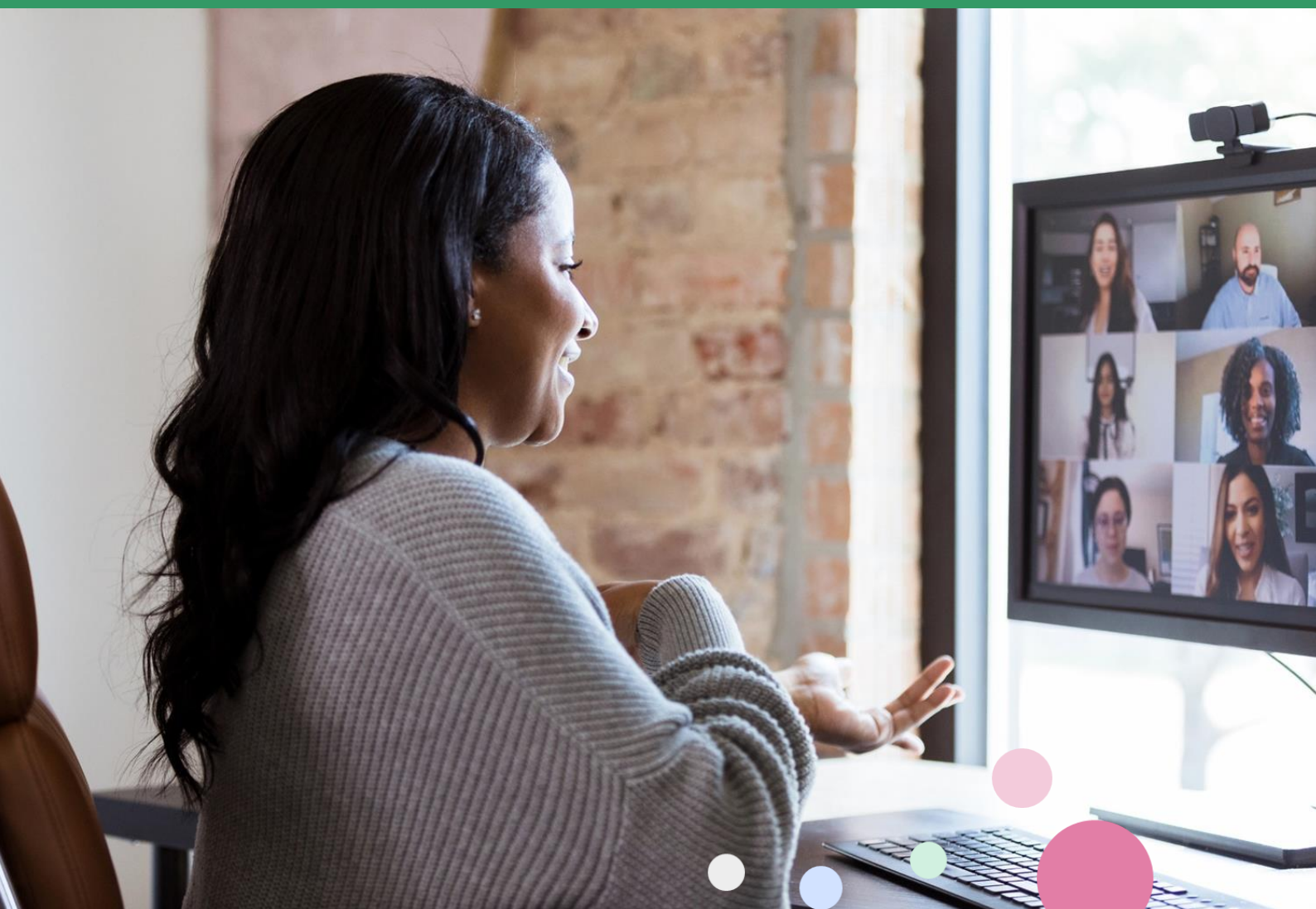


REMOTE TO REMODELLED

POST-PANDEMIC WAYS OF WORKING IN A
KNOWLEDGE-DRIVEN SERVICE BUSINESS

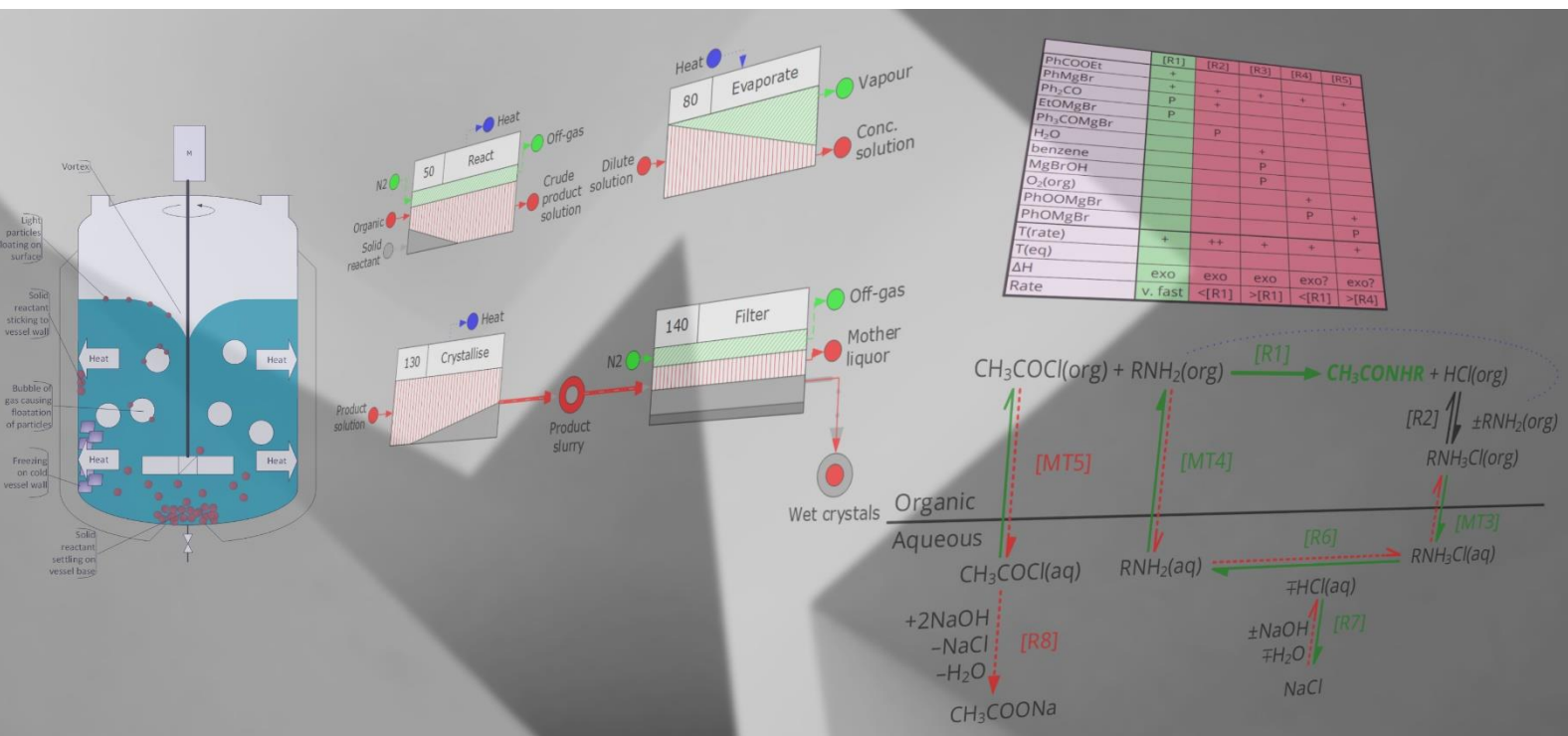


BRITEST LIMITED | AUGUST 2021

Britest



Generating value from process understanding



Britest is a not-for-profit membership-based organisation and consultancy which champions effective whole process design and open innovation throughout the chemical, biochemical and related process industries.

Britest's specialist technical facilitators help multidisciplinary development and manufacturing teams within companies, across supply chains, and in collaborative projects turn their working knowledge into impactful process understanding capable of driving innovation. Visually rich tools for information capture and structuring enable our clients to assimilate and communicate insight critical to product and process development, successful problem solving, and process improvement. The Britest approach has successfully delivered innovative solutions to key process and manufacturing challenges since 2001.

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SUMMARY

COVID-19 has acted as a reset function in many aspects of everyday life and work. Businesses and public sector organisations now have a moment in time to reflect upon how we have adapted to get things done despite the disruptions, and to explore what remodelled, flexible ways of working will look like in future.

Here we share our experience of the challenges presented by lockdown restrictions from the perspective of a knowledge-driven and service-based small business operating with clients in the chemicals, pharma and process industries, and an analysis of the significant benefits we have quantified in terms of time, money, and emissions saved, and new possibilities created, by successfully harnessing remote working and service delivery.

We believe the positive balance of sustainability benefits and new possibilities afforded compared to the minor compromises involved is compelling and provides a template for a remodelled way of future working.

INTRODUCTION

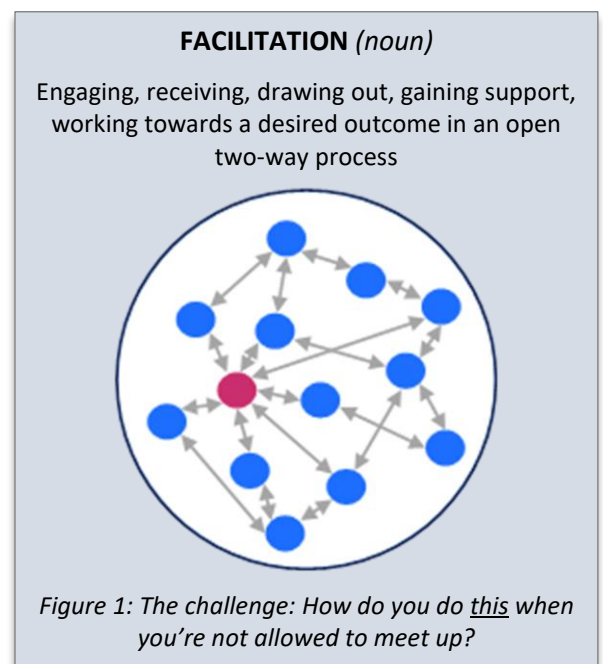
Alongside the undeniable tragedy that COVID-19 has brought to the world since it first imposed itself upon our consciousness in the early months of 2020, the pandemic has served effectively as a reset function for many aspects of everyday life, offering us a unique space for individual and collective reflection on the ways we live and co-exist with family, friends, colleagues, and the world around us. Whilst the seas between us and recovery are still likely to be choppy in places, the voyage is at least now one that we can seriously contemplate thanks in no small part to the exceptional efforts of the international scientific community in epidemiology, public health, scientific communications, behavioural science and, of course, the development and manufacture of therapeutic treatments and vaccines.