





## SPF Clean Air Programme Annual Review 2021

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- WP1 Networks and WP3 Clean Air Analysis Framework Expenditure started
- WP4 Business-led projects: Competition 2 Phase 1 Completed
- Jan 2021 Networks Kick-off Event
- Jan 2021 First Annual review approved by the Programme Board
  - Professor Gary Fuller appointed as a Clean Air Champion
- Feb 2021 Professor Tom Woolley appointed as the new Chair of the Steering Committee

March 2021

Sept 2020

Jan 2021

Jan 2021

• WP4 Business-led projects: Competition 1 Phase 2 Completed





#### The top programmes successes were identified as:

- Delivering successful funding grants at pace while adapting to virtual working
- Programme agility in COVID-19 response
- Community building and raising the visibility of the programme through new collaborations with other disciplines
- Improved cross-organisational working

The key lessons that should be taken into consideration for future learning were identified as:

- Engaging the heath community
- Funded research focus
- Virtual communications and digital-first engagement
- Maximising benefits

#### Summary

Overall, the Programme Management team and the Champions are pleased with how the programme has progressed over the last year. Particularly good progress has been made in delivering successful funding grants at pace while adapting to virtual working (see the Clean Air Networks) and in community building through collaboration with other disciplines (see events such as the Kick-off Meeting, the Joining Forces and Toxicology workshops). The programme has produced useful evidence, but much of this needs to be translated for specific contexts and applied at a strategic or operational level.

### INTRODUCTION

#### **Background and purpose**

This Annual Review provides a review of the SPF Clean Air Programme (Wave 1 & Wave 2), and captures the headlines on successes, lessons learnt and progress towards the aims from the aims from April 2020 to March 2021.

The UKRI SPF team had previously required all SPF programmes to submit an annual review. This was intended to provide reassurance that the programmes are on track to meet their stated objectives and highlight early successes, which could then be used to promote the value of the SPF fund.

While this is no longer a requirement, the need for due diligence and programme monitoring remains. Therefore, it was decided by the Programme Board (PB) that an annual review should still be produced.

The purpose of the Annual Review is to help inform the programme-level analysis of the Clean Air Programme, to promote accountability, and to provide enough time for lesson learning and course correction for the continuation of programme implementation.

#### Approach

The review is focused on two areas: programme management and the delivery of outcomes and benefits related to the programme's strategic objectives. The programme was reviewed against evaluation questions, adapted from the end of programme evaluation questions, as set out in the Monitoring and Evaluation Plan. We have used programme documents such as meeting minutes, the risk register and finance reports, and monitoring data from monthly dashboards, Researchfish, Innovate UK periodic project reviews, and the Met Office input to support the review process where necessary.

#### Audience

This annual review is primarily intended for internal use by the the Programme Board and programme management team to learn lessons about the design and management of the programme, informing:

- discussions on potential improvements in the management and delivery of the Clean Air Programme;
- the development of similar programme approaches and other interventions in the future.

It is likely that sections of this review will be shared with the Steering Committee (SC) to enable them to give advice and guidance on maximising benefits, and extracts may be shared more widely with stakeholders or through comms opportunities.

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Both Events and stakeholder engagement have been important for promoting the SPF Clean Air programme and progressing towards the aims. Both Met Office and UKRI owned communication channels have promoted the programme since the launch. The Met Office and UKRI websites have dedicated sections for the SPF Clean Air programme including latest news and funding opportunities, and the dedicated Clean Air programme website contains more content in regard to the projects, events, news etc. The other main channels utilised are the Met Office Science, UKRI and Clean Air twitter pages that amplify the messages and news.

The most notable press coverage during the review period is listed below.

