Culling, Catastrophe and Collectivity[1]

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Abstract

This paper explores the epidemiology of the culling policies used to control the UK 2001 foot and mouth epidemic. It treats these as a set of political technologies for defining and implementing a version of the common good, and for distinguishing between those parts of the animal-related collective that were to be saved from slaughter, and those that were to be culled. Describing the differences in the policies as these evolved during the crisis, it argues that the last of these, derived from a model developed at Imperial College London, was unnecessarily and inappropriately draconian. It considers why this model was preferred, and argues that it and its surrounding practices were technically, politically, socially, and organisationally opaque. It concludes by pressing the case for political technologies that are, by contrast, relatively transparent, and therefore contestable, and also suggests that devolved political technologies (which often develop in practice as they did in 2001) deserve serious attention.

Introduction

Foot and mouth disease, arrived in the UK in January 2001. It was identified and traced to a pig farm near Newcastle in the north east of England in February. But by then it was too late. Animals with the disease, sheep, had already passed into the national trading networks and been moved around the country. By the time anyone knew that foot and mouth was present it had infected over seventy premises. And it went on spreading, taking especial hold in two regions: Devon in the south-west of England; and the area around Carlisle in the north-west of England, including the Lake District and parts of south-west Scotland.

Seven months later the disease was finally eradicated. By that time it had infected 2030 premises, mostly farms, and the cost of controlling it had reached £3bn. Indirect costs, especially to the tourist industry, had reached £5bn. There were huge social costs too – including rural isolation, fear and heartbreak for farmers and others working on the land. The environmental consequences were serious, as, too were the human health effects of the disease in the rural communities.

In the present paper I'm interested in foot and mouth 2001 for what it might tell us about politics and its technologies. Clearly there are many ways of thinking about both these terms. However, in one interpretation politics is about state-related discretionary decision making. If we stick with this definition, restricted though it is, and attend to the foundations that make such decision making possible, then these include the ability to define a common or general good, and then the ability to act on a discretionary basis to further that common good. Both of these requirements already imply technologies. Thus if we use a general definition of what counts as a technology (treating this as a heterogeneous and relatively routinised set of arrangements for translating materials from one form into another) then states depend on technologies for defining common goods. Such technologies include parliaments, commissions of inquiry, elections and protests (Barry 2001). Technologies for implementing

such goods include tax-collection systems, legal apparatuses and speeding cameras.

As a part of this, politics and its technologies also, and crucially, define the limits of acceptability. They work by drawing lines that distinguish that which is reasonable from that which will be counted as individual, idiosyncratic, deviant, or inimical to the common good. Such technologies of discrimination work in numerous ways but, as has often been noted, they include the definition of populations. Who or what is to be included in a collective, and who or what to be excluded because it is deviant, dangerous and all the rest, these are crucial and contested issues in politics.

Processes of these kinds were at work for foot and mouth in the UK in 2001. How did the policy of disease control work? The answer was: one, by defining (or perhaps assuming) a common good (the disease must be eradicated); two, by defining a population of susceptible animals; three, by discriminating within that population by defining a subset of deviant and dangerous animals with (or at risk of contracting) foot and mouth; and four, by slaughtering the latter. This politics and its technologies worked to generate a series of binaries. The collective good (the eradication of the disease) was divided from the interests of specific herds or farmers. A collective national herd was distinguished from individual groups of animals composing that herd. And finally, particular privileged places such as the Cabinet Office where the general might be properly known were distinguished from other disqualified locations, (for instance in Devon or Cumbria) where it was not. In what follows I explore the technologies of that generated these binaries, how they produced definitions of and divisions within the collectivities, and in particular the opacity and the contestability of those definitions.

Calculating the Collectivity

It is possible to tell a critical tale about foot and mouth 2001, but how we tell that tale depends on where we stand. In particular, it depends on how we draw the boundaries around and through the collective. Here, for instance, is Marc writing to the BBC in 2002:

> 'I was a vegetarian for 9 years prior to foot and mouth. I've now been a vegan for a year. So many of those cattle slaughtered were for dairy production. It drove home the final connection I needed to realise that a plant based diet is the best for the environment, animals, and most of all – people.' (BBC News Talking Point 2002).