¹ As the world's nations seek to steer their various courses to calmer post-pandemic waters, there is a moment in time for businesses and public sector organisations to explore imaginatively what the disruption caused by coronavirus and the ways we have adapted to get things done are telling us about how we can work smarter and more sustainably once COVID-19 has finally been reduced to a managed endemic risk.

The most obvious impact of the steps taken to minimise virus transmission in the absence of effective preventative measures has been the severe restrictions placed upon our mobility. This has of course impinged upon society and individuals at all sorts of levels. The purpose of this paper is to share our experience of the challenges presented by lockdown restrictions from the perspective of a knowledge-driven and service-based small business operating with clients in the chemicals, pharma and process industries, and to provide an analysis of the significant benefits we have quantified in terms of time, money, and emissions saved, and new possibilities realised for our own organisation and for our clients by successfully harnessing remote working to address these challenges and provide continuity of service. Measured in the round, we believe the positive balance of sustainability benefits to the minor compromises of remote service delivery is, in our view, so compelling that whilst it may originally have been driven by circumstances, it now provides a template for a remodelled way of future working based on positive choice.

RESPONDING TO BUSINESS DISRUPTION

Britest champions effective whole process design throughout the chemical and biochemical process industries. The company's core offering is a highly developed specialist technical facilitation approach which is used to help multidisciplinary teams identify and increase their process understanding. In the context of industrial clients this typically involves assimilating and communicating insight critical to product and process development, successful problem solving and process improvement.

In collaborative settings the same approach is applicable to identifying what is needed to deliver innovative solutions to key process and manufacturing challenges. In either case this involves bringing people together from across functions, sites, supply chains, disciplines, and sectors to draw upon all necessary perspectives of the challenge or opportunity at hand. Clearly a world where people could no longer be together to get together potentially threatened a major disruption to how the business could continue to provide value to our clients and collaborators (Figure 1).



