Actions Re Science & COVID-20 in the UK v1.4

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7th-20th March 2020, minor updates through till 17th April 2020

Abstract

What actions should we take when we are getting conflicting advice from seemingly-authoritative sources? On 20th March 2020 the UK government published its science advice in non-technical form, so we can take advantage of the intense international review. This document focusses on just a few of the hundreds of points in the UK scientific evidence, including the ones to do with my speciality. The UK scientific evidence does not always agree with what the UK Prime Minister and his staff have been saying, and both deliberately contradict what the World Health Organisation strongly recommends from experience in hundreds of countries. Citizens of the UK, especially in England, should be sceptical of inconsistent statements made by UK-level ministers about when the lockdown should lift, what the England-level strategy is, and what behaviour is acceptable. UK-level ministers have no authority over COVID-19 measures and enforcement on the 10.7 million UK citizens of Wales, Northern Ireland and Scotland although they often speak as if UK-level control exists (it doesn't, although as always UK constitutional matters are a mess.) The proposed UK-level tracking app does not yet exist but the design plans seem deeply flawed and the app should not be trusted by UK citizens, certainly not as the claimed replacement for WHO recommendations.
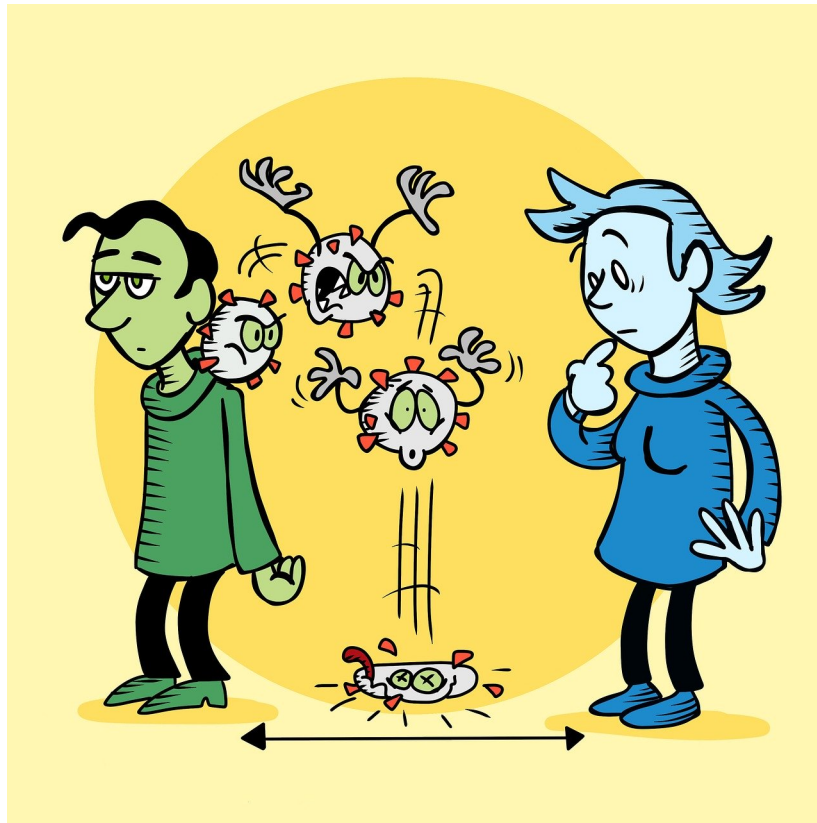
Contents

Figure 1: Social Distancing (from Pixabay)

This paper is by Dan Shearer, developed to assist in my own decision support, and others have found it useful. Corrections and suggestions to dan@shearer.org received with thanks.

The paper lives on github , where you can read it online or download the PDF. If you are familiar with github it'd be great to receive pull requests. If you are not, gihub is a system where the history of all changes is documented in public and can always be seen and compared.

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Status of This Document

The COVID-19 landscape is changing fast, so this document is always out of date.