It is no surprise to learn that a vegan collective includes not only dairy cows as well as people, but for some purposes draws no distinction between them. In Marc's world all the beasts of the field would survive. But most of the 2001 collectives were more narrowly drawn. Farm animals don't, it was mostly assumed, have the same status as people. They have nutritional and economic value in relation to the human collectivity but don't form part of it. Since an animal life is not a good in itself the calculus is utilitarian: some animals may be sacrificed for the benefit of the human common good (as they are routinely in very large numbers). But that calculus suggests that for reasons of production and economics the human common good would also benefit from saving as many animals as possible from the disease. This

means that some animals need to be slaughtered to preserve others. But which?

Now we stumble into disagreement. Within the utilitarian calculus, the line within the collective of animals may be drawn in different ways. My unoriginal thought is that the UK government drew its lines in the wrong place. Following others, I want to argue that a simple but opaque epidemiological technology was used to draw an unnecessarily alarmist line through the animal collective. This alarmist policy was then imposed on farmers and vets by a highly centralised government machine.

There are various possible explanations for this. I don't believe, as do some, that the government simply did this for electoral reasons. It seems more likely that the backdrop of public health concerns in the UK in relation to food and agriculture – indexed especially by the BSE crisis – was important: the government felt pressure to be <u>seen</u> to be acting in the collective interest. But it can and has been plausibly argued that the UK state is more generally preoccupied with control, that it responds positively to technologies that promise such control, and that it fears lack of control (Bickerstaff and Simmons 2004). The paradoxical consequence in 2001 was a kind of ad-hocery, as policies rapidly changed. Of course ad-hocery is component part of life. But the issue is to what extent detail on the ground can be second-guessed at speed from the centre. The UK government thought that this was possible. The sceptics, amongst whose number I count myself, dissent. And if this is right then arguably this points to a form of structural failure: a particular lack of <u>social</u> reflexivity in the technologies of policy and their uses.

To put this differently, I want to argue that foot and mouth 2001 teaches us that even though a commitment to the common good demands a distinction between centre and periphery, this is better done in ways that reflect the complexity of local practices and local spatialities. One implication of this is that the much maligned Ministry of Agriculture and Food, MAFF, which was said by its critics to be inert, insufficient and unresponsive, had actually got it more or less right before Tony Blair and the Cabinet Office got involved in a blaze of national publicity, and took over the management of the crisis.

But I'm getting ahead of myself. Let me tell the story.

Policy Number One: EU Contingency Planning

It is February 19th. The disease has appeared in an abattoir in Essex. How is it imagined? How is it handled?

Here's the default policy (Foot and Mouth Disease 2001: Lessons to be Learned Inquiry 2002, 29). One, the disease is notified to the State Veterinary Service. Two, it's confirmed by laboratory tests. Three, all the animals at the abattoir are slaughtered. Four, the vets trace and test 'dangerous contacts' and slaughter animals in any infected herds (Foot and Mouth Disease 2001: Lessons to be Learned Inquiry 2002, 66). Five, farms within ten kilometres are placed under surveillance, and the movement of animals from these farms is allowed only under licence (and not at all if they are within three kilometres of the infection).

This is the policy. And as it is followed, some other farms near the abattoir are found to be infected. But then the disease is traced to a pig farm near

Newcastle in the north of England where it is well established. I've mentioned this already. Sheep from nearby farms have been sold nationally. It is pretty clear there's going to be a national epidemic. So on February 23rd the whole of the UK is declared a controlled area. No animals may be moved anywhere in the country.[2]

Let me comment on this.