THE PRIME MINISTER
ANNOUNCED
LOCKDOWN
RESTRICTIONS ON
16TH MARCH 2020.
BRITEST DELIVERED
OUR FIRST
SUBSEQUENT
ONLINE EXTERNAL
CLIENT FACILITATION
ON MARCH 19TH.

Fortunately, in early 2020 Britest was able to view the prospect of impending lockdown knowing we held some strong cards in our hand when it came to dealing with the prospective disruption to our business model. With a strong emphasis on service delivery alongside clients built into the company culture, it had long been understood that the business was much more about people rather than a place or facilities. A distributed workforce model and trust-based working culture was therefore already largely in place. Britest's employees were already accustomed to home working for at least part of the week, and to using face to face time optimally with clients and colleagues (historically through a monthly gathering at "HQ"). There was also a relatively high level of in-house experience of using remote meeting tools, albeit mainly for conventional conversational or presentational meetings rather than full-blown interactive, facilitated, group working.

From this starting point we were able to make the most of our agility as a small organisation to (a) decide to act, (b) learn quickly what else was needed to reproduce the experience of a Britest study online, and (c) put it all into place at speed. The second step involved rapidly identifying, evaluating, and selecting best-in-class collaborative tools (e.g., virtual whiteboard tools, event/networking platforms) and thinking carefully about how to use such tools in tandem with the various audio/video web meeting systems in circulation to maximise the vital element of interactivity.

The Prime Minister formally announced the UK's first lockdown restrictions on 16th March 2020. Britest delivered our first subsequent online external client facilitation on March 19th and the second (for a different client) on the 26th, coincidentally the same day that the lockdown restrictions came into legal force. From that starting point, Britest has gone on to successfully transfer almost all aspects of our working activities into a remote delivery model which, in the 14-month period evaluated in more detail below, has amounted to sixty-five Britest-led events (facilitated studies, trainings sessions, innovation focused meetings, etc.) and around ninety 'other' meetings and events (discussions with clients and contacts, external conferences, project meetings, networking activities, etc.).

ASSESSING THE BENEFITS – PEOPLE, PLANET, PROFIT

We have taken a triple bottom line sustainability approach to assessing the benefits of remote collaborative working, seeking to arrive at a realistic estimate of the savings in time and mileage, and the associated reduction in emissions and enhancements to quality of life associated with business travel avoided during the fourteen-month period from March 2020 to May 2021. Britest is certainly not the only organisation to have thought along these lines. The Scottish environmental NGO Zero Waste Scotland has recently published carbon impact calculations comparing their pre-pandemic ways of working with how things are now.² Zero Waste Scotland has a roughly 100 strong workforce who traditionally have worked out of two offices. Their headquarters is in Stirling, and the workforce is scattered all over the Central Belt of Scotland. Their headline finding was that home-based working had a relative carbon equivalent impact of 2.3 compared with nearly 8 for the traditional model, with big reduction in road miles, and therefore emissions and fossil fuel consumption, more than compensating for the relative inefficiency of heating and lighting 150 distributed home workplaces rather than two centralised office facilities. This analysis however was limited simply to the savings associated with employee commuting avoided. Whilst a valid and worthwhile calculation (and anyone who has ever experienced the M8 / M80 on a busy Monday morning will relish the thought of the associated lifestyle enhancements) our belief is that these "in-house" benefits are potentially just one slice of a very attractive looking cake.

SUSTAINABILITY BENEFITS OF REMOTE WORKING

As described earlier, the economic activity of organisations such as Britest (and indeed Zero Waste Scotland) do not simply involve people travelling daily from home to the office and back again, but rather a more complex network of journeys involving geographically distributed, client-facing members of staff interacting with groups of people often assembled from different sites, organisations, and countries to interact together for a variety of purposes and then dispersing again. To produce a more holistic quantitative estimate of the benefits arising from this complex system of interweaving people and journeys we have divided Britest's activities into several categories and, as applicable, have either extracted data directly from our meeting records or modelled based on estimates of typical business diary volumes to derive relevant sustainability indicators, using appropriate conversion factors as detailed in the Appendix to this report.

THE ENVIRONMENTAL COST OF REMOTE MEETINGS

Remote working effectively substitutes a face-to-face encounter (necessitating travel) with a multi-party web-meeting, and it is important to recognise that such meetings are not free of cost nor of environmental impact. The greenhouse gas savings below are expressed on a net basis, taking appropriate account of the additional load on web servers to support the data traffic for web-meetings. Further details may be found in the Appendix.

SUMMARY OF NET BENEFITS

The overall benefits identified are summarised in Table 1 and shown graphically in Figures 2 to 7.

Table 1 Summary of sustainability benefits

Direct Britest Benefits	Nights Away	Subsistence & Expenses (£)	Net CO ₂ (eq) kg avoided	Travel Time (hrs)	Travel Cost (£)
Studies Training Events	117	£18,604	10,739	684	£12,290
Other Meetings (Domestic)	34	£6,560	3,363	363	£5,533
Other Meeting (Overseas)	23	£4,425	12,082	327	£6,806
Commuting	11	£1,650	3,986	408	£5,153
Overall	185	£31,239	30,171	1,783	£29,252
Benefits to Other Participants	Nights Away	Subsistence & Expenses (£)	Net CO ₂ (eq) kg avoided	Travel Time (hrs)	Travel Cost (£)
Studies Training Events	422	£68,017	123,459	4,139	£62,931
Other Meetings (Domestic)	446	£82,053	195,984	7,245	£115,978
Other Meeting (Overseas)	582	£114,386	147,788	5,724	£91,078
Commuting	0	£0	0	0	£0
Overall	1,450	£264,456	467,231	17,108	£269,986
MULTIPLIER (Others:Britest)	7.8	8.5	15.5	9.6	9.2
Overall Benefits	Nights Away	Subsistence & Expenses (£)	Net CO ₂ (eq) kg avoided	Travel Time (hrs)	Travel Cost (£)
Studies Training Events	540	£86,621	134,198	4,824	£75,221
Other Meetings (Domestic)	480	£88,613	199,347	7,609	£121,511
Other Meeting (Overseas)	604	£118,811	159,870	6,051	£97,884
Commuting	11	£1,650	3,986	408	£5,153
TOTAL	1,635	£295,695	497,402	18,891	£299,768

