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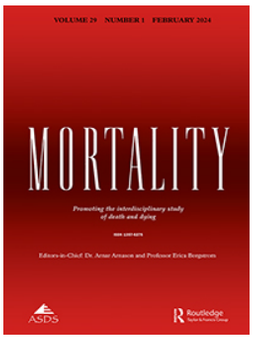

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Paying to pollute? The calculation of environmental indicators in crematorium burden sharing schemes

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ABSTRACT

This article addresses the role of calculations in shaping what numbers convey in crematorium burden sharing schemes. Two co-existing numerical indicators are present in these schemes, with one speaking to the limitation of environmental risk and another to exchange value generation. The environmental risk indicator emerges from the calculations present within environmental policy discussions, where numbers are measured against the damage of air emissions to the environment. Yet, burden sharing involves the introduction of new calculations that cultivate a second indicator of exchange value generation. These calculations are used to decide on the worth of environmental compliance afforded by emissions credits, correlating numbers with the generation of money and away from a focus on sustaining environmental health. The paper offers an empirically grounded contribution to the politics of the environmental disposal of the dead body by demonstrating how the use of numbers inside of crematorium burden sharing schemes reflects a tension between environmental and market-based values.

KEYWORDS

Calculation; cremation; environment; indicator; metric; quantification

Introduction

Quantification, otherwise known as the production and communication of numbers (Espeland and Stevens, 2008), has had a significant role in European, Australian, American, and wider global policy strategies for combatting environmental harm (Brighenti, 2018; Foden et al., 2022; Gabrys, 2016; Gunderson, 2014, 2015; Jamieson, 2020; Verran, 2010, 2013). One implementation of numbers within environmental governance has been through emissions burden sharing schemes, which are used to ensure that all polluters are limiting the number of their air emissions by 50% in the UK and Europe as part of the path to achieve net-zero commitments by 2050 (HM Government UK, 2018). Polluters with filtration equipment installed regularly filter a higher number of air emissions than required by the regulations and they are then able to sell these excess emissions as credits to polluters that are unable to filter their emissions. These credits are used as numerical metrics to demonstrate compliance with emissions regulations whether the holder of these credits is polluting or not. On the surface, burden sharing

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schemes are well documented in social science literature as they have been operational for decades (Lansing, 2012; Lippert, 2012, 2016; Osborne & Shapiro-Garza, 2018). However, significantly less empirical work has been conducted on crematorium burden sharing schemes, which is important as crematoria are, at times, unable to be adapted due to being housed in protected historical buildings. Despite this, environmental policies have been implemented widely, revising the control of emissions from the cremator (Rumble et al., 2014).

This paper proposes that the numbers active within crematorium burden sharing schemes reflect a tension between environmental and market forces as they are shaped by both environmental and exchange calculations. Calculations shape what numbers mean, correlate to, and express (Elden, 2017, 2019). Within crematorium burden sharing schemes, these calculations have been framed from environmental rationale, as well as economically through the managers and directors of the scheme, who use calculation to frame the expression of the value of an emissions credit. Scholarship has widely discussed the calculations that are embedded within these exchanges occurring inside of burden sharing schemes, such as in forestry carbon offsetting and wetland mitigation programmes (Lansing, 2010, 2011; McElwee, 2017). Less, however, has been discussed regarding the ways that these calculations reshape what the numbers themselves mean when implemented as environmental tools (Jørgensen & Sørensen, 2022). This is crucial inside of crematoria as numbers have been vital within the reduction and reuse of the waste matter emerging from the processing of the dead body (Hoeyer, 2009, 2013; Olson, 2016; Robins, 2020).

To map this shaping of numbers, this paper takes forward one form of quantification, the indicator. According to Espeland (2015, p. 59), indicators are simplifications of what a number can constitute. They are a way of making the complexity of numbers visible in the social world. Indicators are non-neutral representations of numbers that '. . . produce relationships among the things or people that they measure by sorting them according to a shared metric'. In the case of this paper, calculations cultivate new shared metrics that numbers are measured against. Calculations underpinning the rationale of environmental policies generate a shared metric of environmental risk, such as through the calculations that support the 50% cap on the numbers of emissions (HM Government UK, 2018). The application of the burden sharing scheme formulates a new set of calculations, whereby emissions credits are traded against money. Financial calculations shape a new indicator of exchange value generation, which emerges through the decisions made that underpin a representation of worth that the use of an emissions credit has as a means for expressing environmental compliance. This new indicator of exchange value generation distances numbers from measurement against the initial metric of environmental risk. Environmental compliance folds into the calculations of monetary worth as a use forming a rationale for exchange rather than a form of environmental sustainability governance alone.