There are many claims that the UK is "not being driven by science" when it comes to practical actions. For example, on 25th March 2020, two specialists published an opinion piece in The Guardian The UK's coronavirus policy may sound scientific. It isn't and compares the UK government's approach to scientism:

> "scientism" – things that have the cosmetic attributes of science but without its rigour.

This was no surprise. An English medical specialist said this as early as 15th March 2020.

Since the science is in public and is being constantly reviewed by many teams worldwide, we can see if these claims are valid. I think they are. As of April 2020, it appears certain there was and continues to be a UK-level decision for England to ignore medical advice in favour of computer-generated projections usually used after or to supplement medical advice. This has also somewhat affected Scotland, although Scotland has not entirely ignored WHO.

The claims of "this isn't science" relate to the overall science and medical approach. I definitely extend this to the large amounts of computer source code written by an academic at Imperial College more than a decade ago, because it became become an authoritative non-medical input to UK-level policy. Promises were made that the source code would be published on github just like this document, but have not been delivered. That is also scientism - to claim mystical properties for computer code that nobody can see. It is trivial to publish the code as it existed at the time it was used to make decisions, and failure to do so is wrong.

I deal with computer source code and analysing how it impacts human and computing information. My motivation for this paper is that I have keyworkers and vulnerable people in my immediate circle, and unlike countries of comparable size such as Germany and South Korea the UK does not have nearly such a strong history of democratic accountability or competent healthcare execution. And unlike small and poor countries such as Greece and Rwanda who have also done well, the UK did not immediately follow best practice

advice.

Summary

This document mostly relates to a handful of points among the many hundreds of points in the published UK government scientific coronavirus advice, as identified by UK epidemiologists. Most of the UK scientific advice is in line with WHO guidelines, some is not. Some of the official UK government statements are out of line with its own scientific advice, and even further out of line with WHO.

Many of the UK actions and advice are good and helpful, if late. Catastrophic mistakes were made in the UK which can be mitigated in part even now. The UK is not Brazil or the US with their disasterous approaches to public policy, and with poor UK-level leadership we do have a fair chance from now on.

Scotland is in a different situation to England it would seem, and if quick action is taken now perhaps Scotland can have a reduced impact. On 25th March 2020 Scotland announced it was setting up a Scotland-specific COVID-19 science advisory body with the (now-sacked) Chief Medical Officer Dr Catherine Calderwood and First Minister Nicola Sturgeon quoted as saying at the press conference that different suppression rules may be needed in Scotland and different parts of Scotland. On 6th April 2020 Dr Calderwood resigned. Perhaps her successor will be more willing to consider implementing WHO recommendations and research summaries, and more willing to mobilie the many trained contact-tracing staff throughout Scotland who are not reported as having been used yet at all.

Every local council in England and Scotland (Wales and Northern Ireland unknown) employs thousands of contact tracing staff as part of their Environmental Health responsibilities. These officers have not been activated in either country (as of early April 2020) despite their core expertise being tracing outbreaks of measles and other infectious diseases. Any one local council could have implemented this: COVID-19 is all about localised clusters. That is not a failing of UK-level government, and it impacts on us locally. An app cannot make up for this skill.

Action Items relevant through March 2020

(need to revisit this section now we are in April)

- Keyworkers who qualify for childcare places should ask their childcare/school facilities about social distancing policies for the children. The UK science advice says that children must practice social distancing immediately. Summarising across other parts of the advice this must mean especially including those children that remain in collective care because their parents are key workers, many of whom are at high risk. The UK government has not discussed this despite it being part of their own COVID-19 cluster management advice. There is some evidence that social distancing compromises work best for children, who will suffer whichever decisions are made.

