

AACHEN'S POLICIES ON AIR POLLUTION

A law and economics analysis

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Abstract This article compares the merits of two opposing air pollution policies in Aachen through a law and economics approach. Based on Cole's (1999) property rights regimes, the current Aachener Approach and the soon to replace it Low Emission Zone (LEZ) are characterized as incentive-based and command-and-control regulation respectively. They are evaluated here on their efficiency and effectiveness using local government reports and legislation, and theoretical law and economics literature. This cost-benefit analysis shows the LEZ to be less efficient and of questionable effectivity in achieving reduction of air pollution levels compared to the current Aachener Approach.

I. Introduction

From February 1st 2016 onwards, the city of Aachen had no other option but to follow in the footsteps of numerous other German cities in establishing a Low Emission Zone (LEZ) (District Government Köln, 2015b). The controversial policy, which prohibits vehicles without an environmental badge from entering the city centre, was a response by the government of the district Köln, to which Aachen belongs, to air pollution levels exceeding the European air qual-

ity standards (Feldhaus & Scheffer, 2015). The policy's controversiality was caused by severe opposition from the municipality of Aachen itself (Eimer, 2015; Green Party, 2015). In 2009, the year the District Government Köln first put forward the possibility of instating a LEZ in Aachen, the city implemented its own clean air plan, which had been devised by a collaboration of local agents (District Government Köln, 2009). Aachen's commission on air quality deemed their locally devised clean air plan, also termed the Aachener Approach, superior to establishing a LEZ in improving air quality while maintaining the city's accessibility (District Government Köln, 2009). Up until the LEZ's establishment in 2016, the municipality argued it wished to keep this approach despite the city's continued exceedance of prescribed NO₂ levels (Eimer, 2015). And not unfoundedly so: the past years had brought a steady decrease in air pollution levels (District Government Köln, 2015a; Eimer, 2015).

The heated debate between advocates and opponents of the LEZ did little to objectively assess the advantages and disadvantages of the Aachener Approach and the LEZ, much less compare them. As Dales (1968) noted, "pollution control is intimately tied up with political processes" (p. 17). Therefore, this paper seeks to consider independent of political goals whether the establishment of a LEZ in Aachen was a rational policy decision at the time.¹ A meaningful assessment of the rationality of any environmental policy must take into account the law-making process, its economic implications, and its environmental effectivity (Dales, 1968). As such, a method especially suited for providing a framework for analysis is law and economics, which evaluates laws based on their efficiency and effectivity.² This paper analyses the different policies available to the regulating authorities in Köln at the time, guided by the research question "how did the Low Emission Zone proposal in Aachen compare to the Aachener Approach from

¹ This paper thus is primarily concerned with the rationality of the decision-making procedure that led to the implementation of the LEZ. It will take all information available to the regulating authorities in Köln at the time of establishment of the LEZ into account to assess whether the LEZ indeed was the most efficient and effective policy available.

² A reader acquainted with Calabresi and Melamed's approach to law and economics might wonder about the choice for the assessment criteria cost-efficiency and effectivity, or rather about the omission of distributive justice (see Calabresi & Melamed, 1972). This is due to the particular nature of this pollution problem, a "general equilibrium situation" in which the many individual polluters at the same time are pollutees. They bring about the costs of pollution and consequently bear them. As Dale noted, "in the end, the costs will be spread around, and the general population will pay for pollution control (...) the important question is not *who* lays out the money in the first place, but *how much* is paid to achieve what benefits" (Dale, 1968, pp. 83, 86, emphasis in original). As opposed to the pollution problems in Calabresi and Melamed, therefore, the setting of the entitlement does not significantly change the distribution of wealth.

a law and economics perspective?” First, a situation sketch of Aachen’s pollution levels and the two available mitigation policies at the time of decision-making is given. These mitigation policies are then characterized, assessed and compared using Cole’s (1999) property rights regimes. The analysis serves to support the hypothesis that a property rights-based cost-benefit analysis shows the Low Emission Zone proposal in Aachen to be inferior to the Aachener Approach in achieving both cost-efficiency and effectivity.