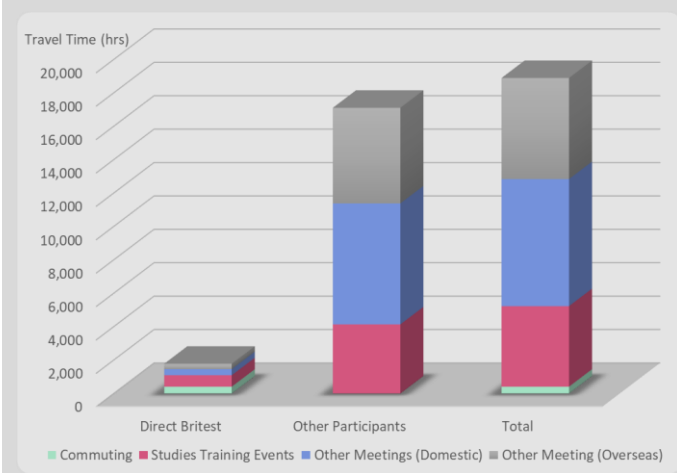


Figure 1 Annual travel time saved

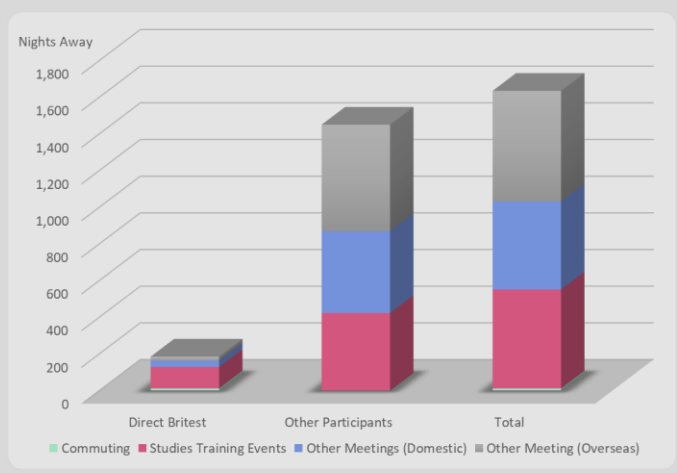


Figure 2 Annual nights away avoided

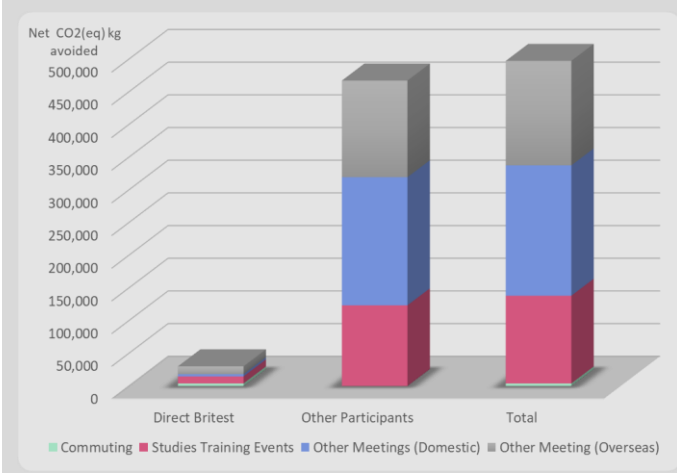


Figure 3 Greenhouse gas emission reductions

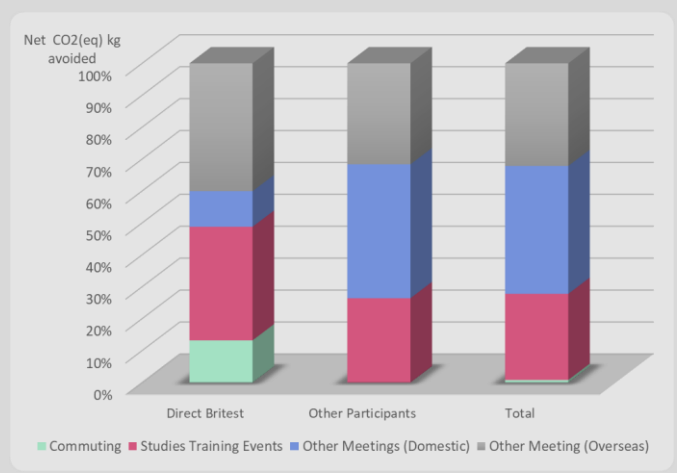


Figure 4 Relative greenhouse gas reductions

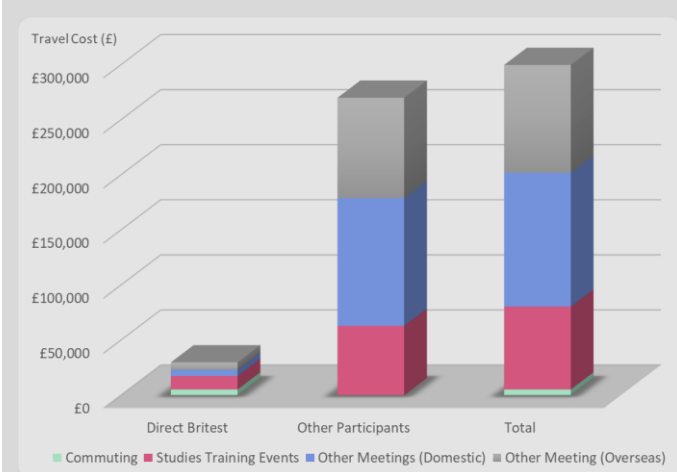


Figure 5 Direct travel costs saved

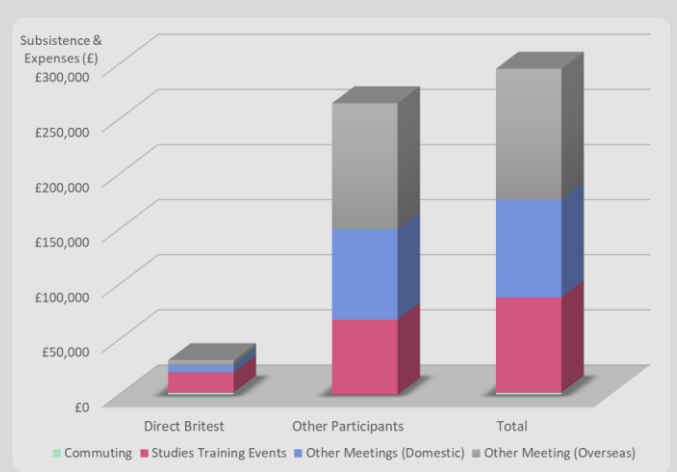


Figure 6 Subsistence and expenses saved

BENEFITS FOR PEOPLE

IT IS APPARENT HOW SUBSTANTIAL ARE THE 'MULTIPLIER' BENEFITS FOR THOSE WITH WHOM WE COME INTO CONTACT.