- Childcare/school facilities open for keyworker's children need to ready their records to be used as evidence in tracing contacts, if and when any of the UK nations implement WHO advice on contact tracing and surveillance testing. The staff knowledge of each child's circumstances could also be vital (for example, who is living with a grandparent.) The UK science advice is completely silent on the topic of contact tracing, while WHO and many countries are very clear that coronavirus cannot be managed without it. In addition the UK government explicitly stopped contact tracing as a deliberate policy. All citizens need to be aware that at some point the UK government will have to catch up with the world and initiate tracing. We can do that by recording who we know who has it (there are several apps now, although most of them are tangential to tracing, which can only be a government function.)

- UK citizens should be prepared to ignore any advice to lift lockdown without testing within their particular nation. The UK science advice in SPI-M-O: Consensus view on behavioural and social interventions says there should be multiple waves of on-off-on-off suppression over a period of a year. This has become de facto policy. If the nations of the UK still do not undertake WHO-approved testing and tracing, then according to the unanimous consensus of epidemiologists as far as I have found, those nations will have years-long on/off COVID-19 outbreaks while other countries have successfully

suppressed or even eradicated it.

- UK citizens should be already noting as best they can who they know of that has seemed to have COVID-19, in preparation for door-to-door health checks ("community surveillance") which are an essential part of WHO advice. This can only be government-led, but in anticipation communities can be actively and informally sharing information with their neighbours now in the absence of leadership on this issue. This virus is very unlike the flu in it's clustering nature, so friends can put together a very effective list of people who should be tested when someone they know has had COVID-19 symptoms or a diagnosis. The Kings College App partially helps with this, and there are at least two other tracking apps.

- For those with computing and robotics/mechanics skills and inclination, there are several actions to consider listed further down, some of them quite simple. This is a respiratory disease and carers need respiratory protection while some patients need respiratory support.

- As an important action for legal or political people, and directly arising from the science, the Appendix to this document has an outline of the legal import of the Precautionary Principle and decisions the UK Parliament is about to make but which have been paused for COVID-19.

Detail of the UK Science

On Friday 20th March the UK government published, after much pressure, the scientific advice it is relying on to develop policy. The contents mostly do not appear to be advice that contradicts WHO advice, except as regards testing (by complete omission) and tracing (also by complete omission) and also in terms of not coming out of lockdown too soon. All these points are further covered below. Although the recommendations are mild and the information sparse. Journalists suggest it was requested after weeks of delay from a small and non-representative selection of experts who were not expecting the task, and who did their best in the time available.

The advice document SPI-B insights on combined behavioural and social interventions (4 March 2020) says "school closure will need to be accompanied by social distancing advice directed at children to be effective" and other similar statements are elsewhere in the documents. We can see from other statements in the advice that this is about avoiding creating disease clusters centred on keyworkers, especially those who are otherwise at low risk.

In the document SPI-M-O: Consensus view on behavioural and social interventions (16 March 2020) the strong recommendation is for on-off-on-off suppression over a period of a year at least. This is not what the UK Prime Minister has said, and on-off-on-off suppression idea has been strongly objected to including in work published in The New England Complex Systems Institute, see below. Fragile people need to be aware that if this is indeed the approach the UK government promotes, that they should definitely not engage with the "off cycles", at risk of their lives. The UK government no longer advocates herd immunity (see next section) but this is something approaching it. With the UK government's refusal so far to engage in targetted testing and also tracing+quarrantine, according to WHO-compatible advice this is concerning.

This same advice document also mentions future "regional controls", which is not something any UK government has acknowledged yet. WHO recommends regional controls. Geographically obvious control points include the Irish Sea and an approximation of the England/Scotland border, and other geograpghic areas within England, plus smaller islands. Is this perhaps where COVID-19 responses could become perceived as politically motivated, and therefore the science would not be applied?

Critiques, and Imperial College Modelling

Professor Bruce Aylward of WHO has been through many pandemics, and lead the WHO COVID-19 investigative mission in China and has given many recent interviews. His interviews invariably conflict with some of the UK science advice, especially:

- response speed (needs to be fast for every reported case)
- testing all suspected cases

- tracing contacts for all confirmed cases

Two of Aylward's interviews are the New Scientist, on testing and the slightly older but very hard-hitting Vox interview.