The collective is the population of susceptible animals: mainly pigs, cows and sheep. Or (and this is an interesting difference) in practice it is the population of premises, mainly farms, with susceptible animals. Since foot and mouth disease is treated as an unambivalent bad, as we have already seen, EU logic divides that population into three groups: the infected (the animals that are to be slaughtered); those at risk (they are to be watched); and those that are not at risk, at least not yet. This is an epidemiological logic, but since infection spreads from animal to animal (or farm to farm) it's also spatial in character[3]. Locations are distinguished epidemiologically: they are made 'local'.[4]

In practice in 2001 there were two problems with this logic. If it is to work, one, you need to know that the disease has arrived, and two, you need to have the resources to carry it out. The two are connected. We've seen that no-one in authority knew that the disease was present in the pig farm. The disease was widespread before it was detected. Then the over-stretched State Veterinary Service (SVS) didn't have the people it needed to handle the national spread of the disease. No-one, including the EU planners, had expected an outbreak on this scale. Ten simultaneous outbreaks, that was what the contingency plan provided for, not fifty or one hundred (Foot and Mouth Disease 2001: Lessons to be Learned Inquiry 2002, 32).

Out of Control

The disease is spreading: 16 cases after one week; 80 after two; and 199 after three. The Minister says the outbreak is under control,[5] but the Chief Veterinary Officer is beginning to think differently. Why?

Three answers.

One, and very simply, the headline figures.

Two, the veterinary service is overwhelmed. Diagnosis, slaughter, disposal and disinfection – all of these are too slow because the people aren't there to do it. There are simply too many infectious animals out there.

And then most important for this story, three, dire predictions are coming from epidemiologists.

The government has an in-house epidemiological model at the Veterinary Laboratories Agency (I'll call this the 'VLA model') that is beginning to predict alarming things. The number of cases may total 1000 or 2000 (Foot and

[2] And footpaths may be closed too. National Audit Office (2002, 58-62).
[3] The spatiality of the epidemiological logic has been explored in Bickerstaff and Simmons (2004) and Donaldson and Wood (2004).
[4] Indeed, there's one way in which the policy also manipulates the spatial. This is because to stop the movement of animals is also to increase the effective distance between farms.
[5] He says this on 11th March. See Foot and Mouth Disease 2001: Lessons to be Learned Inquiry (2002, 79).

Mouth Disease 2001: Lessons to be Learned Inquiry 2002, 88). It's also saying that two thirds of the currently infected premises haven't been identified. Finally, it's advising that 'current control measures are insufficient to control the epidemic.' (National Audit Office 2002, 61). Detection and slaughter need to be quicker.

There are other models too. To simplify, there's a group at Cambridge University (with participation from Edinburgh) and another at Imperial College, London. Both will play a role, and the latter will become particularly important. This is partly because there's a short circuit between the leader of the Imperial group (Professor Roy Anderson), Sir David King (the government Chief Scientific Advisor), and the then Prime Minister, Tony Blair. This is the relevant corridor of power. What Anderson thinks gets quickly to number 10 Downing Street.

An Epidemiological Interlude

So how do the models work? What do they do?

The answer is that they are technologies that seek to mimic statistically the spread of disease in a population. Crucial is the 'case reproduction number', R_0 (Foot and Mouth Disease 2001: Lessons to be Learned Inquiry 2002, 90). In this context R_0 expresses how many premises (mostly farms) an infected premise in turn infects. If it falls below 1 then in due course the epidemic will peter out. If it rises above 1 then it will grow. So how is R_0 determined? And how is it predicted?

Answer, One, the models first define the collectivity of premises. Two, they make assumptions about the network of infective relations between the members of that collectivity (I'll discuss this shortly). Three, they use these assumptions and the pattern of existing known infections to predict how the epidemic will unfold. And then, four, they may be used to simulate how different policies might influence infectivity. This means that they draw lines of life and death through the farm animals implied in the collectivity. So how are the relations of infectivity between premises determined? The answer is that models differ in three significant ways. Another list.

One. The VLA and Cambridge models are stochastic. Chance plays a role (as it does in real-life epidemics). To put it differently, the same data produces a range of possible outcomes with probabilities attached. By contrast Imperial's model is deterministic. This makes it computationally simpler and easier to run[6] but for certain purposes less trustworthy, certainly in the later stages of the epidemic.