2. A Situation Sketch

Following the European Air Quality Directive of 2008, cities whose nitrogen dioxide (NO₂) and particulate matter (PM₁₀) levels exceeded the set standards were compelled to take action by 2015 in order to avoid high fines (European Parliament and Council, 2008).³ Amendments and a new article in the Federal Immission Control Act incorporated the directive into German law (District Government Köln, 2015a). The competence and responsibility to devise air quality improvement plans were given to the district governments, in close consultation with all authorities and institutions that might be affected.⁴ Therefore, the municipality of Aachen was anything but free to unilaterally decide on an approach. Nevertheless, policymaking on environmental measures was characterized by a high degree of local autonomy in the first years after the directive’s implementation, resulting in the Aachener Approach in 2009.

The Aachener Approach, devised by a collaboration of businesses, environmental and traffic associations, the local bus company ASEAG, and the universities, consisted of a range of interlocking projects to promote more sustainable modes of transportation (District Government Köln, 2009). Next to addressing air pollution, the approach aimed to maintain the city’s accessibility as a centre for business, science and tourism. Aachen’s commission on air quality stressed the importance of conviction and voluntary self-commitment, not-

³ See European Parliament and Council Directive 2008/50/EC on ambient air quality and cleaner air for Europe [2008] OJ L152. Interestingly enough, however, it is unlikely that the city of Aachen would have had to bear this fine, as it is deemed to have done all in its power to combat pollution. If the fine would have come about, it would most likely have fallen to the Bund or the Länder (City Council Aachen, 2014, p. 7). Both the municipality and the district government therefore exempted the costs of fines in their cost-benefit analysis, although advocates of the LEZ like to refer to the ominous prospect of paying five-digit fines –a day (Eimer, 2014a).

⁴ § 1 Abs. 1 i. V. m. Nr. 10.6 des Anhangs 2 der Zuständigkeitsverordnung Umweltschutz – ZustVU; § 47 Abs. 4 S. 2 BImSchG

ing that only a consensus supported by a plurality of groups and encompassing a plurality of activities could bring about enduring changes and success for air pollution control (District Government Köln, 2009). This rationale of incentivizing rather than sanctioning led to a programme in which more sustainable transportation was encouraged and subsidized. Examples are cheap tickets for commuting using public transport, the loan of electric bikes on a large scale through the ambitious project Velocity, and a significant improvement of the bike infrastructure (District Government Köln, 2009; Eimer, 2014a). Moreover, substantial sums were invested in making public transport more eco-friendly. This especially concerns the highly pollutive ASEAG bus fleet, which was slowly being replaced by buses sporting significantly lower pollution levels (District Government Köln, 2009; Green Party, 2015).

Up until implementation of the LEZ, the city defended its wish to keep the Aachener Approach despite continued exceedance of NO₂ levels by referring to the successes it had already achieved: a steady improvement of air pollution levels (District Government Köln, 2015a; Eimer, 2015). As Aachen's mayor Marcel Philipp put it, the Aachener Approach has proven to be successful. The Low Emission Zone has no part in it, as Aachen does not wish to be a city sealed off from the outside (Eimer, 2015). This concern is made all the more pressing by Aachen's location in a border region, with many visitors, thus money, coming in from Belgium and the Netherlands. The municipality did recognize that more rigorous measures were necessary to accelerate the decrease in NO₂ levels, and in collaboration with the commission on air quality had devised an expansion on the existing policy. It entailed more comprehensive and expensive programs, but still under the rationale of incentivizing rather than sanctioning (City Council Aachen, 2014).

