CHALMERS

Chalmers Publication Library

Noise Policy-integration with climate and natural resource policies

This document has been downloaded from Chalmers Publication Library (CPL). It is the author´s version of a work that was accepted for publication in:

Noise/News International,

Citation for the published paper:
Kihlman, T. (2013) "Noise Policy-integration with climate and natural resource policies". Noise/News International,, vol. 21(2, 2013), pp. 6.

Downloaded from: http://publications.lib.chalmers.se/publication/184392

Notice: Changes introduced as a result of publishing processes such as copy-editing and formatting may not be reflected in this document. For a definitive version of this work, please refer to the published source. Please note that access to the published version might require a subscription.

Chalmers Publication Library (CPL) offers the possibility of retrieving research publications produced at Chalmers University of Technology. It covers all types of publications: articles, dissertations, licentiate theses, masters theses, conference papers, reports etc. Since 2006 it is the official tool for Chalmers official publication statistics. To ensure that Chalmers research results are disseminated as widely as possible, an Open Access Policy has been adopted.
The CPL service is administrated and maintained by Chalmers Library.

(article starts on next page)

NOISE POLICY – INTEGRATION WITH CLIMATE AND NATURAL RESOURCE POLICIES

Tor Kihlman
Submitted to Noise/News International
2013-05-24

INTRODUCTION

In general, different environmental problems are treated isolated from each other. This is the easiest way in decision-making. However, to solve complex environmental problems, which often include interrelations with other areas, a holistic approach may be preferable or even necessary and result in better solutions.

Interrelations between noise and other policy areas should therefor be identified and pointed out, taken into account and made best use of in the development of solutions.

This paper does not give any examples upon how noise policy has been integrated in other policy areas in reality. Such examples are difficult to find. It discusses where such integration is desirable and should be of mutual advantage. For the time being, such integration may be utopic but appears necessary for effective solutions.

The paper takes problems linked to transportation, the life-blood in our modern society, as the main example. Transportation vehicles for people and goods represent the major source for environmental noise. The production of the vehicles plays an important role in many countries' economy. Transportation is also a very important part of the climate problem. The inertia in the development of the transportation systems is substantial and the necessary lead times for real changes in the emissions from the vehicles are substantial.

Two environmental problems are discussed here; climate change which is a difficult problem and noise which is at least as difficult and

complex. There are relations between these two environmental problems. Some conditions create win/win situations, other conditions give rise to conflicts. It is essential to realize this especially on a strategic level. It may have the effect to increase the political interest.

In the case climate change, it is clear for the politicians and the public that a long-term strategy is necessary. The acute problem is the lack of an effective policy. Nor is the problem continuously followed up by strong actions. In the case noise, the need for a strategy is less understood or admitted by the politicians. This needs to be emphasized. Engineers and scientists have an important role here.

It is very demanding to solve anyone of these two complex problems. They need to be treated on a strategic level and taken seriously, continuously and long-term. Otherwise, it is difficult to make real progress. The climate change has long been on this level, even though the international negotiations have been slow and the decisions taken have been very weak. In the case of noise, where both emission and immission policies are important, the problem has a much less profound position in international fora.

There are no single technological fixes to anyone of these two problems. This makes them difficult to handle politically as political actions are needed on several levels and within different areas to lead to significant progress. The time from political decisions to noticeable effects in the environment is also very long; it may be of the order of 3-10 election periods for politicians. This demands long-term strategies and continuous political leadership. It is obvious, that this circumstance does not make the fields especially attractive for politicians, and definitely not for populist policy. Instead, it demands deep understanding and seriousness. Short-term problems must not take over or delay progress and actions. Nevertheless, in the case climate change it has done so in the shadow of the economic crisis. But have in mind, that during long time periods there will always occur economic crises. How do we then maintain the pressure upon the work within climate change and noise policies and prevent acute problems to take over, maybe resulting in serious mistakes in policy actions. Underlining the coupling between different fields may help to

keep the interest. Continuous involvement of engineers and scientists close to the decision-makers could make a difference.

INVOLVE SCIENCE AND TECHNOLOGY

The complexity of the problems under discussion necessitate that engineers and scientists get involved and given a special responsibility to support and advice policy-makers. We need to participate to explain the fields and what is demanded. This would hopefully lead to work with longer time perspectives. If involved, we can also point at relations between different fields where such relations are not obvious.

In the case of climate change, the International Panel for Climate Change, the IPCC, a large network of scientists around the world, was established in1988. It plays an important role in supplying the politicians and the concerned citizens with knowledge. The IPCC collects and compiles scientific findings of interest and importance for the climate change question. The IPCC provides the political side with a continuously updated scientific base for developing the climate change policy.