The aim of this paper is to investigate the relationship between these environmental and exchange value generation indicators and the calculations that cultivate them in crematorium burden sharing schemes. To begin, I outline the relationship between indicators and calculation, reflecting on the theoretical nuance behind the shaping of the shared metric that an indicator represents. I then turn towards the implementation of the environmental risk indicator that emerges from the calculations present in

environmental policy and wider regulation. Through the calculations underpinning the exchange of an emissions credit for money, indicators are reshaped, introducing a new metric that numbers within burden sharing schemes are measured against, which is exchange value generation. I conclude by arguing that the co-existence of these indicators should challenge the way that calculations are undertaken inside of crematorium burden sharing scheme governance as numbers are frequently distanced from being measured against what is best for sustaining environmental health. One pays to pollute. The role of numbers and how they are calculated in crematorium burden sharing scheme policies should be rethought if cremator emissions are to be better limited in a net-zero landscape. By making this argument, the following paper drives forward the discussions concerning the environmental management of the dead body in cremation by demonstrating the important role that numbers have within these schemes as non-neutral indicators of political shaping. Closer examination of the shaping of these indicators will better elucidate the relationship between the market forces and environmental discourses that oversee the operation of crematorium burden sharing scheme policies.

Method

The argument in this paper is drawn from data that was part of a larger project about the environmental disposal of the dead body. Data was gathered from 'short term ethnographies' (Pink & Morgan, 2013) conducted at three local authority run crematoria in the North of England, as well as the regulatory and legislation documents overseeing air pollution response. As Pink and Morgan (2013) have outlined, the short-term ethnography provides a short period of particularly intense data gathering. The short-term ethnographies used to inform the argument of this paper lasted up to 1 week. During these ethnographies, I conducted semi-structured interviews with the manager of each crematorium. These managers have been named Andy, Mary, and Glenn and their crematorium is not named in order to maintain their anonymity. Much of the fieldwork involved shadowing the cremator operators inside the backrooms of the crematorium. In total, six operators were shadowed across the three crematorias in the sample. Operators are involved in the day-to-day management of the remains of the dead body, operating the cremator and cremulating the remains. Only one operator has been drawn upon in this paper, which is Derek who is from the same crematorium as Glenn. The reason for this is that most of the data consulted in this paper comes from the documents and the managers of the crematoria as these members of staff are involved in the governance of cremation, including the management of air emissions released from their crematorium. The research was ethically approved through the Economics, Law, Management, Politics and Sociology Ethics Committee (ELMPS) at the University of York before it commenced.

Alongside these short-term ethnographies, research data informing the argument of this paper also comes from an extensive document analysis of both the air emissions legislation, as well as regulatory documents that English crematoria are required to act within. The documents analysed were comprised of regulations from Anglo-European and American government departments, legislation from the United Kingdom and European Union, as well as industry documents from the facilitator of the burden sharing scheme studied in this article: The Crematoria Abatement of Mercury

Emissions Organisation (CAMEO). Including documents from outside of England has been important because emissions rules overseeing the operation of English crematoria remain embedded within the strategies of the European Union. These documents provide a sense of how air emissions are governed through the administration of numbers, with these regulations being put into practice by the participants that formed part of the ethnographic fieldwork. In this way, the use of documents as research data is complimentary to the use of short-term ethnographic work (Bowen, 2009).