- A news article on the Clean Air Networks featured on the Cambridge Network website
- Online content on Clean Air Programme featuring a presentation by SPF Clean Air Champion was published on the Air Quality, Conference 2020
- As part of the Clean Air Day, 8 October 2020 a short video was published on the Clean Air Programme website. In this video, Professor Stephen Holgate, UK Clean Air Champion, talks about recent media coverage on the link between air pollution and coronavirus
- A series of short recorded presentations/videos from each project outlining their project plans and progress thus far from The Networks presentations have been posted on the Clean Air Programme website
- The Social Research and Air Quality: STFC, Social Sciences and SAQN event was hosted online and has showcased air quality projects involving social science (including the ANTICIPATE project founded by the Clean Air Programme). The event is covered online here
- The Clean Air Champion, Gary Fuller has used data from the NERC/OSCA funded supersites in a piece for the Guardian published on 12th March 2021.
- Gary Fuller wrote in the Guardian about air pollution from tyre wear during lock down, using data from NERC funded XACT equipment at Marylebone Road.
- The Clean Air Gas Engine (CAGE) project, developed by Lancashire based SME OakTec Power and funded by Innovate UK, as part of the Clean Air Programme was featured in Railway Review and on HS2 website (HS2 trials ultra-low emission technology on construction sites)
- Twitter coverage led to a total of >40k impressions
- The Clean Air programme Twitter account had 366 followers (as of end of March 2021)



The programme had many successes and highlights throughout the review period. Below are the key successes identified by the programme team and Champions (in no particular order).

#### Delivering successful funding grants at pace while adapting to virtual working

- Grants have been awarded at pace, as required by the fund.
- The calls were successful, both with respect to the quantity of applicants and quality of applications, across NERC, IUK, and MO.
- The Programme has successfully transitioned to virtual communications for launching, reviewing, awarding, and providing ongoing support for grants.
- Regular engagement with researchers throughout grants has been beneficial and has added value.
- Met Office Wave 1 external awards were made in FY19/20 and FY20/21 and focused on the development of Wave 2 external calls. Concurrently, Met Office internal science teams worked hard to collaborate with external researchers.
- NERC-led UKRI Wave 2 funded 6 multidisciplinary research networks that will address future air quality challenges at the indoor-outdoor interface.

#### Programme agility in COVID-19 response

- UKRI COVID-19 emergency funding was supported by building on work from the programme.
- Met Office science teams were redeployed to support the initial COVID-19 modelling requirements, but programme science delivery adapted to continue at pace.
- Clean Air infrastructure and researchers were able to use data to inform Government about the effects of lockdown on air quality.
- The national lockdowns have meant that physical events have not been possible throughout the last year, leading to a rapid move to virtual communications. Yet, the programme has successfully been building the community and raising the visibility of the programme through new collaborations with other disciplines.
- Innovate UK-led UKRI calls worked directly with innovation pilot projects, through Monitoring Officers, to help projects address the direct effects of COVID-19 and lockdown restrictions. Projects were able to adapt designs and source new supply chains in order to maintain momentum.

### Community building and raising the visibility of the programme through new collaborations with other disciplines

- Launching the Clean Air Networks raised the visibility of the programme with researchers and other sectors (schools, building industry, transport sector, decarbonisation agenda, vulnerable people).
- Workshops (e.g. The Royal Society workshop) generated new collaboration with other disciplines. Raising awareness of the role for toxicology in AQ has led to a new AQfocused post at MRC tox centre.

- A number of UKRI Consortia proposals include collaboration with other disciplines, in particular in relation to social sciences (with specific evidence that this was catalysed through e.g. January workshop).
- The CAGE and AutoAlign innovation pilots are both working directly with academics at Imperial College. CAGE is looking for independent exhaust emission analysis of their hybrid gas engines compared to conventional diesel systems, while AutoAlign is exploring how the size of tyre wear particles relates to toxicology.
- Joining Forces Workshop has brought together a multidisciplinary audience. The workshop was hosted in collaboration with the Clean Air Champions and held virtually in September 2020. Attendance was good, from across the multi-disciplinary community. Findings from this event are being developed into sources for the next proposed Data Workshop to be held in Sept 2021.