Two. Distance is modelled using what is called a 'spatial kernel'[7]. Here again the models differ. They make different assumptions about how much infection will travel with distance. I'll talk about this in a moment. But they also model distances differently too. The VLA and the Cambridge models include GIS

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[6] Kao (2002, 281). See also Ferguson's response to the House of Commons Select Committee on Agriculture (2001, question 406).

[7] 'Spatial interactions … are governed by … kernels, symmetric, normalized, decreasing functions of distance that determine the probability or relative strength of interactions. Kernels have a functional form and a scale parameter (λ) that sets the spatial scale of interaction. Large values of λ mean strongly localised, short-range interaction.' Dieckmann, Law and Metz (1999, 392).

data. They 'know' where the premises in the UK are located. The Imperial model doesn't. In part distance is simply irrelevant (Kao 2002, 283) (which isn't stupid if infected animals are being shipped round the country). In part it models the spatial in a manner that is (as they put it) 'implicit'[8]. It does this by using an approximation called <u>moment-closure</u> to make guestimates about the proximities and clusterings of premises. This technique, taken from statistical microphysics, is conceptually difficult but also controversial. This is because it ultimately depends on questionably defensible isotropic assumptions (about the distances between threesomes of farms). And also because it cannot even approximate, questionably or otherwise, larger clusters of premises.[9]

Three. Then there are what modellers call '<u>heterogeneities</u>'. These are other factors that influence disease transmission because, as one commentator puts it, 'All farms are not created equal' (Kao 2002, 281). Examples (a further list). One, all the models make contestable assumptions about when animals are infectious and when they are not. Two, the VLA model reflects differences in species <u>susceptibility</u> (cows are distinguished from sheep), species <u>transmissibility</u>, and the <u>numbers</u> of different kinds of animals on each premise. The Imperial model does not. Three, geographical heterogeneities include <u>farm size</u>, and <u>field concentration</u> (with growth in farm size, many farms have discontinuous landholdings which is bad for infection). These heterogeneities are collapsed into a single term in the Imperial model to produce what the optimists call a 'broad brush approach', while Cambridge and the VLA models include more data and terms about farm heterogeneity (54 in the case of the VLA (Kao 2002, 283)). Four, the VLA includes a meteorological function, and Imperial doesn't. And so on.

Two observations. One. We're dealing with trade-offs here. The more the detail, the finer the grain of the model, but the slower the calculations (though given the computing power available the effect may be marginal). And, of course, a model is only as good as the data that goes into it – and the data going into these models is patchy at best, and poor at worst. I'm not going to talk about this here, but problems with data are absolutely crucial in 2001.

Two. In principle the list of heterogeneities is as long as your arm. More can always be found. They work, if I may put it this way, to disrupt or (more optimistically) complexify the spatial relations, the spatial kernels, of the models. (To put it slightly differently, they work to move farms around in a conceptual space, making them closer or more distant in terms of infectivity. Increasing or decreasing the risk of infection.) Applied to a policy of disease control, they work to draw different lines of life and death through the animals implied in the collectivity. Life and death depends, as it must in an epidemiological logic, on technologies that determine what is important to infection and what is not.

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[8] Keeling, Donnelly and Anderson (2002, 8). The quotation is taken from a PowerPoint presentation.
[9] See Kao (2002, 281, 283). I am also deeply grateful to Richard Law for his careful explanation of moment closure procedures. I am only able to gesture at these here.

Policy Number Two: 3 Km and Sheep

It is March and the modellers are breathing down the necks of the Ministry and its vets. R_0 is too high. Quicker diagnosis, quicker slaughter, and (most important for this story) for <u>more pre-emptive slaughter</u> are needed. (Vaccination, another option, to be combined with slaughter, is discussed but rejected[10].) The government is under increasing public pressure[11]. On March 15th the Minister of Agriculture announces that in Cumbria all 'animals' within three kilometres of infected premises are to be slaughtered. (He means 'sheep', not 'animals', a mistake that will end his political career (House of Commons 2001, column 1200), (Barwick 2001).) Note the change. They are to be <u>slaughtered</u>. Not kept under surveillance.