Professor Aylward declines to criticise the two doctors who have lead England's and in part the UK's medical response, he just keeps explaining why WHO is recommending countries do more than the UK is.

In the New Scientist on 23rd March 2020 there was a critique of the UK government's scientific advice .

From the New Scientist article:

- Testing is barely mentioned, despite WHO and other countries telling us it is completely essential
- Tracing is barely mentioned, which is what informs successful testing and quarrantining cases before they show symptoms
- The Imperial College modelling seems to be the only modelling that is used rather than more usual combination of modelling teams. The Imperial College work was very important because it convinced the government to agree at least partially with science, but it has been shown to have some serious errors and oversights.

The Imperial College modelling was reviewed by The New England Complex Systems Institute. Complex systems research is about mathematical modelling, and the UK government's science is based on a single mathematical model, so this is a helpful source.

The March 17th 2020 Review has this summary paragraph (references not copied in here):

> However, they make structural mistakes in analyzing outbreak response. They ignore standard Contact Tracing [2] allowing isolation of infected prior to symptoms. They also ignore door-to-door monitoring to identify cases with symptoms [3]. Their conclusions that there will be resurgent outbreaks are wrong. After a few weeks of lockdown almost all infectious people are identified and their contacts are isolated prior to symptoms and cannot infect others [4]. The outbreak can be stopped completely with no resurgence as in China, where new cases were down to one yesterday, after ex-

cluding imported international travelers that are
quarantined.

Still-Unpublished "Thousands of Lines of Undocumented C Code"

The Imperial College modelling seems to have been critically
important to turn around the Uk policy of "do nothing". For
that much, Neil Ferguson is to be congratulated on his work.
Unfortunately there has been no public followthrough, and
so there can be no review of what turns out to be a single
person's decades-old source code which drives some of the
most important decisions the UK has ever made.

As to the code, Ferguson wrote on Twitter on 22nd March
2020:

> I'm conscious that lots of people would like to see
> and run the pandemic simulation code we are using
> to model control measures against COVID-19. To ex-
> plain the background - I wrote the code (thousands
> of lines of undocumented C) 13+ years ago to model
> flu pandemics… I am happy to say that @Microsoft
> and @GitHub are working with @Imperial_JIDEA and
> @MRC_Outbreak to document, refactor and extend the
> code to allow others to use without the multiple
> days training it would currently require (and which
> we don't have time to give)…

As of 14th April 2020 there has been no sign of this, and
there is no excuse for a codebase as critical as this to
not yet be published, particularly since the original un-
modified code as used for UK (and apparently US) decisions
needs to be published. Common reasons for not publishing
code that was never intended for publication include embar-
rassment by the author, and highlighting of errors, neither
of which matter in this case. This failure to publish is
exceptionally unprofessional. Life and death decisions af-
fecting me and those around me were made on the basis of
this code and according to public statements in April 2020,
still are.

There is no doubt that Neil Fergusson is an authoritative
voice, but to those of us who live in a world that routinely
has "thousands of lines of undocumented C code", there is
no excuse.

To illustrate, the UK government could have called on pandemic experts with an ample choice of additional pandemic modelling code bases already published, including:

- EPIMODEL on github, written by 9 people and kept current with models for many diseases and mathematical approaches
- ringbp on github, as described in Lancet on the 28th February: Feasibility of controlling 2019-nCoV outbreaks by isolation of cases and contacts

It takes a medical and mathematical specialist to work out which combination of modeling codebases are best to use. But we can say with confidence the approach chosen by the UK government was definitely not acceptable, and the continued refusal to publish is extremely poor practice. This computer science fact alone would be sufficient grounds for well-informed citizens to ignore UK-level government advice about coming out of

To further illustrate how computer modelling alone can be very misleading even from eminent experts, on 25th March 2020 Sunepta Gupta of the Oxford Evolutionary Ecology of Infectious Disease was widely reported as stating in article in the Financial Times the unlikely claim that "Coronavirus may have infected half of UK population" . This interpretation is deeply in error, and the author only said that was the outside possibility in the range given by her modelling. Once again a pile of computer code unaccompanied by population testing to confirm or deny the mathematics has not been put in context.