#### Improved cross-organisational working

- Programme management has maintained flexibility, focus and momentum in programme delivery with key activities continued as planned.
- The collaboration between partners has been largely effective.
- Flexibility across the programme has allowed to utilise underspends by one partner to alleviate COVID-19 pressures for another (e.g. UKRI business-led calls funding for IOP).
- Working together and collaborating with others virtually has been effective and removed barriers of location and travel.



### **LESSONS LEARNT**

The lessons learnt throughout the review period are an important part of reflecting on progress so far and can be used to inform future decisions. Below are the key areas we can take learning from that have been identified by the programme team and Champions (in no particular order).

### Engaging the health community

- Community of interested health professionals is small and so we keep leaning on the same people. Going forward we need to find ways to grow this pool of people to include for example representatives from primary care.
- Preparatory work has been done on a data workshop for FY21/22 to understand what data the health community needs in order to engage with clean air research and the Clean Air programme.



#### **Funded research focus**

- The portfolio of funded research is not as comprehensive as it could have been. This is because funded research must balance science excellence and priority areas!. To have funded a more diverse or comprehensive portfolio of research projects would have required greater specification in the call text. It should be noted that breadth and diversity of funded research comes at a cost reducing depth of understanding in focus areas. Future programmes should consider this trade off early to ensure best use of available funds is made.
- More thinking and joint up activities are needed to identify ways to effectively engage with health and social sciences. Some work is progressing in this area and may have attracted different applicants if calls had been delivered by other RC's.
- Linking research and innovation requires complex coordination and clear communication between academics and businesses.



#### Virtual communications and digital-first engagement

- Although virtual communications have removed some barriers, there is still more to be done to build better connections.
- There have been higher engagement numbers and wider engagement which could be lost if all virtual elements are removed, therefore we should consider a balance between virtual and in person events in the future.
- Moving to virtual communications has taken time and we know a lot more about it now than when we started.
- Assuming that the trend towards digital-first engagement events will continue beyond COVID-19, we will need to explore ways to make the most of new technologies (facilitating greater access for those less able to make physical events), while preserving serendipitous discussions.

#### **Maximising benefits**

- The programme is effective at providing evidence, but not distilling what this means to translate this into action. For example, the programme is not effective at linking projects together or linking government departments (including PHE) within the programme.
- Clear communication is needed with tailored messages for different stakeholder groups. When planning communication, we need simpler articulation of what the programme is going to deliver and when. Stakeholders want to engage but the programme is so big it is hard for them to know how and on what aspects.
- The mechanisms to facilitate the flow of ideas emerging from primary research into innovations delivering impact in the market need to be better understood and supported.
- Champions role is bigger and more complex than they anticipated, needed to adjust the skills mix of the team for the most benefits this year.
- The role of the Steering Committee in shaping calls was useful and now needs to adapt with the programme to focus on maximising benefits and the programme legacy.
- Final ranked order and funding of proposals has not always followed solely science excellence, fit to scheme has been considered and altered the rankings. For example, where a proposal scored highly on science excellence but poorly on fit to scheme it would be lowered in the final ranking of proposals and may not receive funding.



### **PROGRAMME CASE STUDIES**

This selection of case studies highlights successes of the programme and illustrates the breadth of good stories there are to tell.

#### Building a multi-disciplinary community

Recognising the need to bring different research communities together and start building a truly multi-and inter-disciplinary research and innovation (MIDRI) community in the area of air quality, the SPF Clean Air programme held a two day "Joining Forces to Improve Air Quality and Heath Workshop" in October 2020. The event brought together 84 representatives from across the diverse range of disciplines and stakeholders involved in Air Quality and Health issues including academic and public sector researchers, health practitioners, national and local government, industrial innovators, environmental consultants, and third sector representatives.

The workshop featured short presentations representing views from academia, local and national policy, primary health care, charities and industry and provided an opportunity for a wide range of experts who work in various air quality and health related sectors to share experiences, requirements and concerns and discuss the relevant questions and issues that lie at the heart of continued progress in this area.