The district government, however, deemed the establishment of a LEZ the only possibility to bring about a lasting reduction of limit exceedances, and thus protect the citizens' health (District Government Köln, 2015b). It argued that under no circumstances the Aachener Approach would be able to attain compliance with the EU's NO₂ limit (District Government Köln, 2015a). Their preferred policy, the LEZ, entailed categorizing vehicles based on their pollution levels. Only those vehicles that complied with certain European pollution standards (Euro 4) would be eligible for the green environmental badge required to enter the city centre. Motorists driving a vehicle without a badge would risk high fines (District Government Köln, 2015a). As most modern passenger cars – about 90% – complied with these standards, the LEZ's influence seemed limited (Feldhaus & Scheffer, 2015). However, three groups were expected to form an exception to this. First, the owners of vehicles that under the LEZ would be

prohibited from entering the city centre, a group which mostly consists of owners of small businesses (Feldhaus & Scheffer, 2015). Secondly, visitors from Belgium and the Netherlands would face higher transaction costs in acquiring an environmental badge, although these would not be insurmountable (Schack, 2015). Thirdly and most importantly, local bus company ASEAG would have to take far-reaching measures to be able to continue operating in Aachen. When on the 21st of August the District Government Köln decided to implement the LEZ half a year from then, the ASEAG's fleet still utilized more than a hundred buses that would not be allowed into the city anymore due to their emission rates. In order to be eligible for a green badge, these buses would have to be equipped with particle filters that lower PM₁₀ emissions, at about €10.000,- per filter (Feldhaus & Scheffer, 2015).

3 Analysis

3.1 Property rights in environmental goods

Now that the basic content of both approaches has been established, their merit can be assessed using Cole's analysis of property rights regimes. Cole's (1999) law and economics approach argues that pollution results from inadequately specified property rights of environmental goods. This problem, also defined as the tragedy of the commons, can be addressed by assigning specific property rights to the state or individuals (Hardin, 1968). This can be done in many ways, of which two are especially relevant for the purposes of this paper: regulations in the form of command-and-control, and in the form of market-based incentives. The former involves making a good state property, *res publica*, with officials determining the conditions for its use and exclusion. The latter comprises governments vesting a limited form of private property rights, *res privata*, in individuals to incentivize control of emissions (Cole, 1999; Stavin, 1997).

At the outset, the right to use air as one pleases was characterized by a 'res nullius', an open access right, in Aachen as much as anywhere else (Cole, 1999, p. 276).⁵ And with disastrous consequences, for as long as the individual benefits of polluting the commons are greater than the individual's share of the ensuing

⁵ Dales disputed the theoretical existence of goods without any property rights, arguing that such goods inevitably are "vested in the right of some government", thus common property (Dales, 1968, p. 62). However, he did concede that state ownership on a no-rule base, "unrestricted common property", practically amounts to there being no effective ownership (Dale, 1968, p. 63). Therefore, the initial situation will further be referred to as being characterized by a *res nullius*.

common costs, we are, as Hardin (1968) puts it, “locked into a system of fouling our own nest” (p. 1245). As both pollution and awareness of its negative consequences grew, governments started defining property rights of environmental goods (Harrington & Morgenstern, 2004). Most often, they did so in the form of command-and-control regulation, thus by asserting the state’s property rights to “[impose] on polluters a legally enforceable duty to comply with all restrictions on use of the public’s atmosphere” (Cole, 1999, p. 282).

3.2 The Aachener Approach

Aachen, however, formed an exception to this pattern of command-and-control regulation by issuing the Aachener Approach: a market-based form of regulation. As indicated under the situation sketch, this policy relies on incentivizing motorists to reduce pollution rather than relying on traffic-related sanctions (District Government Köln, 2009). One could thus say that it gives individuals as well as companies a limited private property right to “use” the air. The property right holders can then decide whether to use this right to pollute by driving in the inner city, or “sell” (part of) their right to the municipality of Aachen by opting for one (or any combination) of several subsidized alternatives.⁶ This strategy coincides with Hardin’s (1968) advice to policymakers not to offer “prohibition, but carefully biased options” (p. 1247).

This specific form of market-based regulation contains aspects of both pollution charges and subsidization.⁷ Due to the quantity of polluters, an emission rights market, which is deemed the most efficient and effective policy, is impossible (Dales, 1968). The Aachener Approach remedies this by establishing a similar possibility: a “market” in which individuals can trade the use of their rights for subsidized alternatives with the municipality. Individuals cannot trade their rights with others, but remain in control of the extent to which they pollute, and which subsidies they wish to apply to their individual case (Dales, 1968).