In the same article Gupta questions the reliance of the UK government on the single model from Imperial College, and supports the evidence so far that not a single other specialist epidimology department in the UK was contacted by the UK government. This in turn supports the notion of "sciencism" determining UK policy.

As of early April it seems from medical documentation published from Austria, the Netherlands and other countries that have followed WHO testing advice that the figure might be closer to 2% than 50%, although one town in Germany registered 13%. We just don't know yet, until the data from medical testing comes in.

The lesson I along with any other computer scientist can affirm is: never ever make a giant decision on the basis of one person's ancient unpublished source code.

Open Source Action Items

Context - The Complexity of This Problem

There has been a great deal of activitiy in open source communities on many projects related to COVID-19. Many of the 3D printing projects for PPE and some of the app-creation efforts are addressing problems thoroughly. However some of projects for creating medical devices are beyond ambitious technically and bordering on providing false hope. The open source community needs to avoid repeating the mistakes of the UK government in thinking computing expertise can make up for lack of medical expertise.

As a comparison, consider the medical approaches China brought to bear in Wuhan starting from zero knowledge. In the Vox interview discussed above, Professor Aylward describes the Chinese approach as both innovative and advanced (this is entirely beside the point of China's initial prevarication on their COVID-19 response). Aylward said:

> they find cases fast, get them isolated, in treatment, and supported early. Second thing they do is ventilate dozens in the average hospital; they use extracorporeal membrane oxygenation when ventilation doesn't work. This is sophisticated health care. They have a survival rate for this disease I would not extrapolate to the rest of the world. What you've seen in Italy and Iran is that a lot of people are dying.

(extracorporeal membrane oxygenation, ECMO is a form of heart-lung machine that can be used for a week or two at most for patients with collapsed pulmonary systems)

His point is that it is unlikely that Western countries such as the UK can match the sophistication of healthcare available in China in the sense that they were able to both deploy equipment and also try many different imaginative approaches on the job to arrive at scientific consensus of how best to react.

To a technologist, his comments are also a very pointed reminder of the daunting complexity of the software and hardware required at scale. Ventilators are difficult machines to make, and ECMO machines much more so. Nevertheless, we need them, and people are dying. The Italian healthcare system is excellent (for example, more beds than in the

UK system) and yet many people are dying. Many African healthcare systems are nothing like as good. COVID-19 has many presentations and degrees of symptoms, and medical devices need to be able to be adjusted for the particular COVID-19 response needed. Regulatory approval is hard to get because it is very easy for a machine to blow too hard into damaged lungs, to pick a simple example.

The technical facts for open source communities are that there are three levels of pulmunary assistance that can be provided:

- Powered Air Purifying Respirator (PAPR) - for carers, not patients! As many have pointed out, most well-meaning ventilator build projects would be better using the same parts at much less risk to protect medical staff. Code and instructions here
- Ventilators. The open source efforts have been scattered, but start here. Ventilators are very hard indeed. There is a collective EU ventilator procurement project that the UK has declined to participate in. The last resort ventilators produced by open source developers and doctors in Spain and Italy are not ones you would choose to be used on you unless you are about to die. More advanced designs are seemingly ready in Germany and the Czech Republic, with backing from other EU countries. The key is testing of these proposed devices and that takes time. (it is helpful to remember that Germany went into this in the positions that nearly all of their very large number of ICU beds already had a ventilator.)
- ECMO machines are just too advanced for the UK to consider at scale. A recent parliamentary question revealed that in all of England there are just 15 ECMO ICU beds. Building an ECMO is very complex, although German manufacturers are increasing production as fast as they can. Testing an ECMO is difficult, and there just isn't a way to suddenly make thousands of ECMOs appear in the UK. That means people will be dying due to lack of ECMO.