Attendees examined areas of potential synergies between the health and air quality communities to formulate continued collaborative work that will enable the aims of the Clean Air Programme to be effectively achieved. A summary of how the programme has responded to this opportunity could be provided on request.

#### **Responding to opportunities**

Unprecedented changes in living and working patterns during the pandemic are likely to have had a significant, but as yet unquantified, effect on air pollution and our exposure to it. There are questions crucial to our nation's public health that need an interdisciplinary scientific response. Yet there is no UK group with a remit to coordinate across the many disciplines that need to co-operate to address COVID-19-related air quality knowledge gaps. On 20 May 2020, in response to a request by the Clean Air Champions, an online workshop was held to begin coordinating research action on the interactions between air quality and COVID-19. The workshop was run by the Science and Technology Facilities Council (STFC) Air Quality Network (SAQN) in partnership with the UK Indoor Environments Group (UKIEG), the Air Quality Network UK (AQNUK) and the Clean Air Champions. A summary of how the programme has responded to this opportunity is available on request.



The annual programme evaluation scores indicate how the programme team and Champions feel the programme has progressed towards the aims within the review period. Each evaluation question has been assessed to give an indication of how the programme is progressing and flag any areas of the programme that may need course correction to get back on track, or are working exceptionally well and could be learned from or celebrated more.

### Question 1: To what extent, and how, has the programme progressed towards building better connection, cross discipline interaction and interdisciplinary capacity?

- To date the Initial work done included raising awareness but key changes still yet to happen. Quite AQ focussed, though signs of realignment to health within e.g. Defra. Pandemic has limited ability to capitalise on health side of programme.
- The Clean Air Networks are now supporting this in a really positive direction. Six Clean Air Networks were funded, all of which are explicitly MIDRI in nature.
- A workshop held in Jan 20 resulted in a number of new collaborations across disciplines, which would not have happened otherwise (based on follow-up feedback of workshop).
- Majority of 33 Consortia Outlines submitted were deemed to have interdisciplinary approach/structure by Panel, addressing some or all of call's objectives (which span disciplines).
- UKRI business-led calls have engaged fully in all of these areas. The programme could develop closer links to Clean Air Tech business sector.

#### Question 2: To what extent, and how, has the programme progressed in providing national leadership to coordinate and facilitate knowledge exchange between the programme and the wider UK stakeholder community?

- Early phase for programme with minimal outputs thus far, making hard to assess level of knowledge exchange. Industry is lacking. Lots of planning has taken place, but outputs not there to date. The programme is aligning/positioning to a more leadership role. Emphasis at Programme Board and Steering Committee level shows that the coming year will be a pivotal period as these outputs start to increase.
- Cross-programme activity such as delayed IOP will be useful exemplar of leadership/ coordination in future months.
- Up to now there are fewer examples of international engagement and this could be potentially an area for development as there is great potential for innovation projects to have an international impact when commercialised.
- Champions continue to lead and advocate for programme successfully, including some engagement with other networks (e.g. SAQN). Events such as Annual Conference to contribute to this goal in year ahead.

- Champions are in the process of appointing regional champions to better engage with local stakeholders.
- Following the Toxicology workshop there is specific focus targeting the toxicology community. The is general acceptance that the toxicology report will inform key challenges to address.

### Question 3: To what extent, and how, has the programme been engaging with policy makers, the health sector, and industries?

- The Clean Air Champions activity remains strong in this area, with developing themes/ activity in the health sector such as addressing professional education, inequalities. Ongoing efforts to build direct relationships with DHSC (e.g. Louise Woods) and PHE (i.e. through invitation to SC) but COVID-19 has made efforts difficult.
- In the Policy area is notable the consultation roundtable inc. Env. SoS on PM2.5 and other air quality issues for the Environment Bill, representation on Welsh Clean Air Plan advisory group.
- Champions are in the process of appointing regional champions to better engage with local stakeholders.
- The programme is heading in the right direction and the progress is adequate for the stage of the programme. Going forward more opportunities for greater engagement are actively sought and steer from the SC would be beneficial.
- The programme is engaging well with national and local Air Quality policy. Local Authority wants to be involved and the programme is building connections. The industry also shows support for the Joining Forces plans and the intention is to deepen the engagement.
- The Clean Air Champions are working hard on all these areas and bringing sectors to knowledge exchange events. There needs to be more push on this. Industry needs more work, but good progress has been made to date.