3.2.1 *Efficiency*

By making it increasingly expensive (through forgoing cheaper options) to display the less-preferred behaviour of polluting, its temperance can be achieved in an efficient way (Cole, 1999; Dales, 1968). Every motorist can decide for themselves

⁶ Note, however, that they cannot transfer this right to anyone but the state. There is no full-fledged emission market, making the property rights limited.

⁷ Dales distinguished three ideal types of solutions for the tragedy of the commons: technology-based regulation, subsidization, and pollution charges (Dales, 1968), Pollution charges encompass the polluter pays principle, whereas subsidization gives the polluters a right to pollute that is transferable to the government.

to what extent they should reduce the use of their right to pollute in order to minimize their costs, rather than having the commission on air quality or municipality establish and subsequently monitor how much every individual may pollute. As every polluter minimizes their costs, total costs of tempering pollution are minimized (Dales, 1968). Moreover, transaction costs are low, as there was no coercion, little monitoring, and little negotiation involved (Dales, 1968).⁸

3.2.2 *Effectivity*

However, the district government of Köln did not criticize the Aachener Approach for its level of efficiency, but rather for its lack of effectivity. As the LEZ's effectivity is up for discussion as well, one might object that this constitutes "thoughtlessly [governing with] a double standard", in which measures are dismissed as soon as "its opponents triumphantly discover a flaw in it" (Hardin, 1968, p. 1247). However, this does not invalidate the district government's criticism. Indeed, the prognoses issued by the district government showed that the outlook for attaining the EU's pollution levels limit in the near future at the current rate were bleak, and the municipality acknowledged the same (city council Aachen, 2014; District Government Köln, 2015c). While the district government mainly justified the implementation of the LEZ on this basis, it is in fact very unlikely that the LEZ will be able to bring about the required reduction in a short timeframe, either: prognoses in 2015 showed an attainment date in 2025 (District Government Köln, 2015a). The standard for effectivity must therefore be readjusted. The question remains as to how: the municipality advocated a long-term goal of reducing air pollution while remaining accessible, whereas the district government advocated the conception of effectivity solely as bringing about reduction of pollution levels as quickly as possible (District Government Köln, 2009, 2015c; Eimer, 2014a). When assessing effectivity on the basis of the former conception, the Aachener Approach seems superior, whereas on the basis of the latter this cannot be said as unequivocally (Eimer, 2015).

3.2.3 *A distinct case: ASEAG*

In short, the incentive-based regulatory approach seems efficient and can be argued to be effective. This is true for individuals at least, as it is hard to see how subsidizing and encouraging the use of buses and bikes would make the ASEAG lower their bus fleet's pollution. Yet, to attain the EU's pollution levels threshold,

⁸ This is not, of course, to say that the Aachener Approach was cheap. The incentives offered did cost money. However, there were little dead-weight costs – costs that constitute no investments but are solely made to enable some other transaction.

especially for the critical NO₂ levels, this is crucial: in 2015, at the time of decision-making, the public bus fleet was responsible for 43% of NO₂ emissions from traffic (District Government Köln, 2015a). The municipality therefore followed a different strategy to address this source of pollution. It subsidized upgrading of pollutive buses, supported the acquisition of electric and hybrid buses, and exerted political pressure (City Council Aachen, 2014). This policy can be seen as a blend of market-based and control-and-command regulations: although the ASEAG was not strictly being coerced to fulfil a certain pollution standard, the options the municipality gave it were very much biased towards investing in a more sustainable bus fleet. The property rights on the use of air therefore strictly remained with the ASEAG, but in fact the conditions of use were partly determined by the municipality. Therefore, the property right shows a striking resemblance to a usufruct: The ASEAG was allowed to use the air and to enjoy any profits that stem from it, but abuse was practically prohibited (Cole, 1999). This approach was advocated to be cost-efficient – although ASEAG’s freedom to pursue the degree of pollution reduction that yields most utility was limited, it was free to choose those measures that reduced pollution most efficiently (Breuer, 2015). In practice, this seemed to be working well with steady reductions in NO₂ levels as well as the less critical PM₁₀ levels since the elimination of the *res nullius* in 2009 (District Government Köln, 2015a).