The Indicator and Calculation

Indicators are, as Espeland (2015) states, a means for simplifying the complexity of numbers in the social world. They provide a way to draw on the relationships that numbers have with social actors, processes, and institutions. Most importantly, an indicator reflects a shared metric that numbers are compared, classified, and sorted against. These metrics are, within this paper, predominantly two-fold. The first of these is a metric of environmental risk that is introduced through the calculations underpinning environmental policies that utilise numbers as a measure for reducing environmental catastrophe and promote burden sharing schemes as a solution. The second is a metric of exchange value generation that emerges through the application of these burden sharing schemes in practice. As Foucault (2013) suggests, measures are subject to calculation. The measures overseeing the everyday governance of environmental catastrophe are shaped by calculation. The relationship between metrics and calculation is noted by Stuart Elden in two separate instances that provide a conceptual basis for approaching this relationship between calculations and the indicator. A particular quote identified and drawn on by Elden (2019, p. 116) from Heidegger's Plato's Sophist is that calculation does not solely reflect the process of counting and arithmetic, but rather that it functions as a means of designing numbers:

> connected with this definition is that of man as the being which calculates [rechnet], arithmein. Calculating does not mean here counting [zahlen] but to reckon something, to be designing [berechnend sein]; it is only on the basis of this original sense of calculating [Rechnen] thar number [Zahl] developed.

In another translation, Heidegger (2003, p. 12) states

> Calculating does not here mean counting but to count on some- thing, to be designing, it is only on the basis of this original sense of calculating that number is developed.

The challenging question here is what is meant by a design of calculation. Design appears to be a means in itself, a function that calculation serves in its shaping and cultivating of the correlations of numbers as indicators, bringing them into being. Elden (2019) provides a valuable unpacking of Heidegger's approach towards calculation alongside notions of rationality, but less is mentioned about the designing of numbers as a phenomenon in itself. The significance of this quote lies in the illumination that it provides about calculation as a process of shaping and crafting what numbers indicate. Heidegger's (2003) argument recognises that numbers flow into the social world through calculation. With indicators, the meanings tied to those

numbers formulate simplifications of numerical complexity (Rottenburg et al., 2015). It is calculation that makes numbers mean something through cultivating the shared metrics that these numbers are compared, classified, and sorted against. Calculations bring numbers and what they indicate into being.

Elden (2017, p. 306) also draws on this role of calculation in shaping numbers as correlative measures. He asks, 'what about the techniques of calculation, operations of measure and control, which are directed toward the earth, the geo?' This provides a foundation from which to consider the politics of calculation, inviting a larger consideration of their role in the implementation of environmental policy. Ultimately, Elden reflects here on the role that calculations have in the governance of numbers as a potential reframing of geopolitics in an era of environmental restructuring. When approaching environmental policy, we must consider the impact that calculations have in shaping the numerical measures that reflect the interests present in environmental governance.

There is certainly a connection between Elden's arguments and the contention present within this paper. Calculations are imperative within the cultivation of indicators that numbers correlate to. The calculations that are present within environmental policies formulate a particular metric of environmental risk that numbers are measured against. Through the implementation of numbers as indicators for environmental risk, these numbers are given a productive use for providing a measure of compliance with environmental regulations that are based limiting the risk of chemicals seeping into the food chain. The implementation of this initial indicator of environmental risk formulates an exchange, whereby emissions credits are traded for money. A new set of calculations emerge to frame the correlation of numbers within the scheme as they come to be measured against a new metric of exchange value generation, which is based on their use as a means for complying with regulation rather than solely providing a basis for limiting environmental risk.

The Implementation of an Environmental Indicator

Within burden sharing schemes, the indicator is formed through environmental risk calculations being implemented into practice. Specifically, numbers operating within the scheme come to reflect a metric for limiting the impact of emissions on environmental health. This sense of rationale is seen within the reasoning underpinning a myriad of environmental policy and contemporary emissions regulation that oversee crematorium emissions but are not crematoria specific (Department for Environment, Food, and Rural Affairs [DEFRA], 2017; Environment Act, 2021; The Control of Mercury (Enforcement) Regulations, 2017; The Control of Mercury (Amendment) (EU Exit) Regulations, 2019; HM Govt UK Clean Air Strategy, 2019). The minutes from the UK Department for Environment Food and Rural Affairs (DEFRA, 2004) consultation meeting reflect:

> In the May 2003 consultation paper mercury emissions estimates were given as a range. The basis of the range was measured emissions from 18 cremations which suggested an average of 0.9 g of mercury per cremation and a calculated emission factor of 3 g of mercury per cremation as an average. When taken with estimates of future increases in amounts of

> mercury for demographic/dental-related reasons, this translated into an estimated contribution by crematoria to total national mercury emissions in 2020 of between 11% and 35%.