Noise control technology engineers and scientists should take a similar responsibility to support policy-makers with a base for policy development within the area noise. This is time consuming and demanding but could lead to more effective progress towards a less noisy environment. Within the International Council of Academies of Engineering and Technological Sciences, CAETS, a Noise Control Technology Committee has been established as a step in this direction. The initiative is described in ref [9]. Activity reports and other information about the CAETS Noise Control Technology Committee are posted on CAETS' website, www.caets.org.

CURRENT APPROACH TO SOLVE ENVIRONMENTAL PROBLEMS

Many environmental problems have been treated and solved successfully in isolation from other problems. This is especially the case where it has been possible to find solutions without sacrificing

essential utilities for the public. These are the easy ones. Some examples can be mentioned.

Today, many kinds of industrial and consumer products are recycled. It reduces the ”garbage mountain” and the need for new raw material. It also decreases the risk for contamination of the ground and the ground water. Such facts are easy to explain and therefor understood by the public. Recycling is a modest sacrifice for the consumer and is easy to include in every day life. It has been accepted by a majority in the public in many countries. Systems for recycling have been developed. Nevertheless, recycling is still insufficient, especiallly for some critical key elements such as phosphorus and rare metals on which the society is dependent.

For polluted water and air, technological fixes have been found. Examples are the catalyst for car engines and various filters at the end of the exhaust pipes. We have built plants for processing of the sewage water.

The positive effects have been evident. Exhaust gases from car engines do no longer cause the same smog problems in cities as they did a few decades ago. Cars can be used without severe restrictions for short-term air pollution reasons. During the last decades, we have got much cleaner rivers and lakes and cleaner air in the cities at least in the developed countries.

CFCs have been phased out and replaced by other substances, which provide the same service but with less effects upon the ozone layer. The remarkable Montreal protocol has played an important role here. DDT, PCB and some other chemicals have been found to result in serious negative effects and have been banned in many countries. This has been possible and accepted by the public as other substances giving the same utility or service have existed or been developed.

Typical in these cases is that the solutions have not interfered very much with daily life. Further, the positive effects have occurred rather soon and have therefor been easy to understand by the public.

Similar solutions do not exist for the more complex problems under discussion here. Technological fixes are not available. Substitutes are not at hand. Unpopular restrictions which affect daily life may be necessary. Utilities and comfort may get in danger. Lifestyle changes may be needed. The positive effects may not be noticeable soon; they may not come until after several decades. In such difficult situations a closer involvement of engineers and scientists could help.

THE CLIMATE CHANGE PROBLEM

Climate change policy is more difficult than the above-mentioned environmental problems. The reports from IPCC show with increasing evidence that climate change is real and man-induced and that the emission of large amounts of the climate gases carbon dioxide and methane is the main cause. The "deniers" is a shrinking group.

Radical cuts in the emission of climate gases are claimed to be necessary within a very short time to limit the heating of the planet to +2 degrees centigrade. This may in theory be possible but very demanding. Not only technological development but also major lifestyle changes appear urgent.

The public has not yet perceived any severe effects of climate change. Few perceive the climate change other than through the media reports concerning the development of total climate gas emissions and a hitherto small increase in global temperature. Climate change may be the reason for some extreme weather conditions, which have occurred during the last years.

Large reductions of the total emissions of carbon dioxide and methane imply very uncomfortable actions. If the only solution is to decrease the use of fossil fuels dramatically, utilities for the public are endangered with consequences in daily life. It raises questions on lifestyles and global distribution of wealth.

Such issues are not easy to handle. An illustration of what on the contrary is of interest in international negotiations is how the melting ice-cover in the arctic regions is met. The severe background to the

melting ice is not the issue on the political agenda, but rather the new possibilities to exploit the natural resources and get more oil to burn.

THE NOISE PROBLEM

Noise policy is in many respects even more difficult than climate change policy because of its complexity. In contrast to the climate change problem, the environmental noise problem has been identified long ago and discussed for more than 50 years. Also environmental noise has obvious and severe effects upon health and wellbeing. Many citizens are affected directly and personally by the noise. Yet, few realize the severe effects upon public health. Some believe that today's noise levels are inevitable in the urban environment.