PRODUCTIVE WORKING TIME LIBERATED FROM TRAVEL EQUATES TO ABOUT HALF AN EXTRA PERSON-YEAR MADE AVAILABLE TO OUR FIVE-PERSON BUSINESS.

The benefits for members of the Britest team and for those with whom we interact are primarily captured in terms of time. Time no longer spent travelling to work and meetings is directly freed up, providing opportunities for both more productive and less stressful working time and useful, restorative personal time. There is also a modest financial benefit involved, through a small amount of avoided commuting costs, however since the costs of almost all the travel considered here would be either directly paid for by companies or recovered through expenses, the associated costs savings for travel, accommodation and subsistence are really a business benefit. For other businesses with a more centralised offices/facilities conventional working model, commuting costs reduction might well be substantially greater for the workforce under a partial or fully remote working model.

Annual travel time savings for Britest staff and external personnel over the four categories of activity considered are shown in Figure 2. It is immediately apparent how much more is involved that commuting time saved (the slim light green band), and how substantial are the 'multiplier' benefits associated with people with whom a highly networked organisation like Britest comes into contact. Nevertheless, the direct benefits are themselves substantial. For argument's sake if we assume that 1,783 hours of Britest staff travelling time saved are evenly split between home life gains and more productive working hours (with due respect to snatched hours with a laptop on trains and planes), 891 liberated working hours equates to about half an extra person-year made available to the business; quite an additional resource to discover within a five-person company!

Anecdotally, time benefits are also felt by members of staff through the extra flexibility afforded by remote working: people can better manage and mix their work and home demands to suit individual circumstances, and without adversely impacting upon either. A further important quality of life benefit to be considered is reduced nights spent away from home, Figure 3. Clearly whilst the opportunity for some work-related travel is for most people an attractive proposition, the reality of routine business travel is often a lot less so. Spending fewer nights away also contributes to the enhanced flexibility of work-life balance previously discussed.

Finally, a brief word on safety. Whilst the objective benefits of travel avoided within the scope of this study would be small in absolute terms³, from a bigger picture point of view, less congested and use-worn roads⁴ used by less fatigued and time-pressured drivers would do no harm to the general sense of societal well-being and taken over the broader population would undoubtedly save lives.

ENVIRONMENTAL BENEFITS

PER CAPITA ANNUAL GREENHOUSE GAS REDUCTIONS OF AROUND 6 TONNES CO₂ (EQ) HAVE BEEN MADE.

The important multiplier effect of the interconnected nature of the company's activities on the savings arising is even more apparent in the net reduction⁵ in greenhouse gas emissions arising from switching to remote working (Figure 4). It is helpful once again to express the benefits in alternative terms: for direct Britest activity these equate to 6 tonnes per capita CO₂(eq) savings annually. The equivalent figure for other participants (estimated to be just over 1,900 individuals in total in the year) is around 240 kg per capita CO₂(eq), though of course working with Britest represents only a fraction of their total annual business activity.

It is interesting to note that the proportions of contributions to greenhouse gas reductions across different types of activity is not the same for Britest staff and other participants. This is more easily seen by plotting both data sets as relative contributions, each adding up to 100%, Figure 5. Of course, only Britest commuting is considered. Britest studies and training are usually delivered at client premises, so client travel is often a relatively modest element of the impacts of such events. The blue bar in this case nonetheless includes a substantial contribution from "off-site" non-Britest study

participants, typically members of client staff based at other sites, or from equipment or service providers, or customers associated with the upstream or downstream whole process. For other domestic meetings, the relatively narrow orange band in the Britest mix is notable. This reflects the relative ease with which we can act in accordance with existing corporate travel policies encouraging the use of the least climate impacting modes of transport available: simply put, third party events tend to be located near major train terminal points more frequently than client on-site meetings, which tend to require car travel. With international travel our green travel options are more limited, except where using the Channel Tunnel is a viable option.

BUSINESS BENEFITS

Finally, we consider business benefits, mostly in terms of money but, as already discussed there are other relevant gains in terms of time freed up for other productive activities and enhanced flexibility. Cost savings are made up of two elements, direct costs of travel (ticket purchases, vehicle mileage costs, etc.) and associated costs of accommodation and subsistence whilst travelling. The former is shown in Figure 6 and the latter in Figure 7.

Once again, direct combined cost savings of nearly £60,000 need to be read in the context of a small not-for-profit organisation. These costs would have been generated predominantly by the travel of four individuals⁶, so *per capita* gains are substantial and appreciable in terms of overall business turnover, albeit that the company would in fact have been able to recover some part of them as eligible expenses within funded projects. As treated here, the recoverable element would primarily fall under the categories of Other Meetings (some domestic, some overseas) but would only be a part of each. Assuming that, say, 60% of these categories' direct travel, subsistence and accommodation costs were recovered through projects, gives a figure of around £14,000 which arguably could be deducted from the headline benefit. Businesses will also need to consider that there may be some set-up and ongoing costs associated with part or full-time home working, to ensure that home workplaces are suitable and safe, and that employees are not unfairly burdened with additional running costs of heating, lighting, or other services.

**ONE CRUCIAL
ADVANTAGE OF
ONLINE SERVICE
PROVISION IS
FLEXIBILITY IN
DELIVERY.**

One crucial advantage of online service provision which is not captured directly in the calculated indicators is flexibility in delivery. The idea of flexibility has already been discussed in the context of personal work-life balance, but for the core activity of technical facilitation of group working, it would not be an exaggeration to say that that embracing online working has opened up new possibilities and enabled several studies which would have been arguably at best sub-optimally conducted as hybrid events or more likely would simply not have happened at all through face to face delivery, (see 'A Meeting of Minds' below).

A MEETING OF MINDS


A series of process understanding studies, delving into the reaction pathways and potential impurity profiles for a complex multi-stage active pharmaceutical ingredient synthesis led by two Britest innovation specialist facilitators on behalf of a major pharmaceutical manufacturer was conducted in two phases and over three sessions in March, September, and November 2020.