The calculations present in the rationale underpinning future environmental policy are unmistakable as much of this is repeated in the 2012 statutory guidance for crematoria document outlined by DEFRA (2012, p. 47):

> For the reasons given in two consultation papers issued in 2003 and 2004 it remains Defra and WAG's view that the environmental impact from mercury emitted from crematoria is through long range transportation before its deposition, take-up by fish, and consumption as food.

These provide one example of the calculative processes that cultivate an environmental risk indicator that numbers are measured against. Numbers are implemented as a way of limiting the effects of pollution from crematoria. Following this regulatory guidance, the implementation of numbers into polluters has been environmentally focused. Each crematorium in Europe is required to abate (filter) at least 50% of the emissions from their crematorium. This requires the installation of abatement equipment, which each of the crematoria that I visited possess. When the dead body is reduced through heat inside of the cremator, the moisture from the organic tissues of the body evaporates into a particulate filled air. This particulate is filled with a number of chemicals, such as hydrogen chloride, carbon monoxide, and nitrogen (DEFRA, 2012), but the most noteworthy of these in air emissions discourse has been the mercury that is emitted through certain types of teeth filling (Bernholf, 2012; Rumble et al, 2014). These pieces of what are termed 'abatement equipment' are built into the back rooms of the crematorium, where the dead body is cremated. The hot particulate filled air emitted from the cremator flows through large tubes to be cooled, captured, and collected into a carbon solution that is contained in a barrel. This barrel will then be removed and processed by the local authority.

Each filtration of an emission (per one cremation) is abstracted into one emissions credit, which crematoria can use to demonstrate compliance with the government targets for air emissions limitation. This is further highlighted by Andy, the manager of Crematorium 1 in the sample:

Andy (Crematorium 1): *Say you've got a local authority who hasn't got an incinerator, they pay another local authority who has got an incinerator to get rid of their waste and then they get credits, which they then go to the government to say that we're now green. We have now complied.*

The core aspect of Andy's comment is that these credits are used by crematoria as tokens to represent their compliance with emissions requirements. Emissions targets take the form of the shared metric that numbers within the burden sharing scheme are compared, classified, and sorted against. Each crematorium is required to represent 50% of their cremations in the form of emissions credits to demonstrate compliance with current policies to reduce emissions. In this research, the figure of 50% was fully accepted by crematorium managers as being part of the policy guidance for environmentally friendly cremation. This compliance is therefore numerically driven. For the 50% to be expressed, numbers must be used (Ballestero, 2014; Day et al., 2014; Guyer, 2014). As such, the numbers within the burden sharing scheme are measured against this metric of

environmental risk, whereby numbers communicate one's compliance with environmental measures articulated by the regulations. Importantly, the implementation of numbers into these burden sharing schemes reflect their use as an indicator of environmental risk. Numbers are sorted against the metric of limiting this environmental risk. They provide a means of communicating the amount of mercury saved from entering into the atmosphere.

A lack of compliance with the numbers embedded in this metric is presented within the discourse of the governance as being a source of substantial issues for public health. This was repeated to me by Derek, a cremator operator at Crematorium 2, who shares:

Derek (Crematorium 2): *They don't want mercury in the atmosphere, getting into the oceans, into the fish, and we eat the fish. Yeah, that's what they've said to us, yeah.*

Derek reflects on the rationale used to underpin the implementation of burden sharing schemes into crematoria, which is to halt the risk of pollutants from seeping into the food chain. There is a sense that these chemicals are out of place (Douglas, 2002) when evaporating into the air, which manifests as a risk that they could enter into the food chain. A lack of adherence to the environmental risk metric reflects danger to public health whereby pollution seeps from the chimneys of unabated crematoria, into the atmosphere, and then into the food chain of the public. This is directly reminiscent of the policy justifications in the initial DEFRA meetings, whereby the need to cap emissions were discussed. The same rationale of mercury and other chemicals seeping into the food chain is present in these meeting minutes (DEFRA, 2004). The indicator emerging from the calculations underpinning environmental policy and wider regulation is therefore communicated into practice with the same sense of rationale present in environmental health discourse. This sense of the shared metric reflecting on risk echoes Beer's (2015, 2016) broader suggestion that measurement has become an important component of social life, with metrics providing a significant means through which organisations engage with risk. Specifically, metrics have become an institutional response to environmental harm. As such, the emissions credit is quantified into a digit that can be made compatible with these to indicate a minimisation of risks to environmental health (Brighenti, 2018).