We have moved from the EU first policy. The line dissecting the animals implied in the collective has changed. More will die.

Policy Number Three: The Contiguous Cull

Now some specificities. The Imperial and the Cambridge modellers pass their first findings to the Chief Veterinary Officer on March 16th (National Audit Office 2002, 61). They agree with the VLA. More control measures are needed. But the similarity ends there. Remember that the VLA is saying the epidemic will be large but finite. The three kilometre cull of sheep will reduce its size. By contrast, the predictions of the other modellers are dire. They're saying that unless something is done the epidemic will grow exponentially. There will be up to 1000 new cases each day by mid May. In the end most of the susceptible animals in Britain will catch the disease[12].

On March 21st there's a crisis meeting between the modellers, the civil servants and the vets. It is all very tense. Imperial says that R_0 is 1.7[13]. Only a ring cull – killing all the animals 3 to 4 kilometres around each infected farm – will save the national herd (Food Standards Agency 2002, 2). The thin but

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[10] This, which would draw different lines through the animal collective, is rejected for veterinary and economic reasons. In veterinary terms, vaccination is uncertain and not always effective – though 'vaccination for slaughter' was used successfully in the Netherlands in 2001, and its possibility is now much more actively incorporated into EU policy. Economically, the meat trade was concerned both that consumers would reject meat from vaccinated animals, and that vaccination would slow the return to international markets of British meat after the end of the epidemic. The latter is an economic and veterinary argument. In 2001 it was not always possible to distinguish vaccinated animals from those that had suffered foot and mouth, which had implications for disease control that were reflected in WTO rules about meat trading. Note that this implies that the character of the lines being drawn through the animal collective further reflects the interests of the human collective.

[11] The politicians are worried. The outbreak is growing daily, and this is very bad news. It is costly. The delays in slaughter and disposal are beginning to look like public incompetence. The tourist industry is screaming. (Ministers are now somewhat belatedly learning that this is five times larger than the relevant sections of agriculture). And there are elections due. So the Cabinet Office and Prime Minister Tony Blair, never much of an advocate of hands-off government, are beginning to take a lively interest in the foot and mouth. The Prime Minister chairs a meeting about the wider implications of the outbreak on 13th March (National Audit Office (2002, 106)); and the Cabinet discusses the outbreak on the 14th (Foot and Mouth Disease 2001: Lessons to be Learned Inquiry (2002, 66).

[12] R_0 falls by itself in the end, after all the susceptible animals have contracted the disease (or been slaughtered).

[13] The Cambridge/Edinburgh group calculate an R_0 of 1.8. See Food Standards Agency (2002, 3).

fatal line through the collective should be re-drawn. The Chief Veterinary Officer, Jim Scudamore, is sceptical for at least four reasons.

1. The Imperial model doesn't seem to reflect the ban on animal movement. (They disagree about this).

2. It models an 'average animal'. There is no proper account of species differences.

3. The model hasn't been validated – it's making predictions about foot and mouth in sheep, but there's never been a large epidemic in sheep anywhere before (Scudamore 2002, 1).

4. Four, the modellers simply don't have the subtle knowledge of the disease that the vets do (Scudamore 2001, 4), and (Shannon 2002, 3). Why is this important? Again, it's to do with sheep. Sheep don't catch the disease very easily. When they're sick they're less infectious. They're also less likely to exhibit visible symptoms, even when they <u>are</u> sick. This is going to affect how the disease spreads. It will spread more slowly.