These sessions variously brought together up to fifteen participants from multiple sites within the same European locality and, on the latter two occasions, multiple participants (six in September, four in November) from sites in both India and South-East Asia. Each session took the form of a short, sharp half-day activity with close, active involvement of all team members using virtual collaboration tools to share information, exchange ideas, and explore concepts as a group.

It would simply not have been possible to assemble this team to work in this way to these timings in a face to face or traditional hybrid meeting setting.



BUT IS IT SUSTAINABLE?



The previous section has clearly shown that the attractions of online working are substantial and multifaceted, however it is not all upside under the new remote working paradigm; not everyone is a winner under the new rules. Some of the benefits realised undoubtedly come at the cut of a twin-edged sword.

Travel, accommodation, and subsistence costs saved by businesses represent lost income to public transport, and to the catering, hospitality, and hotel trades. The absence of business commuters and travellers during lockdown has seriously exacerbated the already problematic decline of general footfall in city centres, and business districts may face a similar crisis of purpose if the importance of physical location to getting business done is reduced.

For individual workers, risks of isolation from colleagues, demotivation, and general lack of the sociable aspects of life in the workplace (the so-called ‘water-cooler’ moments) need to be recognised. For management, there may be concerns that productivity will drop as a result, or that certain tasks just cannot be done the same way without looking someone in the eye in the same room. Viewed from government, the summation of all these parts is a direct loss of economic turnover and hence income to the exchequer in taxation and, if new ways of working are not as effective as hoped, the risk of an additional chilling effect on output and growth just when we need to bounce back from the restriction necessitated by having to give priority to public health. So where do attitudes stand to the new ways of working, and has the COVID-19 reset changed anything?

It is worth stating that all UK workers already have the right to request flexible working terms from their employer.⁷ Such statutory applications must be dealt with in a “reasonable manner” but this does not meet that they will be granted. In March 2021 it was widely reported that the Department for Business, Energy, and Industrial Strategy (BEIS) was looking at ways to make advances in flexible working precipitated by COVID-19 permanent. With some figures in government said to be pushing for a straightforward legal right to work from home, it was stated that a consultation would be launched “in due course”.⁸ Following the leak of an internal Whitehall document on 16th June⁹ the Prime Minister’s official spokesperson confirmed that the government is considering legislating to make working from home the default option by giving employees the right to request it from the outset. The source however emphasised that there would be no legal right to work from home, adding that the prime minister still believed there were benefits to being in the office, including collaboration with colleagues.¹⁰ The chair of the government’s task force appointed to draw up guidance for flexible working has advocated for supporting the emergence of new, hybrid ways of working¹¹, saying that the pandemic had demonstrated that people could work productively away from traditional workplaces, citing research by the Chartered Institute of Personnel and Development (CIPD) which concluded that 71% of firms reporting that home working had either boosted or made no difference to productivity.¹²

Some business voices have been positive. Both regular¹³ and one-off business surveys¹⁴ in the last year have indicated increasingly positive attitudes towards flexible and home working enabled by remote communications tools. 63% of respondents to the Institute of Directors (IoD) in April 2021 said that they intended to shift to working from home for office-based workers for between one and four days a week¹⁵, and the following month a survey of 500 Scottish business¹⁶ generated headlines including “95% of companies believe internet connectivity is now more important than a city centre office”¹⁷ and “A quarter of Scottish businesses expect to reduce office footprint.”¹⁸ Others, notably the CBI¹⁹, argue against an automatic right to work from home. A TUC policy officer on the government task force has countered this view, arguing that, “the right to request is a right to be turned down” and cautioned against the creation of a two-tier workforce of flexible working haves and have-nots, with the benefits only felt by non-manual workers.

In the chemicals sector Deloitte’s analysis in October 2020 was that “increased use of digital technologies in the workplace is transforming work and the workforce”²⁰, whilst the UK’s Chemical Industry Association’s guidance for the “Recovery” phase of the pandemic perhaps understandably focuses more on the safe start-up of operational facilities²¹ as well as offering up a Mental Health and Mental Well-being Leading Indicator Tool.²² Interestingly for manufacturing more generally, a McKinsey report reimagining manufacturing operations after COVID-19 postulates the emergence of another “have and have-not” inequality, arguing that Industry 4.0 technologies were already transforming manufacturers’ operations before the pandemic, and that now adoption is diverging between technology haves and have-nots.²³

Returning to the views of IoD members expressed in April 2021, opinions were split on whether working from home was more or less productive than conventional working, with four in ten saying remote working was more productive, whilst a slightly smaller number (37%) felt it was less productive for their work. According to the IoD report authors, this mixed response suggests that hybrid working models are likely to provide the optimum balance for businesses as the economy reopens, although many employers are yet to determine how this will work in practice. Anecdotally, and from our own experience, it seems like areas such as new business development and networking for various purposes are areas that are particularly challenging in a world of purely remote interaction. Whilst online event/conference tools have improved rapidly to recreate many aspects of the real-world style experience, it is nonetheless very difficult to provide opportunities for serendipitous conversations as naturally as that long-established business tool, the queue for coffee.

WHAT DO OUR CLIENTS THINK?

WE HAVE RECEIVED OVERWHELMINGLY POSITIVE COMMENTS ON BRITEST ON-LINE FACILITATION.

Britest has recently taken our own recent soundings of attitudes amongst our network of Advocate companies and organisations.²⁴ These identified positive and negative features of both face-to-face and on-line facilitated meetings, see Table 2. We have however received overwhelmingly positive comments on how Britest on-line facilitation have gone, with some respondents feeling these are better than the face-to-face versions. In some cases, this has now become the default meeting type. The effective use of virtual collaboration tools has been positively noted, and this was recognised as going hand in hand with the importance of careful pre-meeting preparation carried out by the Britest facilitators.

Table 2 Britest Advocates’ attitudes to different facilitated meeting modes

Facilitation Mode	Relevant Decision Criteria	Pros	Cons
On-line		<ul style="list-style-type: none"> • Flexible • Easy to have Multiple shorter sessions. • Easy to arrange at short notice. • Cheaper (no travel) • Viable if offices are closed 	<ul style="list-style-type: none"> • Guaranteeing engagement of all • Distractions • Potential IT/connection issues
Hybrid A: Meeting room to meeting room	<ul style="list-style-type: none"> • Cost • Time • Effectiveness • Nature of problem 	<ul style="list-style-type: none"> • Enables teams on different sites to confer. • Avoids business travel 	<ul style="list-style-type: none"> • Often difficult to get good AV & IT to ensure full participation. • If one site has a much larger group, then balance can be lost
Hybrid B: Meeting room + individuals on-line	<ul style="list-style-type: none"> • Attendees (geography) • Meeting room availability • Office / meeting room occupancy restrictions 	<ul style="list-style-type: none"> • Better group interactions – partially face to face • Can use flip charts. • Can involve off-site participants without travel 	<ul style="list-style-type: none"> • Difficult for and difficult to engage the online participants. • Consider rotating who are online attendees over multiple sessions.
Face-to-face (single site)		<ul style="list-style-type: none"> • Better group discussions • Full participation of all (with sound facilitation) • (Possibly) minimises distractions 	<ul style="list-style-type: none"> • Travel time, costs, and impact on people availability • When will this be possible again?