For those with the skills, apart from building PAPRs (which seems quite an obvious thing to do) there is scope for code:

- analytics from ventilators and ECMOs needs to be gathered as a priority national resource. Noninvasive logging into an open form in public is a low-risk, high-reward activity.

- analytics from ECMO machines even more so, perhaps assisting in better allocating their usage as the scarecest of resources

Agreement In Science-based Opinions

Who Can I Believe?

For citizens wondering "who do I believe?" it helps that all of the basic science recommendations worldwide are agreed, even among scientists who disagree so far on one aspect or another of this unknown virus.

As an example, the following two pieces represent hugely differing views from eminent scientists and mathematicians, which nevertheless agree on all basic principles. Unlike the UK science advice, a multiplicity of views is important for solid science to emerge. England has had regular events and intensive study on pandemic responses in places such as the Cambridge Centre for the Study of Existential Risk and their research on Global Catastrophic Biological Risks , and any of these could have been called on, but were not.

Nicholas Taleb and Yaneer Bar-Yam, authors of the Complex Systems Institute paper wrote in the non-scientific Guardian article on 25th March 2020 quoted in the abstract of this document:

> when one deals with deep uncertainty, both governance and precaution require us to hedge for the worst. While risk-taking is a business that is left to individuals, collective safety and systemic risk are the business of the state. Failing that mandate of prudence by gambling with the lives of citizens is a professional wrongdoing that extends beyond academic mistake; it is a violation of the ethics of governing.

> The obvious policy left now is a lockdown, with overactive testing and contact tracing: follow the evidence from China and South Korea rather than thousands of error-prone computer codes. So we have wasted weeks, and ones that matter with a multiplicative threat.

In contrast, the Nobel prize winner Michael Levitt who successfully and almost exactly predicted the outcome of the

Wuhan COVID-19 experience so far, is very upbeat about the trajectory of COVID-19, and why people should not be overly worried. And yet on 23rd March 2020 he was interviewed in the LA Times he agreed with pretty much every other scientist involved, except perhaps the Chief Medical Officer of England, when he said:

> The goal needs to be better early detection — not just through testing but perhaps with body-temperature surveillance, which China is implementing — and immediate social isolation.

His other views are interesting and encouraging, and let's hope they are borne out over the next few months.

Jiayou 加油

In January 2020, tens of thousands of tonnes of supplies were shipped from the EU to Wuhan. Two months later, Wuhan is opening up and we live in a world where Jiayou ("keep strong") is part of the Italian language, emphasised by hundreds of emergency doctors coming from China to Italy, and millions of testing kits arriving in the EU from China. This time, let's not forget about pandemics, and that no country can possibly do this on their own.

Appendix: The UK Precautionary Principle

Are you into campaigning or influencing how the UK runs? When the UK's various parliaments return after COVID-19 - or perhaps beforehand, given the efforts being made to keep democracy ticking - the Precautionary Principle will be one of the things they need to continue legislating on, all four parliaments and assemblies.

It is common to hear in political thinking in England that the Precautionary Principle is a bad idea. This seems to also be associated with ignorance around it. Since the PP, and its absence, is very much at the heart of the UK's COVID-19 response, perhaps MPs can be persuaded to have a different view.

Draft Law and Guidance is more circumspect, in that it does not explicitly dispense with the PP. However in embedding economic progress into environmental protections the UK

government seems to setting the scene for weakening the PP
by means of interpretation.

What is the PP?

In 2018 the British Academy wrote in Legal Aspects of the
Precautionary Principle:

> The precautionary principle is an environmental
> principle enshrined in the Treaty on the Function-
> ing of the European Union. Where there is scien-
> tific uncertainty about risks to human health or
> the environment, the precautionary principle al-
> lows decision-makers to adopt protective measures
> without having to wait until the reality of those
> risks become fully apparent.