What are the implications of what the Chief Vet is saying? The answer is that <u>R_0 appears to be much higher than it actually is</u>. This is because even though sheep may have caught the disease in the early stages of the epidemic, it is only appearing and being detected in them now. 'Old' infections are adding to the reported R_0 figure. Sure, things are worrying, and if the disease is slowly passing through the sheep of Cumbria then something needs to be done. (This is the reason for the 3km cull: there simply aren't enough vets to keep an eye on the sheep.) But, and this is the bottom line, overall the epidemic is probably <u>already under control</u>. It is likely that actual as opposed to apparent R_0 is below 1. A general ring cull isn't needed. Worse, it's going to divert scarce resources that would be better used to track dangerous contacts and cull the sheep in Cumbria.

Other things are happening too. For instance, the head of the Imperial group, Anderson, appears on the BBC news programme <u>Newsnight</u> the same evening and tells the world that the epidemic is 'out of control'. (Parts of the government are most exceedingly displeased.) And public pressure is reaching a crescendo in other ways as well. But if we fast-forward six days, to March 27th, two things have changed. One, the crisis is now being controlled by the Cabinet Office rather than the Ministry of Agriculture (such an incompetent outfit, it seems, is not to be trusted). And, two, another new culling policy has been announced: animals on premises <u>contiguous</u> to those that are infected are to be slaughtered within 48 hours.

The line through the animals of the collectivity has been moved again. This isn't sheep within 3km of infection in Cumbria. This is all <u>animals on contiguous premises</u> anywhere.

Comment

Three questions. One, why has this happened? Two, is it necessary? And three, what are the consequences?

One: why has this happened?

The sceptical answer is that the Cabinet Office and Prime Minister have panicked. There's lots of bad publicity, they believe the epidemic is out of control, and they believe that the Ministry is incompetent. Let me rephrase this. The behind-closed doors answer is that the modellers – and especially the Imperial group – have persuaded the Chief Scientific Advisor who has in turn persuaded that Prime Minister that the epidemic is out of control: that R_0 is above 1. The Chief Vet, Scudamore, doesn't really believe this. He thinks that the existing policy of slaughter is working. But the figures aren't so clear, and perhaps he's not quite sure. Or perhaps his arguments about sheep are simply too subtle. At any rate, despite the fact he's worried about the legality of a contiguous cull, he's not being heard. Somehow or other (the paper trail, if it exists, is not visible to outsiders) the demand, championed by Imperial, for a three-to-four kilometre ring cull has been transmuted into a decision to slaughter on contiguous premises.

Two. Is it necessary? Well, it does depend on the criteria you choose. But if the issue is disease control, then with the benefit of hindsight, the answer is: probably not. It's still debatable, but on balance history is going to side with the Chief Veterinary Officer[14]. The number of new cases peaks on 29th or 30th March (National Audit Office 2002, 70). This suggests that the peak level of infection was around March 18th. Note the timing. This is three days after the 3km cull of <u>sheep</u> was announced. Perhaps it was this that tipped the balance (though perhaps not – it took some while to organise this, and it may be that the first EU-derived policy was working). One thing, however, is certain. Infection reaches its peak rate nine days <u>before</u> the contiguous cull became policy. The latter was <u>not</u> the turning point

And three. What are the consequences? Well, it is possible that the contiguous cull reduced the total number of animals slaughtered, though this is uncertain, and there are those who think, to the contrary, that it actually contributed to the epidemic (Donaldson 2002, 7). What it certainly did, however, was to stir up controversy. Many accepted it as a necessary evil:

> 'The contiguous cull was controversial. In a comparatively small number of instances in Wales, the cull was resisted by individuals keeping livestock who contended that topography and the farming circumstances in their specific locale did not warrant a cull of their stock. From an overall epidemiological perspective, however, there were concerns that, by holding up the contiguous cull, these appeals did create or threatened to create serious disease risks.' (National Farmers' Union Cymru 2002, 18)

Others thought it was arbitrary and unreasonable. This is from the Devon Country Council report:

> 'The contiguous cull (based on a computer model) appears to have been implemented by officials poring over maps in remote offices so that only holdings were considered, not the topography, the disposition of animals upon it nor the distances between them. One witness described the process as "carnage by computer". In many cases according to farmers and vets the risk of transmission was nil, yet all the animals on contiguous holdings were slaughtered.' (Mercer 2002, 6)

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[14] The arguments are rehearsed in Kitching <u>et al</u>. (2006).