Returning to the theme of flexibility, one of the advantages of the on-line approach is the ability to split a study into several sections. This helps with concentration and energy levels amongst the study team, but also allows key data to be acquired between sessions. Face-to-face meetings, because of the required travel, tend to force completion of the study in a single block of time. Others still prefer face-to-face meetings where possible (for example where all the participants are reasonably close geographically) however it was recognised that for many companies there is often a need to involve sites in different parts of the world, so there may always be a need for on-line meetings.

A point of common ground, and a cautionary note for those seeking hybrid models, was that, in the context of this sort of highly specialised facilitated group working environment, there was a sense that a hybrid meeting (either a mix of predominantly face to face with some remote participants, or multiple groups of people gathered in separate meetings rooms connected remotely) risked combining the worst of both worlds. It might be better therefore to organise decisively one way or the other for any given event. Whatever the case, conscious decision making about the meeting mode to be used needs to be an integral part of the overall planning process for the activity.

Taken as a whole, there is a decisively positive sentiment towards capitalizing further on the advantages and possibilities of online delivery both in real time and on-demand. The necessity of adapting to COVID-19 has challenged our assumptions about what is and is not possible, accelerated changes to the ways we and our clients work, and galvanised us to identify and develop new and improved training offerings which can reach beyond our traditional customer base. These will be coming to market soon.

ADAPTING TO COVID-19 HAS CHALLENGED OUR ASSUMPTIONS, ACCELERATED CHANGES TO THE WAYS WE AND OUR CLIENTS WORK, AND GALVANISED THE DEVELOPMENT OF NEW AND IMPROVED OFFERINGS WHICH CAN REACH BEYOND OUR TRADITIONAL CUSTOMER BASE.

IN CONCLUSION

A thorough and realistic analysis of Britest's business activities in the fourteen months following the imposition of COVID-19 travel restrictions has clearly demonstrated that substantial benefits have been achieved through remote delivery of services. These include:

- cost-savings and improved operational flexibility for the company and, with an eight- to ninefold multiplier, for our clients;
- reduced expense, time gains, and lifestyle benefits for members of staff and, via a similar multiplier, those with whom they interact; and
- greenhouse gas reductions of 6 tonnes CO₂(eq) per head of staff, and a fifteen fold multiplier in total emissions when client interactions are taken into account.

Britest's lockdown experience has catalysed innovation in terms of new, extended, and enhanced online service and training offerings which can reach beyond our traditional customer base, and the indications are that effective, collaborative remote working and service delivery will continue to play a full part in Britest's overall mix of activities as the working world gradually establishes its post-COVID norms.

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- ² <https://www.zerowastescotland.org.uk/sites/default/files/ZWS1618%20Carbon%20impacts%20of%20lockdown.pdf>
- ³ The statistics that would provide relevant conversion factors tend to be expressed in accidents per billion miles travelled, e.g., <https://www.gov.uk/government/statistical-data-sets/reported-road-accidents-vehicles-and-casualties-tables-for-great-britain>
- ⁴ The statistics that would provide relevant conversion factors tend to be expressed in accidents per *billion* miles travelled, e.g. <https://www.gov.uk/government/statistical-data-sets/reported-road-accidents-vehicles-and-casualties-tables-for-great-britain>
- ⁵ Travel emissions avoided minus additional server emissions due to added data traffic.
- ⁶ As a note of minor detail, it is valid to include an element of “commuting” as a cost to the business in the specific case of Britest, as the distributed workforce model means that remote staff members are employed from home and are thus able to recoup travel expenses for periodic trips to centralised face to face team meetings and similar.
- ⁷ <https://www.gov.uk/flexible-working>
- ⁸ For example, <https://www.thetimes.co.uk/article/working-from-home-and-flexing-hours-will-become-the-norm-r9s325ml3>, <https://www.heart.co.uk/lifestyle/remote-working-normal-change-flexi-hours-government/>, <https://www.cityam.com/ministers-mull-making-home-and-flexible-working-a-legal-right/> all from 24th March 2021.
- ⁹ <https://www.politico.eu/newsletter/london-playbook/politico-london-playbook-living-with-corona-work-from-home-long-term-perspectives-scrapped/>, 16th June 2021.
- ¹⁰ <https://www.theguardian.com/business/2021/jun/17/labour-demands-clarity-on-plans-to-make-working-from-home-a-default-right>, 17th June 2021.
- ¹¹ <https://www.theguardian.com/business/2021/may/02/government-taskforce-urges-permanent-job-flexibility-for-all-workers>, 2nd May 2021.
- ¹² <https://www.cipd.co.uk/about/media/press/010421homeworking-increased-productivity>, 1st April 2021.
- ¹³ Useful regular data sources include the Decision Maker Panel <https://decisionmakerpanel.co.uk/> and the Office for National Statistics (ONS) Business Insights and Conditions Survey (BICS) updated periodically at <https://www.ons.gov.uk/businessindustryandtrade/business/businessservices>
- ¹⁴ *Working from home is revolutionising the UK labour market*, VOXEU/CEPR summary of attitudes of 5,000 working adults in the UK <https://voxeu.org/article/working-home-revolutionising-uk-labour-market>, March 2021.
- ¹⁵ <https://www.iod.com/news/news/articles/IOD-Directors-look-to-hybrid-working-for-the-future>, April 2021.
- ¹⁶ <https://www.addleshawgoddard.com/the-workspace-debate-ag-report-2021/>, May 2021.
- ¹⁷ <https://www.insider.co.uk/news/95-companies-believe-internet-connectivity-24032521>, May 2021
- ¹⁸ <https://www.scottishconstructionnow.com/article/quarter-of-scottish-businesses-expect-to-reduce-office-footprint>, May 2021.
- ¹⁹ <https://www.theguardian.com/business/2021/jun/21/cbi-city-bosses-warn-against-giving-uk-staff-legal-right-work-from-home>, June 2021.
- ²⁰ The shifting landscape of chemicals and materials: COVID-19 impact on the chemicals industry, <https://www2.deloitte.com/uk/en/insights/industry/oil-and-gas/COVID-19-chemicals-industry-impact.html>, October 2020.
- ²¹ <https://www.cia.org.uk/Portals/0/%E2%80%98Recovery%E2%80%99%20Phase%20for%20Operations%20in%20the%20COVID-19%20Pandemic.pdf?ver=2020-05-27-124621-323>, May 2020.
- ²² Available to download from <https://www.cia.org.uk/COVID-19>, accessed June 2021.
- ²³ Industry 4.0: Reimagining manufacturing operations after COVID-19, <https://www.mckinsey.com/business-functions/operations/our-insights/industry-40-reimagining-manufacturing-operations-after-COVID-19>, accessed June 2021.
- ²⁴ Britest internal client survey and discussions, May 2021.