The Precautionary Principle is a feature of law that I and
others have worked with for years, and it is no secret
that those leading the Brexit charge disliked it intensely,
and the United States rejects it outright at the federal
level and in many court rulings. On 31st January 2020, a
well-known writer on economics topics produced a summary
of these sorts of views in a Spiked article:

> The British government should adopt a similar inde-
> pendent approach in setting aside the precaution-
> ary principle deployed by the European Commission.
> This principle means that in the case of 'scien-
> tific uncertainty', the EU often adopts a high
> level of caution with regard to debatable risks.
> This holds back innovation, not least in areas
> such as genomics and new materials, and leads to
> banning certain products.

This article feels broadly representative of the views of
people who dislike the PP, please let me know if this is
not the case.

What is the Status of the Precautionary Principle
in the UK?

The PP applies across large amounts of UK law, but it starts
with environmental and health protection. There is a draft
Environment (Principles and Governance) Bill but despite
three years of discussion it has not progressed at all.
Various hopeful statements were made that the Bill would

become law in 2020, but there is virtually no chance of
this now happening since the committee is not sitting and
the Bill hasn't even reached the first stage yet.

In the text of the first Draft Bill, and in the publication
Scrutiny of the Draft Environment (Principles and Gover-
nance) Bill The Precautionary Principle is acknowledged as
one of the four EU principles governing environmental law,
but then it is clear that this Bill seeks to destroy the
concept of any binding principles:

> …principles have become "creatures of policy" and
> not law which undermines their legal influence "to
> the greatest extent possible, despite their statu-
> tory foothold

and

> They are to be defined and expanded upon by the
> Secretary of State. They are only relevant to
> policy formation and not decision making. They do
> not apply in any direct way to anything other than
> central Government and so on and so on

This makes for grim reading, and according to this detail,
is the exact opposite of the UK government spin of "improv-
ing on our already-strong environmental protections".

Further evidence is in the 10th March 2020 document Evi-
ronmental Governence Factsheet was published, in which the
four EU principles of environmental protection are acknowl-
edged just as in the draft Bill, but also it makes this
giant can-kicking loophole statement:

> The Bill requires the Environment Secretary to pub-
> lish an environmental principles policy statement,
> setting out how these principles are to be inter-
> preted and proportionately applied by ministers in
> order to deliver their objective of contributing
> to the improvement of environmental protection and
> to sustainable development.

In short, not only does the Bill water down the idea of
any principles, the Government will not even issue a pol-
icy statement about the most basic principles. It is not
looking good for the PP.

What is Devolved?

In the section Collaboration with Devolved Administrations the scruitiny document says:

> Environment is a devolved matter, subject to a small number of areas that are reserved… the OEP could exercise functions more widely across the UK "subject to the ongoing framework discussions with the devolved administrations".

This is the topic of the "power grab" discussions, where devolved administrations are unhappy that Westminster has seized control of things handled within EU frameworks.

It seems clear that Westminster wants to force the all parts of the UK to abide within policy directions set in London, undermining the ability of the devolved areas to have their own insistence on principles including the PP.

This is a very active area of discussion, and it is far from over yet. There is a complex interplay of rights, jurisdiction, responsibilities and interests that is completely unclear.

What Next?

COVID-19 will be endlessly discussed, in terms of risk, response, principles and more. The PP should explicitly be a central part of this. We know what the PP is, and it has been a part of UK law and court decisions for decades. The citizens of the UK would greatly benefit if the term "precautionary principle" was to become in common usage. Many in the UK seem to feel a lot more cautious than the Westminster government has chosen to be in its COVID-19 response.

Health, environment, climate change, quality of life and fun - these are all intimately linked and need both bold innovations and also the Precautionary Principle.