### Question 4: To what extent, and how, has the programme been driving new knowledge such as IP, TRL advancement, process, and conceptual innovation?

- Programme outputs will include emissions inventory, CERC's work on free software, the Met office Framework. It is still too early to tell but there is clear indication that the projects will deliver capability and new applied knowledge. An example from the Integrated Research Observation System for Clean Air (OSCA - NE/T001917/1) coordinated by Professor A Lewis, University of York, National Centre for Atmospheric Science could be provided on request.
- Using SBRI as a competition instrument enables business to generate, retain and commercialise valuable IP. All three of the Wave 1 innovation pilots have successfully developed and tested valuable new commercial concepts that will result in less pollution in priority areas. All three pilots are engaged in well advanced discussions with future customers looking to deploy the innovations immediately the SBRI projects conclude.



- Champions have been raising the profile of the programme through the involvement with GAP and prof. Holgate high profile work with the Ella Kissi Debra case.
- The website is aimed at the science community but also directed to the public. It seems to be the main public facing channel for the engagement with the Clean Air community and will play an important role in communicating with the public going forward.
- It is considered that he Networks projects will be large drivers of this; however, they are still in early stages.
- Consortia outline proposals demonstrated several good exemplars of public engagement, with 4 out of 10 Full Proposals invited having significant participatory elements – evidencing that the community are increasingly considering public participation as an integral part of their research.
- The Champions' work with GAP and Clean Air Day has promoted awareness of AQ to the public, for example QA-ing and providing evidence for their Clean Air Hub information source and videos regarding the link between AQ and COVID-19. The recruitment of Gary Fuller, with experience and expertise in public-facing communications, demonstrates programme prioritisation of this in the coming years.
- As highlighted some work was undertaken to date but more is intended in future work package plans. It's still early days for this work but there are plans for the latter parts of the programme. The Champions are planning to support greater media engagement from mid and early career researchers as the investments reach maturity from 2022 onwards.

# Question 6: To what extent, and how, has the programme been identifying scalable, sustainable technologies that are ready for deployment and commercialisation in a) the UK; and ii) internationally?

- To date the programme has focused efforts on developing brand new ideas, and providing the funding to build, evaluate and test them ahead of subsequent commercialisation. This was not our initial focus, but the tools and resources developed will allow others to commercialise products. Many of these outputs are about being scalable and adaptable and can be used in different areas of the UK/world.
- All 3 Wave 1 innovation funded projects are developing technologies ready for commercialisation and designed to have a positive impact on air quality. As they mature the Wave 2 projects should follow the same path toward commercialisation. All of the Wave 1 pilots are currently in discussion with potential future customers in the UK. The CAGE project has also received interest from customers looking to deploy their clean air gas engine in Africa.



## Question 7: To what extent, and how, has the programme integrated the different work packages to create coherence?

- Work packages were created to allow integration and coherence. We are starting to see this happening as the science develops with projects making connections and integration opportunities.
- Activity in support of better integration of the work packages has been led by the programme delivery team supported by the Champions, including meetings with PIs and visits to projects, participation at the Scoping Workshops for Consortia Call, and a programme wide Kick-off Meeting in January. Champions will continue to play significant role.
- Active efforts underway to promote Network integration (with each other, other SPF funded research and external research programmes). This is exemplified by activities at Kick-Off meeting which identified a number of new synergies (inc. between MO and UKRI in terms of nascent Metrology Network).
- Existing investments starting to develop further links e.g. ANTICIPATE has developed strong links with TRANSITION to inform decarbonising transport agenda.
- Activities to understand associated risks (undertaken by programme managers) progressing well, this understanding of interdependencies may inform further work to better integrate work packages.
- Programme partners inviting greater involvement of other partners than before in key activities to shape activities and/or identify future synergies (e.g. invitation to view Panel/procurement meetings).
- The Science Plan which was approved by Programme Board in April will be the external sign of this.
- Overall, some good work has been undertaken in this area, and it is acceptable for the stage the programme is at. However, attention is needed here to ensure that the programme becomes more cohesive to maximise impact.