Often, as NFU Cymru notes, there is resistance. Sometimes that resistance is effective (animals are hidden, or officials are driven off with the threat of shotguns and are then so busy slaughtering animals belonging to more tractable landowners that they never return, perhaps because the incubation period has passed.) In practice, then, the contiguous cull is only patchily applied. But it leaves a huge legacy of bitterness – and that bitterness is still there today[15].

Conclusion

I've argued that state policymaking works by defining a common good. Then I've suggested that it distinguishes between the common good and local interests. Finally it works by imposing the common good on localities. As a part of this it defines a population or a collective to which it applies its definition of the common good. This means that it cuts through the subject population, treating parts of this as dangerous. They become suitable cases for isolation, detention, treatment or slaughter, while others are exempt, still to be protected. The implication is that the technologies used by the state to define the collectivity and the divisions that run through it are political tools: that epidemiology is a powerful political technology. In 2001 the various epidemiological models and their uses got caught up controversy about the nature of the collective, about how lines might or should be drawn through that collective, and about how local interests and collective goods could and should be defined and balanced off against one another.

I've suggested, following many others, that the construction of the public good was seriously flawed in 2001. Even if we accept the starting premise – that animals should be slaughtered without vaccination to protect the interests of a human collectivity – it is pretty certain that the contiguous cull was unnecessary from the point of view of disease eradication. Further, this is not simply a matter of hindsight. There were, as Jim Scudamore's responses to the Imperial proposals shows, reasons for believing this to be the case at the time. So what does this teach us about the technologies of politics? In thinking about this I want to attend to the issue of opacity.

First, there is an issue to do with difficulty. In the contemporary UK very few of us are able to understand what is at stake in the implicit spatial modelling created by the moment closure method. Indeed, it is difficult for outsiders to discern the fact that moment closure is ultimately arbitrary in the absence of spatial data generated from outside the model – which is not, of course, to say that the method is necessarily flawed or inappropriate. Nevertheless, the Imperial model is difficult in a way in which the VLA model is not. In practice it is opaque. Though alongside and against this, we need, second, to note that models vary in complexity or (as the modellers put it) the extent to which they handle heterogeneities. Recall, for instance, that the VLA model has 54 parameters. None are irrelevant to disease transmission. But taken together

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[15] Culling policy is going to change again. A month later, on 26th April, with the epidemic now clearly declining, policy will respond to some of the complaints. More local discretion will be allowed. Rare species and hefted sheep may be saved. Cattle with good biosecurity too. And, as a part of this, a pet lamb, Phoenix, that escaped the slaughter of its herd, is also saved. This is a media hot topic.

they produce a model of great complexity that is also more or less opaque, even for those who are familiar with its working.

But difficulty and complexity, more generally opacity, are not simply technical matters. They are at the same time also <u>social or relational</u>. If we say that many are able to read maps (one of the simplest outsider models involved sticking pins in a road atlas (Lusmore 2002)) but few understand moment closure we are also talking about social relations of competence. It is common to moralise about these. We are told that people 'should' be learning the skills to handle formalisms; or that they 'should' be learning to trust the experts when the latter start to reason about the public good[16]. But an alternative (or perhaps complementary) politics is possible. This is to argue that where there is a choice it is better to opt for less complexity and difficulty rather than more. And this is because it is a good to increase the contestability of the political technologies that define the general good and then create and divide the collective. In this way of thinking, those political technologies that are difficult and complex might, then, start life with a handicap, instead of being fetishised.