In later years, the research has revealed more severe adverse effects of environmental noise than earlier known. These effects mainly occur at levels above current guideline values formulated long ago, but such higher levels are common as too little has been done to abate the noise. It is especially the effects of environmental noise on cardio-vascular diseases that have been evaluated in later years. This can lead to hypertension and heart attacks. WHO/Europe, the World Health Organization/Regional Office for Europe, has recently published two reports on these effects, [1], [2]. According to these reports, the traffic noise in Europe causes more than one million lost healthy life years per year in the population. The number of fatal heart attacks caused by the traffic noise is substantial. More recently, results from Danish studies on relations to strokes and diabetes have been published, [3], [4] and [5]. If also these Danish research results are taken into account, it appears reasonable to assume that the traffic noise leads to a similar number of premature deaths annually in Europe as the fatal traffic accidents. Traffic noise is not a marginal health problem but a major. To reduce the noise, demands political action on many levels.

WHO has given recommendations on limits both for day and night, both for short-term and long-term. These targets are set with strong scientific backing. Not only the long-term goals but also the short-term are very demanding to achieve. In many places, the noise levels lie far above these recommended levels. It will be difficult for EU

Member States to follow these recommendations but it should also be difficult for the Member States to ignore the severe problem. The WHO reports give imperative arguments for an ambitious noise policy to decrease immission levels.

It is a very demanding task to decrease the environmental noise sufficiently much. Actions directed towards lower immissions are needed in several areas; emissions from major noise sources, city and regional planning, traffic planning and management, building orientation and design and choice of road covering, sound shielding and insulation. To handle these issues, demands good understanding of different technologies and industry's conditions, necessary lead times for implementation of new rules and also life times for the products. The options and limits to reduce the noise problems through good planning require understanding of sound propagation over open land and in built up areas. What is needed and what is possible with different measures.

Substantial progress towards eliminating the adverse effects of noise demands that all the actors participate and exert oneself to the utmost. An effective noise policy should be founded upon a balance between requirements on each factor. No actor can refer the problems and the solutions to "the others".

Few politicians can be expected to have a sufficient overview and understanding of the complexity of the environmental noise problem. This circumstance may explain why progress is so extremely slow. It is necessary to understand that actions are necessary within all areas, by all actors, and it is challenging for each of them.

It should be the task for independent engineers and scientists to inform and advice policy-makers to a much higher degree than is the case today.

THE ROAD TRAFFIC NOISE PROBLEM

Road traffic noise is the biggest environmental noise problem in terms of number of affected persons.

The majority of the persons exposed to high road traffic noise levels live in urban areas. Equivalent levels of 65 dB and more are common along major roads and busy streets, much too high to correspond to a healthy environment. Even with good city and building planning, there is a serious gap of 10 dB or more to a reasonably healthy environment.

In order to bridge this gap, it is needed both to reduce the emissions and to do more in the town and building planning and traffic management.

The emissions

To close the gap, a substantial reduction of the noise emissions from the city traffic is necessary.

For road vehicles, not only the engine noise is the problem, also the rolling noise is problematic. There are many requirements on tyres and road surfaces to be fulfilled. Low rolling resistance and good wet grip is needed. There may be conflicts here with low noise emissions. If top speeds are reduced, it should be easier and cheaper to meet the requirements. Lower speeds are beneficial for traffic safety. Lower average speeds lead to lower fuel consumption and lower noise emissions.

Progress regarding internationally agreed test methods and maximum noise limits for road vehicles has been very slow. They are now under revision but the expected outcome will not make any big change. The test methods are rather premature. They do not distinguish between engine noise and rolling noise. They only regard speeds around 50 km/h. It appears rather impossible within the present type approval system, to reduce the emissions from city traffic in general sufficiently much by lowering the limit values.

To lower the emissions demands technical development on vehicles, tyres and road surfaces. This in turn demands a major revision of the test methods with separate methods for vehicles, tyres and road surfaces under a variety of operating modes.

Electric cars and busses may be part of the solution for personal transportation at speeds below 30 km/h. At higher speeds the rolling noise must be tackled.

To reduce the emissions, also traffic management and speed control are needed

City planning

Different cities, compact as well as sprawled, are surprisingly equal in terms of traffic noise power expressed as emission per unit urban area. This is because the traffic work (the total traffic in the city) expressed as vehicle*km per unit time and urban area is surprisingly equal in most major cities. These characteristics of city traffic have been discussed in a couple of papers, [3], [4]. The data imply that the average traffic noise emission per unit urban area with today's vehicles, has a spread of approx. only 3 dB and is rather independent of population density. There seems to be an urban cultural law of traffic leading to this result. Cf also Zahavi's law [5].