These risks have manifested in all crematoria being required to provide numbers that can be measured against this metric of environmental risk. Yet, there are two types of crematoria: Those with these filtration systems built into their crematorium (abated), and those without (unabated). 'Unabated' crematoria are often either in a historically listed building that cannot be changed, do not have the space to instal the equipment, or they may be unable to afford it as the equipment is expensive to instal.

Those that have abatement will be filtering all of their cremations over the year, but they are only required to meet the target of 50% in order to show compliance with government targets. Yet, unabated crematoria that are unable to filter their cremations for practical reasons are still required to show on document that they meet this 50% target (The Control of Mercury Enforcement Regulations, 2017; The Control of Mercury Amendment EU Exit Regulations, 2019). As such, the burden sharing scheme revolves around the trading of the surplus filtered emissions. These filtered emissions are formulated into credits and sold to unabated crematoria. The logic behind the system is that the unabated crematoria are sharing the costs that the abated crematoria paid for the abatement equipment. This is confirmed by crematorium manager, Mary:

Mary (Crematorium 3): *Because the legislation is that 50% cremations are abated – I have a shared flue arrangement that means 100% of my cremations are abated. You might not be able to fit abatement in your crematorium because it might be a listed building, you might not have the space to fit it, it may be that you don't carry out very many cremations and therefore the investment in the plant economically wouldn't be viable. I might have 1000 going spare, but you might only cremate 1000 people a year and therefore only need 500. That might be cheaper for you than installing the equipment, or there might be other reasons why you can't instal the equipment. Or you might be installing the equipment, but not yet.*

Andy also adds:

Andy (Crematorium 1): *We had it done 2012. There's still some crematoria who haven't had it done. Because a) they can't get the planning because they're old buildings. But you don't have to get it done. You can do what they call 'burden share'. So, I could arrange with (nearby crematorium) to part use their filtration. So, I would pay them a fee and in return they would issue me a number of credits, which I could then use to offset my cremations without filtration. It's a bit like waste trading.*

Significant here is the use of the emissions credit number. I have already established that these numbers are measured against a metric for environmental risk, but core to both Mary and Andy's statements is that this compliance with the environmental risk metric underpins the use of these credits. This use of the number as a metric for lessening environmental harm stimulates the entry of these credits into an exchange market. With some crematoria filtering more emissions than the regulation requires and others without any filtered emissions, the implementation of a burden sharing scheme facilitates a trading system that can be undertaken between two crematorias that agree to exchange credits for money between them. Although as a growing number of crematoria have installed filtration technology, I found that seldom did crematoria trade directly with one another. Rather, all three crematorias in my sample took part in a burden sharing scheme run by a 'DEFRA approved' organisation called the Crematoria Abatement of Mercury Emissions Organisation (CAMEO). CAMEO oversees the deposits and withdrawals of emissions credits and is vital to facilitating the sale and purchase of these emissions credits. These legislative targets provide the numerical credit with a productive use, namely, its ability to be used to communicate compliance with environmental regulations.

CAMEO operates between the government and the crematorium, providing a central component of a policy-driven nexus. Initially proposed by the Federation of Burial and Cremation Authorities, CAMEO provides a national umbrella through which crematoria can report their compliance with government mandated emissions targets. CAMEO collects the statistical data from crematoria, collates this, and then feeds this back to the government. The CAMEO scheme provides a means for both DEFRA and for the Federation of Burial and Cremation authorities to clearly view a measured and rationalised compliance with mandated emissions targets of 50% (DEFRA, 2012). As Andy hints, CAMEO forms the type of bank that credits can be traded through, while government departments view CAMEO as a central reference point that produces data reflecting compliance.