3.3 The Low Emission Zone

The LEZ on the other hand is based on across-the-board control-and-command regulation.⁹ The property right to the air remains vested in the government, which determines the conditions for its use (Cole, 1999). In the case of the LEZ, motorists driving vehicles too pollutive are excluded, although they can buy their way out of this position through the purchase of an environmentally friendly car. This approach, too, does not perfectly fit the ideal type of regulation as put forward by Dales (1968): although the conditions for polluting are specified, the extent to which motorists can make use of it remain undefined. In contrast to the Aachener Approach, the regulation is the same for all individuals and companies. This homogeneity of treatment is argued to be its major strength by advocates (in effectivity) as well as its major weakness (in efficiency) by opponents (District Government Köln, 2015a; Feldhaus & Scheffer, 2015).

⁹ The distinction between across-the-board, thus uniform application, and point-by-point, meaning regulation adjusted to individual polluters, originates from Dales, 1968, p. 84.

3.3.1 Efficiency

Although various opponents of the LEZ disputed its effectivity as well, the main concerns raised related to the high costs following from implementation (Eimer, 2015; Laberer & Niedermeier, 2009). The closing remarks of a local news report on the impending implementation of a LEZ in Aachen are telling: The LEZ will cost a large amount of money for a measure that will not significantly improve Aachen's air quality (Furhrmann, 2015). These costs were expected to mainly arise in three groups, first in the group of small business owners situated in the inner city. Their larger company vehicles often do not comply with the criteria for a green badge, meaning that their vehicles would have to be upgraded. Only under very specific conditions, including a statement from a tax consultant that the business would face closure if it cannot continue using its prohibited vehicle, are exceptions made (Mayor and Executive Board Aachen, 2015). It was feared that small business owners would therefore encounter financial difficulties (Furhrmann, 2015). This criticism on the LEZ is derived from the argument that command-and-control regulations tend to be "economically inefficient – that is, excessively costly – because they ignore market signals about which firms can reduce emissions most cheaply" (Stavin & Whitehead, 1992, p. 15).

Secondly, costs in the form of foregone revenue could arise from the increase in transaction costs for visitors from Belgium and the Netherlands. It was feared that they would be deterred by the trouble and cost of having to acquire an environmental badge (Furhrmann, 2015). This concern is understandable considering the substantial revenue made at the hands of visitors from nearby towns across the border (Piana, 2015). Opponents therefore warned that the LEZ had the potential of becoming a new border hurdle (Eimer, 2015). As this concern does not apply to most other, non-border region cities that have implemented a LEZ, these costs have not been considered in any cost-benefit analysis by the district government, which might prove a significant flaw in the process of making well-informed decisions (Piana, 2015).

The most upheaval, however, was caused by the investments the ASEAG would have to make up until December 31st 2017, when the ASEAG's exemption from the LEZ ends, in order for all buses to continue to be allowed into the city centre (District Government Köln, 2015a). Under the Aachener Approach, the ASEAG de facto was required to make its bus fleet more sustainable as well (City Council Aachen, 2014). However, given the shortened timeframe left by the LEZ, the ASEAG now would have to resort to measures that provide less pollution reduction for the same amount of investment, notably particle filters. The investments as planned under the Aachener Approach still have to be made in the long run, however, leading to overall higher costs (Breuer, 2015). As such,

the ASEAG-case illustrates Cole's (1999) argument that command-and-control approaches fail to "[take] into account the different cost structures individual firms have for pollution control" (p. 283).

