irish Observer