APPENDIX

SUMMARY OF SUSTAINABILITY BENEFITS CALCULATIONS

To produce a holistic quantitative estimate of the benefits reported we have divided Britest’s business activities into four categories as shown in the table below and have either extracted data directly from calendars and meeting records or modelled typical business diary volumes which can be combined with suitable conversion factors to derive relevant sustainability indicators.^a

Summary of sustainability benefits calculations

Activity Type and Quantity	Basis for Data / Calculation
Britest studies, training, and events (domestic and international): 65 events in total during March 2020 – May 2021	Directly extracted from meetings records (dates, durations, likely locations if these events had been conducted in conventional face to face mode, attendee numbers and their base locations). Final derived impact benefits scaled by a factor of 12/14 to provide annual figures. For Britest staff travel, wherever possible actual journey distances and modes of transport were used. For non-Britest staff we have estimated a reasonable mixture of transport modes and average distances according to types of journeys undertaken (travel to local/usual workplace meeting venue, non-local domestic travel, short or long-haul international travel).
Other events – domestic: 72 events per annum	Travel within mainland Great Britain (potentially including domestic flights) if these events had taken place conventionally face to face. Volumes estimated from typical frequencies of two sub-types of events: small group meetings (on average 1 Britest staff member meeting with 2.5 others), and large group meetings (on average 1 Britest staff members meeting with 30 others) where domestic travel would have been required (by Britest staff) conventionally. A modest proportion of external attendees are assumed to travel from overseas, either short or long haul. Impacts estimated from a reasonable mixture of transport modes according to journeys undertaken for all categories of attendees.
Other events – overseas: 18 events per annum	Travel beyond the island of Great Britain if these events had taken place face to face. Volumes estimated from typical frequencies of the same two sub-types of meetings where international travel would have been required conventionally. Impacts estimated from a reasonable mixture of transport modes according to journeys undertaken for all categories of attendees.
Britest commuting: Per annum	Based upon typical frequencies and actual locations and journeys for a core team of five members of staff under two scenarios: (1) pre-pandemic conditions and (2) a likely post-pandemic model retaining increased use of remote meeting tools, halved frequency of face-to-face team meetings and the relocation of team meetings from a suburban location (Daresbury, Cheshire) to Central Manchester.

All actual data, estimates and assumptions about events frequencies, attendee mixes, typical journey lengths and mixes of travel modes were validated by discussion with the members of the Britest team directly involved in the activities.

^a A spreadsheet which would allow our methodology to be replicated is available upon request from the author.

Modes of transport considered, and the conversion factors employed to calculate impact benefits, are shown in the following table.

Modes of Transport and Conversion Factors

Transport Mode	CO ₂ (eq) (g km ⁻¹) ^b	Ave Speed (mph) ^c	Cost (£ per mile) ^d
1. Domestic Flight	255	116	0.21
2. Medium Petrol Car (Urban)	192	15 ^e	0.45
3. Medium Petrol Car (Trunk)	192	45 ^f	0.45
4. Short-Haul Flight	156	177	0.18
5. Long-Haul Flight	150	348	0.06
6. Rail (Local)	41	18	0.52
7. Rail (Intercity)	41	57	0.23

A conversion factor of 36 CO₂ (eq) g hr⁻¹ advocated by the IEA in November 2020^g has been used in conjunction with the known and assumed duration of events to estimate the additional burden of web-meeting bandwidth on servers associated with online events. A group Zoom meeting for example typically consumes 1.35GB of data^h per hour. For the purposes of this discussion, and indeed in fact, any necessary software licences were already in place, or additional licence purchase costs may be considered negligible, compared with the travel and accommodation costs avoided.

^b Values from UK Department for Business, Energy & Industrial Strategy (BEIS)

<https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019>

^c Based upon Google Maps returns of estimated times, and advertised timetabled public transport durations for specimen cases of domestic, short- and long-haul journeys for each mode as applicable, with additional allowances made for, e.g., transfers, check-ins, delays, congestion, parking up etc.

^d Based upon publicly advertised, UK available fares for specimen case journeys during May 2021 and current HMRC mileage rates for road transport.

^e As points of comparison, values of 25.7km/h for Stockholm, and 31.5km/h for Amsterdam are quoted in *Disparities in travel times between car and transit: Spatiotemporal patterns in cities*, Yuan Liao, Jorge Gil, Rafael H. M. Pereira, Sonia Yeh & Vilhelm Verendel, <https://www.nature.com/articles/s41598-020-61077-0>, <https://www.nature.com/articles/s41598-020-61077-0.pdf>

^f According to regularly published UK Department of Transport data, average *moving* trunk road speeds are about 55 - 60 mph.

^g International Energy Association, <https://www.iea.org/commentaries/the-carbon-footprint-of-streaming-video-fact-checking-the-headlines>, accessed June 2021. A significant focus of this publication was to debunk a seemingly oft-quoted estimate of 3.2 CO₂ (eq) kg hr⁻¹ produced by the Shift Project in 2019 which in the view of the IEA was based upon flawed (over)estimates of data use intensity in streaming services. This in turn led to a series of inaccurate headlines in the popular press and media concerning the impacts of online services and streaming in subsequent months. The IEA's estimate is also a significant downward adjustment of their own previous estimate of 82 CO₂ (eq) g hr⁻¹ (from February 2020).

^h <https://www.reviews.org/internet-service/how-much-data-does-zoom-use/>



Generating value from process understanding