Sprawling does not help for obtaining quieter neighborhoods in general. In some respects it rather worsens the situation. In the sprawled city, the longer distances demand higher typical speeds leading to higher noise emissions per km.

From a general point of view, sprawled cities are no quieter than compact ones but the noise problems are different and involve different challenges. The sprawled city may have enclaves with excellent quiet environment but the necessary high-speed main arteries which link these enclaves give rise to very noisy environments. Who suffers? This is also a democratic problem! The compact city can have blocks which offer a high degree of quietness thanks to effective shielding. However, the distances to the busy streets are short and the noise exposure of the buildings facing these streets may get high also if the traffic speed is low. A healthy environment demands stricter requirements regarding noise emissions esp. for heavy vehicles such as delivery vehicles and busses

CONCLUSIONS

Noise is an integrated part or effect of almost every major activity in the society. Consequently, there are links between noise policy and other policy areas. Measures taken in one area may be counterproductive in the other. One important link to be observed is between the community noise problem and the global climate problem. Their solutions involve both conflicts and win/win situations. As both the climate problem and the noise problem are complex and demand long-term policies, the links between them may be difficult to identify by non-experts.

Global warming is attributed the emission of climate gases. Much of these come from burning fossil fuels in vehicle engines. Fuel consumption increases not only with travelled distance but also with traffic speed. Compact cities save land and have typical shorter travelling distances than sprawled ones. Lower speeds are possible. Conditions for public transportation are good. Lanes for busses can be located close to dwellings. The compact city is advantageous for walking and bicycling. These are good reasons for compact cities from a climate point of view. It is also a clear political trend today to build the cities more compact.

But the environmental noise must be more effectively handled. Compact cities may be very noisy and unhealthy. However, with very careful acoustic planning, they can also offer conditions for quiet and thereby healthy environments. But to make them a really good solution demands substantially lower noise emissions from road vehicles at low speeds in relation to what is common today. This demands international agreements on emission limits overcoming national industrial interests. Public transportation vehicles have to be substantially quieter than today. Heavy vehicles for goods delivery and public services must be quieter.

With regard to climate and noise policies the compact city can be a real win/win solution but this provides concerted actions on noise sources and city planning. With proper political leadership we could

in the future have compact, healthy cities where the dominant sound is not traffic noise but sounds from people in the streets talking and laughing.

There are also conflicts between climate change policy and noise policy. Noise reduction measures often lead to increased weight. Demands upon reduced fuel consumption and cleaner exhaust gases for internal combustion engines, ICEs, make the noise emission problems tougher. The demand for higher efficiency of ICEs for road vehicles leads to demand for higher compression ratios which in turn leads to more difficult noise problems. Also for airplanes, there are trade-offs between noise reduction, fuel consumption and NOX emissions. The desired noise emission reductions imply very challenging engineering problems demanding both time and effort to be achieved at reasonable costs

Noise policy is challenging. It will take a long time to achieve a substantially quieter world with less health effects caused by noise. Adequate policies are needed. They must involve participation by many parties, the industry, the town planners, the builders and many others.

Few policy-makers comprehend the complexity of the noise issue with its intricate links to other policy areas. The involvement from independent organizations of engineers and scientists with a good overview of the different aspects of the environmental area could make a difference. The CAETS work in this respect is a step in that direction.

REFERENCES

1. "Night Noise Guidelines for Europe", *WHO Regional Office for Europe*, (2009)
2. "Burden of Disease from environmental noise, Quantification of healthy life years lost in Europe", *WHO Regional Office for Europe*, (2011)

3. M. Sörensen, et al, “Road traffic noise and stroke: a prospective cohort study”, *European Heart Journal,* (2011)
4. M. Sörensen, et al, “Road Traffic Noise and Incident Myocardial Infarction: A Prospective Cohort Study”, *PLoSone,* (2012)
5. M. Sörensen, et al, “Long-Term exposure to Road Traffic Noise and Incident Diabetes: A Cohort Study”, *Environmental Health Perspectives,* (2013)
6. T. Kihlman, and W. Kropp, “Limits to the Noise Limits”, *Intl Congress on Acoustics, Seattle,* (1998)
7. T. Kihlman, and W. Kropp, ”Soundscapes in cities, limits to the noise limits” *Forum Acusticum 99, Berlin,* (1999)
8. Y. Zahavi, and M. Ryan. "Stability of Travel Components Over Time" *Transportation Research Record,* 750: 19-26, (1980)
9. William W. Lang and Tor Kihlman, “Sound environment as a global issue-perspectives on global noise policies”, *Internoise 2011, Osaka, (2011)*