But if we think this way then we also need to extend the argument since there are other sources of non-contestability. For instance, the VLA model is <u>proprietary</u> – the extent to which it is open to scrutiny was limited for reasons of ownership. And then, perhaps even more important, non-contestability also reflects the <u>workings of Whitehall</u>. For as the government machine moved towards the contiguous cull, events and decisions tended to short-circuit the previous arrangements for defining the collective and the common good. In particular, the Imperial modellers had the connections that they needed to achieve credibility in the Cabinet Office. This meant that the previous processes of epidemiological decision making were bypassed. Arguably this short-circuit was helped because, as commentators Bickerstaff and Simmons note, the Imperial model was decisive, centralising and <u>dirigiste</u> in its policy style. It solved not just an epidemiological problem, but also (in some versions) a problem to do with political accountability and governability[17]. Accordingly, all of this was seen as a good by those – the modellers and the politicians – most involved. They thought they were responding to an emergency in the best way. There was, as they saw it, no alternative. But the consequence was that along the way doubts, and worries about the model and its uncertain foundations in the data disappeared. Even Chief Veterinary Officer, Jim Scudamore could not manage to puncture this definition of the collective and the collective good.

Unsurprisingly, then, as the technologies of politics make collectives, collective goods, and local interests, their contestability or otherwise turns out to reflect the technical, political, social, <u>and</u> organisational production of opacity and transparency. But the 2001 foot and mouth culling debacle reveals a confusion that rests, or so I suggest, on the elision of two divisions or dichotomies. On the one hand, policy distinguished, as it must do, between

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[16] These suggestions are two versions of what is often coded up as the 'public understanding of science'.

[17] These authors suggest, in my view persuasively, not only that the 'right tool for the job' rested on and in professional interests, but also that there was an elective affinity between the centralising aspirations of Blair's government and the rapid and relatively simple prescriptions for policy generated by the Imperial model. See Bickerstaff and Simmons (2004).

collective goods and specific interests. And then, on the other, it reproduced a distinction between legitimated central government definitions of that good and those located elsewhere – for instance in Devon, Cumbria, and the Ministry of Agriculture, Fisheries and Food. In the politically unreflexive world of the Cabinet Office these two dichotomies were folded together. Local versions of the collective good were erased in favour of an opaque and centralised account of that good. But two points follow. First, a single part of the government machine does not have a monopoly over definitions of the collective good. And two, to imagine that this is the case is a failure in political and social imagination. It is, as Brian Wynne and his collaborators might put it, a failure in social and political reflexivity (Wynne 1996).

Now, however, we trip over a paradox. Leaving aside the theory, in practice the policies for culling were complex and heterogeneous. The three kilometre cull of sheep was carried out primarily in Cumbria, and then only patchily. And the contiguous cull, in theory universal, was similarly patchy. And indeed we've seen why. The people weren't there on the ground to enforce it. Some of the farmers resisted and then, given the delays, in places the SVS stopped trying to enforce it. Leave aside the heterogeneities in epidemiological theory: there were heterogeneities in epidemiological practice too. Different lines were drawn in practice through the collective in different places. Notwithstanding the centralisation indeed being sought by the centre, the collective good was simply being done differently.

This, however, suggests that we might try out a thought experiment. What would have been different in terms of disease control if the government had recognised those heterogeneities in practice? If, say, those caught up in a place of disease in (for instance) the Lake District had actually been asked: 'where should we cull?' Or: 'does a contiguous cull make any sense here?' Of course we will never know. And, in any case, the answer would have depended on who was asked. But here's a guess: the disease would have been eradicated just as quickly, but with somewhat less killing and a good deal less grief. For no-one <u>wanted</u> the disease to spread. And the heterogeneities were there anyway: animal species, farm sizes, cows kept indoors, meteorology, physical comings and goings, the habits of farmers, and the endlessly variable topography of the British countryside. These actors, human and non-human, all played their role anyway. But a local assessment of these heterogeneities would have added a layer of intelligence to the effort that was lacking in the way it was being applied. It would have helped to generate local and specific forms of the collectivity. It might have worked as well – or better. Though, of course the Cabinet Office would no longer have been able to delude itself that it was seeing like a state.[18]

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[18] The phrase comes from the title of James C. Scott's admirable <u>Seeing Like a State</u> (1998).

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