This trading system then facilitates the exchange of these productive uses of emissions credits as numerical measures and, as such, underpins the expression of their value in a monetary form. The use underpinning the measurement of environmental compliance is a source of value. As an indicator of environmental risk, these numbers are implemented in such a way that they become commodities. The productive use of the number as a metric of environmental compliance motivates its exchangeability, which is the way that the burden sharing scheme operates, with these emissions credits being traded for money. This notion speaks to Colic-Peisker and Flitney's (2017) claim that, in the capitalist exchange system, the number is more important than the word, with calculus being prioritised over discourse. This is to say that by abstracting the problem emissions present to the environment into a metric, the numerical credit is made ready for exchange with other numbers. Numbers, as an indicator of environmental risk, are made to communicate with other numbers as they are made compatible with one another. Significantly, in *Kapital*, Marx (2013) comprehensively discusses how exchange systems are built around the quantifying of the value of a thing into a monetary figure. It is through this monetary figure that the value of that thing is represented back into the social world. Simply put, the value of environmental compliance emerges in social life through the exchange of emissions credits for money. One number, the emissions credit, is exchanged for another number, money.

The implementation of an exchange system has formulated two co-existing indicators that represent two shared metrics that numbers within the scheme are measured against. The first of these is the metric of environmental risk, which underpins the use that these emissions credits have as numbers that can demonstrate compliance with environmental regulations. Yet, alongside this metric of environmental risk, the quantification of value through exchange calculation formulates a second metric that numbers are measured against, which is one of the exchange value generations. Exchange value generation simply indicates the amount of financial monetary gain that is generated out of these emissions credits as they are traded. Below, I will show how these two indicators exist alongside each other, reflecting on the way that this shaping of a new indicator of exchange value generation destabilises the integrity of this initial indicator of environmental risk and distances numbers from being solely measured against the limitation of this.

The Indicator of Exchange Value Generation

As calculations shape the financial valuation of the numerical emissions credit, a second indicator of exchange value emerges, co-existing with the environmental risk indicator. Through calculations, numbers come to be measured against both a sustaining of environmental health through the lowering of risk to this, as well as their worth in monetary terms. As numbers are measured against and correlated to exchange value generation, they are distanced from their indication of environmental risk. This occurs through the environmental risk metric becoming a reflection of a productive use that the emissions credit has as a means for demonstrating compliance with regulatory governance, rather than purely providing a measure for sustaining environmental health.

A deeper insight into the administrative management of emissions credits reveals the complex array of calculations at work underpinning this burden sharing exchange system.

Calculation provides an important function as it oversees how the monetary figure that provides an expression of the credits' value is decided and by whom. I found that these calculations are enacted by the managers and directors of the CAMEO trading scheme, as stated on their website (CAMEO – Scheme Rules, 2021):

> Tradeable Mercury Abatement Credits (tmac) value means the value of a tmac for the purpose of trading within the Burden Sharing Scheme and set annually by the Manager and approved by the Directors.

The significance of this is that the managers and directors of the burden sharing scheme operate outside of the walls of the crematorium. Calculations are removed from the organisations that pay into and buy out of them, operating behind a layer of administration (Polzer et al, 2016) whereby they are happening out of view from the crematorium staff. These exchange-based calculations shape a new indicator of the numbers within the scheme as vehicles for financial value generation. As shared in the data above, managers and directors of the scheme come to calculate the worth of an emissions credit with the purpose of trading it, rather than its worth as a purpose of securing environmental health. This monetary figure is placed at £55 and is argued to be reflective of DEFRA's estimation for how much abatement equipment costs for participating crematoria.

This is further evident in the wider profit engineering calculations that factor into the initial calculation of the monetary value of an emissions credit. One particular component is the administration cost that the operators of the burden sharing scheme layer on top of the exchange. The administration costs are rationalised to serve a purpose of keeping the scheme running and, therefore, affect the income paid to contributors, as the CAMEO – Scheme Rules (2021), outlines

> Upon receipt of all payments from Burden Sharing Participants, the income, less the Administration Charge, is paid to Contributor Participants pro rata in accordance with the number of tmacs traded.

This adds another layer to the calculation, which is almost impossible to track since there is little clarity regarding these administration costs. The calculation of these costs is partially revealed as it is only mentioned that the charge is calculated in relation to the number of emissions credits traded. Nobody outside of the scheme is aware of how many emissions credits are traded. Furthermore, it is exceptionally difficult to challenge these administrative costs as they are nestled within the rules of the CAMEO burden sharing scheme. The rules ensure that one does not challenge the expression of value that is communicated back to crematoria. This point can be taken further in reference to another section of the CAMEO rules and regulations section on its website (CAMEO – Scheme Rules, 2021):

> If any Participants fail to pay CAMEO any amount in relation to tmacs purchased, CAMEO shall in no way be liable to any Participants for any outstanding sums due or unpaid. If all monies due from Participants are not received by CAMEO by 1st March in each year, the Manager shall recalculate the tmac value by dividing the total sum received in from Participants by the number of tmacs traded, and each Contributor Participant and/or Independent Scheme Participant shall receive the revised tmac value less the Administration Charge pro rata in accordance with the number of tmacs traded. The value of outstanding tmacs will be accrued to the following years trading and/or recovered as a simple debt.