3.3.2 *Effectivity*

Nevertheless, the LEZ should not be dismissed solely because of its inferiority to the Aachener Approach in terms of efficiency. As Cole (1999) argues, the primary purpose of market-based approaches to reducing pollution is "not to reduce emissions but to minimize the costs of reducing emissions" (p. 283). The LEZ's primary purpose is to reduce emissions, and it can therefore be expected to be superior in terms of effectivity. If the district government decided rationally on what constitutes the best approach, the gain in pollution reduction must be enough to compensate for the lack of efficiency.

It was, however, anything but clear whether the LEZ in fact would add much to the reduction of the critical levels of air pollution at all. This concern mainly was expressed concerning the public bus fleet. As mentioned above, ASEAG would have to invest considerable amounts in equipping buses that are not eligible for a green badge with particle filters. Although these particle filters do reduce PM₁₀ levels, they lead to an increase in NO₂ emissions – precisely the pollutant that Aachen's air quality suffered most from, and which was projected to be the most difficult to reduce to the levels prescribed by the EU (Breuer, 2015; District Government Köln, 2015a). The money needed for this operation could not be spent elsewhere, notably on the originally planned acquisition of much more environmentally friendly buses (Feldhaus & Scheffer, 2015). As a spokesperson of Aachen's Green Party argued, the city needs new buses, not a Low Emission Zone (Breuer, 2015).

Despite assurances by the district government that environmental associations agreed on the utility of a LEZ, said organizations were in fact doubtful about its merit. Excluding the LEZ's consequences for the upgrading of the bus fleet, they have conceded that a LEZ could marginally contribute to reducing pollution, but were quick to warn that much more needs to be done. And precisely that, it was feared, would be discouraged by the establishment of a LEZ. As Aachen's Green Party put it, there is fear that the establishment of the LEZ will cause further inaction, leading to measures that are actually effective not being taken (Green Party, 2015). In other words, authorities might be tempted to lean back and consider their duty to be fulfilled once the LEZ is established. In that sense, the LEZ was more effective in improving air quality when it was only an impending plan: it then worked as a stimulus for the development of other ambitious plans to render the establishment of a LEZ unnecessary (Eimer, 2014a).

4 Conclusion

In a property-rights based analysis, this paper has shown the incentive-based Aachener Approach to be the rational choice for Aachen: it is more cost-efficient than the command-and-control regulation LEZ in achieving reduction of pollution levels. Depending on the definition of effectivity, namely quick reduction of pollution levels or reduction while remaining accessible, the LEZ could respectively be said to be at best marginally more effective, but at worst counterproductive. As Stavins and Whitehead (1992) put it, “market forces can offer a more powerful, far-reaching, efficient, and democratic tool than centralized regulations for protecting the environment” (p. 15). In the light of these results, the district government’s establishment of a LEZ rather than relying on its superior alternative seems most puzzling. Rather than being a satisfactory and conclusive answer to the research question, the findings raise the question why the district government’s choice of policy is diametrically opposed to the law and economics analysis’ preferred policy.

This discrepancy between the law and economics analysis’s outcome and the district government’s choice of policy points at shortcomings on both sides of the debate. First, it highlights uneconomic thinking on the part of the district government. With a policy preferred by its target group well in place, replacing it by a less efficient and effective alternative is ill-advised from an economic point of view. However, this does not take away from the fact that the LEZ, an unthinkable choice from a law and economics perspective, has been established. As such, secondly, it demonstrates a gap in the explanatory power of law and economics analysis. By only considering economic criteria for the desirability of a certain policy, it leaves no room for any non-economic considerations that change this assessment. Law is not only intricately intertwined with economics, but also with politics and society as a whole. A myriad of non-economic reasons might have driven the district government, such as seeking to assert authority over lower levels of government, wanting to appear to be a strong defender of the environment, or bureaucratic, incremental decision-making. The law and economics analysis thus shows which policy would be better from an economic perspective, not which one will actually be chosen. One may thus say that while the district government demonstrated little economic thinking in choosing the LEZ, a policy that was less efficient and effective than its alternative, the law and economics analysis implies too much economic thinking to be able to explain the district government’s choice of policy.

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