#### Question 8: To what extent, and how, has the programme identified, improved, and expanded the evidence and knowledge base on new air pollution challenges and associated health risks?

- The programme is still in its early days for research outputs and has been impacted by some delays due to COVID-19 restrictions, however early signs are positive.
- The Clean Air Champions Futures Group is being scoped, which will ensure that new areas of air pollution challenges will be proactively identified.
- Joining forces event brought together key stakeholders but further impact will come as the programme develops.
- The research and innovation activities feel to be the right mix and focus to achieve this as the programme develops further.



### FORWARD LOOK

- Focus on completion of the test phase of the Framework for initial testing in the Community.
- Activities are planned to celebrate Clean Air Day 2021 on 17 June.
- The first SPF Clean Air Annual Conference: Working in partnership for cleaner air, will take place online on 22 and 23 June 2021.
- Regional Champions are proposed for each of the devolved Administrations (Scotland, Wales, and Northern Ireland), and the Midlands North West.
- The programme will contribute to Road to COP26 activities and COP26 itself e.g. supporting the design and delivery of the Health theme with virtual content.
- A Data Workshop will be organised in September 2021.
- A mid- term review will be caried out to help shape coordination and integration call via the Champions to help ensure the programme meets its objectives, and capitalises on opportunities to maximise outputs, benefits, and impact from the programme.
- Focus for the Wave 1 Innovation Pilots will switch to preparing the innovations for market and promoting them to potential customers.
- A range of new innovation pilots will be launched focused on understanding and addressing air pollution in the domestic environment.
- Research will be undertaken to better understand the size, shape, and strengths of the Clean Air Tech sector, and uncover the interventions to grow these businesses and increase their impact on pollution, both in the UK and globally.
- Commissioning of the NERC-led UKRI Wave 2 consortia grants looking at indooroutdoor air pollution.



### CONCLUSIONS AND RECOMMENDATIONS

The programme is heading in the right direction and the progress is satisfactory for the stage of the programme. The research and innovation activities feel to be the right mix and focus to achieve the programme benefits as the programme develops further.

Translating research evidence into policy is crucial for improving air quality and health outcomes. This is starting to happen as the science develops with projects making connections and integration opportunities. Additionally, research outputs are starting to feed into policy and being scalable and adaptable, ready for commercialization and deployment.

The programme is positioning to a more leadership role. The coming year will be a pivotal period for better integration of different work packages to become more coherent and translation into policy and practice.

Going forward, the recommendations are the programme should focus on the following areas:

- Greater stakeholder and end user engagement. Stakeholder mapping and management will streamline the programme's work with the key stakeholder groups and help the programme have real world impact. Some areas that could be a focus of this work include capitalising on regional champions activities, working more closely with Defra, and better targeting and engagement of the primary care groups and toxicology experts.
- Ensuring advice and steer from the Steering Committee to realise benefits. The Steering Committee's input into the development of the programme and individual funding calls was extremely valuable and the programme now need to ensure we can maintain momentum and build on this. The advice provided will help ensure the programme meets its objectives and benefits from opportunities to maximise outputs, benefits, and impact.
- Raising the profile of the programme to increase uptake of solutions. To help tackle sources of air pollution, making the air healthier to breathe, while protecting nature and boosting the economy, the programme will need to intensify efforts in awareness raising, and in inducing behavioural changes. Effective communication of health messages about air pollution and appropriate action can save lives and improve quality of life for many as well as encourage the uptake of new technologies and policies for reducing air pollution. Champions will continue to play significant role and take leadership in this area.

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