This shows how the different administrative aspects that govern numerical digits can layer upon one another, resulting in a myriad of administrative complexity overseeing the emissions credit market. There are a series of calculations that factor into expressing the value of the emissions credit. That is, the calculation of credits purchased, recalculation based on number of participants in the scheme, this calculation minus the administration charges, and then, if there are accrued debts, the calculation of credits traded minus accrued debts.

Within these calculations, the initial indicator of environmental risk that is entered into the scheme is drawn out of focus. The number attached to the emissions credit is shaped, through CAMEO discourse, into a tradeable mercury abatement credit (tmac). The formulation of the tradeable credit through the calculations within the scheme formulates this new indicator of exchange value generation where the numbers making up the emissions credits are measured against the financial outcomes of their trade. The calculations speak to this exchangeability of the emissions credit, as further calculations build on the status of these numbers as cultivating exchange value from the credit, with further costs becoming applied to further measure these numbers against the money that they generate.

From this new indicator, a tension erupts concerning what the numbers correlate to in burden sharing schemes. In particular, there is a sense that the initial indicator of environmental risk becomes weaker, with actors contributing into the burden sharing scheme struggling to make sense of the relationship between the numbers and the indicators that simplify the relationship that these numbers have to the social world. This argument is reflected in a discussion with Glenn, who, in a conversation with Derek, the operator of Crematorium 2, and I, shared the following thoughts:

Derek (Crematorium 2): *So, you got one crematorium filtering nothing, one pumping into atmosphere – it's still going into atmosphere?*

Glenn (Crematorium 2): It is, isn't it – it's a paper exercise. CAMEO is a paper exercise, that's all it is because we're abating (filtering) 100%, then down the road in (location secret) they don't abate (filter) anything because they can't fit the kit in, so they're just pumping 1800 cremations into the atmosphere, but we're abating (filtering) them all, but yet they're still polluting the atmosphere – you know what I mean? But yet they still have to pay, it's like a sere-charge you have to pay, so I think they pay something like £55 per cremation to CAMEO, yeah, they have to pay CAMEO for not abating (filtering).

From Glenn's quote there is a sense that two indicators are coming into contact. There is a metric of environmental risk that supports the rationale of the scheme, but alongside this, there is a second metric of exchange value generation, whereby a revenue stream is being created from the money generated out of the scheme. These two indicators come together through what Glenn argues is an ability for one to pay if they continue to pollute. Glenn sees the numbers returning from the scheme as being distanced from the rationale used to implement them. That is, the numbers returning from the scheme appear to be distanced from their indication of environmental risk as the calculations produced through the exchange does not consider whether one is physically polluting or not. Rather, the numbers within the scheme appear to be measured against exchange value generation rather than purely against a risk to the environment.

This is reflected in changes to the shaping of the numbers through exchange-based calculations. Upon implementation, the indicator was presented as one of the environmental risk as credits are used to indicate lowering pollution problems presented to the environment. Through the scheme, however, this has been adapted into a use whereby the credits are used to comply with regulations, rather than solely measure this limitation of risk. The exchange calculations quantify the value of the use of the emissions credit, and, in this way, the two indicators come into contact, operating alongside each other as environmental risk limitation (use) and exchange value generation (exchange). This argument of environmental matters and capital coming together reflects Knoll's (2019) warning that burden sharing schemes should be understood as contemporary forms of sustainable markets that draw together state intervention and market forces. Specifically, for Knoll, there is a sense that this sharing of the burden reflects welfare economics, a form of commensuration that asks us to reconsider the state-market divide. Certainly, in this research, I have found that these environmental risk and exchange value generation indicators reflect these two components of state and market intervention.

Despite this coming together of state and market intervention, this paper takes a firm stance that numbers cannot be measured against both of these indicators consistently. While Knoll's framework is useful in further examining this interplay between the two indicators, research into UK cremation shows that the two strategies do not co-exist in a way harmonious enough to support this framework. Through Glenn's comment, it can be seen that there is a sense of the environmental rationale becoming distanced as those that pollute can pay for the privilege. In essence, exchange value generation is the stronger of the two indicators as it is this indicator that numbers predominantly come to be measured against. As a use for representing environmental compliance, the credits gain monetary value and exchangeability. While this does reflect the measurement of the numbers against limiting environmental risk, there is a stronger sense from crematorium staff, as well as the documents, that the measurement of environmental compliance provides a stronger motivator of value rather than environmental risk limitation. This is what the documents show with their calculations attached to 'tradeable' mercury emissions credits, and it is what crematorium managers share when they discuss the scheme. That is, above being an indicator of the limitation of environmental damage, numerical credits as compliance tools are exchangeable for money. Numbers are predominantly measured against the generation of exchange value.

This leaves the question of why burden sharing is used as a logical means for lowering crematorium emissions in the first place. For example, when Newark and Sherwood district council faced problems with their abatement equipment, they were required to purchase 614 emissions credits at a price of £55 each to pay for compliance, which led to the calculated figure of £33770 (Newark and Sherwood District Council, 2018). The rationale presented in the letter outlining this cost concerns buying the credits to meet targets, rather than pertaining to the specifics of environmental health. As Mary, the manager for a different crematorium stated earlier in this article, 'I might have 1000 going spare, but you might only cremate 1000 people a year and therefore only need 500'. Exchange-based calculations, such as this 55×614, are reflective of participating in a scheme to trade to the minimum point of a government emissions target.

Therefore, on a level of environmental health, it is difficult to see how schemes such as these make sense as a means of moving towards clean air. Polluters pay to

pollute. The calculation of numbers in these schemes reflects a greenwashing where, on the surface, they appear as figures for lowering emissions, but the reality is that they are dictated by the exchange-based calculations of cost and revenue. These figures wind up costing local authorities when abatement fails and produces an extra means of revenue when it works. The calculation of numbers reflects what Kunertova's (2018) argument that such schemes operate on a basis of efficiency rather than an ethical fairness. The ethical dimensions of CAMEO burden sharing schemes reflect the same cost distribution mechanisms of broader global burden sharing policies based in NATO and EU pledges. Fairness is rationalised as sharing the cost. Yet, like in these global pledges, the calculations of burden sharing are unintelligible on an environmental level, reflecting instead on the market-based finances of cost and revenue.

Conclusion

The focus of the empirical research compiling this paper is the first of its kind. Through it, I have demonstrated how two co-existing numerical indicators are formulated through the environmental and exchange-based calculations that take place within crematorium burden sharing schemes. When implemented into burden sharing schemes, number-based credits that indicate a limitation of environmental risk are shaped into 'tradeable mercury abatement credits'. The tension between environmental and market values articulated through the management of these numbers reflects a justification for reconsidering the calculations that are undertaken inside of burden sharing schemes. If environmental compliance is being calculated as a financially valuable use, then the question that this paper leaves is the following: *How environmentally rigorous are numerical measures as a means for limiting cremator emissions?* The role of numbers and how they are calculated in crematorium burden sharing scheme policies should be rethought if cremator emissions are to be better limited in a net-zero landscape. This role of numbers inside of the governance of crematorium burden sharing schemes should continue to be examined to further elucidate what is valued in the limitation of emissions from cremators and further address this question and the environmental rigorousness of current burden sharing policies.

While attention has been focused on the calculation of these numbers as they pass through crematorium burden sharing schemes, the scope of this paper has not allowed for a fuller account of what these monetary returns are classified as when they re-enter the crematorium. This is relevant as prior research has shown that monetary returns from environmental schemes hold contested definitions within crematoria as compensation rather than profit (Hoeyer, 2009, 2013; Rumble in Kohn et al., 2019). Yet, these papers have focused on money generated from metal recycling, rather than burden sharing schemes. Future research would be well placed to expand on the points made in this paper in reference to the classifications of monetary returns from burden sharing schemes inside of crematoria as this is uncharted territory. Doing so would reveal more about the values underpinning such burden sharing schemes as further questions should be asked about what numbers mean in the operation of crematorium burden sharing schemes.

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