Informal document on non-technical and structural measures

Prepared by the Gothenburg Protocol Review group (GPG)

Requirements under the Gothenburg Protocol include national emission reduction obligations and the implementation of technical emission limit values (ELVs) for i.e., installations, vehicles and products (ELVs). Their ultimate goal is to protect human health and ecosystems.

Beyond emission limit values

Implementation of ELVs only is not always sufficient to meet national emission reduction obligations or air quality targets. In such cases, additional actions in the form of "non-technical" measures could be considered, at the national or local level. This could include encouraging a faster substitution of old and polluting technologies by new and cleaner technologies, facilitating the use of cleaner fuels or feedstocks, or stimulating a greener behaviour of consumers. The latter could include a modal shift from private to public transport, dietary changes or domestic energy saving. Sometimes such measures prove to be more efficient and less costly than implementing stricter ELVs.

Non-technical/structural measures

Such additional measures are not included in the technical annexes of the protocol and are for that reason sometimes referred to as 'non-technical', voluntary, innovative or non-regulatory measures, although in reality these can still have highly technical components. For example, in the case of building insulation, solar energy, product and process redesign or advanced public transport systems. Examples of measures with almost no technical component include improved maintenance routines (e.g. regular checking of pumps, valves and pipelines for leakages, check-up for cars, heating systems, etc.), reducing indoor temperature, land-use improvements, obeying speed limits and turning off the lights when leaving the room. Examples of hybrid measures or solutions are motion-activated light switches, cruise control functionalities in vehicles, or awareness raising combined with certified product information so people can be sure they select environmental-friendly products.

For example, the U.S. EPA certifies residential wood stoves for meeting emission limits and efficiency. In this case the government has a unique role as a trusted third party. Emissions from wood stoves are the combined result of various aspects like technical standards, choice and placement of appliance, maintenance, fuel choice and wood burning behaviour. Awareness raising is often a first necessary step to change behaviour and can help the acceptance of regulation on how and when to burn wood (if awareness raising alone proves to be insufficiently effective). Checking the right wood burning behaviour by chimney sweepers, such as in Germany, and the obligation to respect the weather forecast in some states in the U.S., are examples of policies to further reduce emissions from wood stoves in addition to technical standard setting.

Often 'non-technical measures' are associated exclusively with behavioural change, however it is clear that it can mean much more. Given that narrow or potentially misleading interpretation of 'non-technical measures', the broader term 'structural measures or structural changes' may be more appropriate when we refer to measuresthat are additional to the end-of-pipe techniques prescribed in the technical annexes to the protocol.The common feature of structural changes is that they cannot easily be implemented via permitting ofspecific activities. They often require a combination of actions by various players in the production chain, as well as by consumers. As the term 'structural changes' suggests, it could even include a transition towards a new economic structure that relies less on the use of fossil fuels or animals.

Implementation through policy instruments

For the purpose of this informal note, we distinguish four types of policy instruments: regulatory, economic, social (information and communication) and public investments (including Research and Development[1]): These instruments can be combined in various ways. Below are some examples focusing on these 4 types of policy instruments in the transport system.

1. Regulatory instruments: some cities have closed parts of the city centres to cars or have withheld permits (e.g. for new roads). The recent lockdown has demonstrated that the regulation of vehicle activity in the event of an emergency can be acceptable.
2. Economic instruments: These could include a tax for polluting cars; subsidies for clean alternatives; compensation for the early scrapping of old cars; and increased parking fees in city centres.[2]
3. Social instruments: These could include raising awareness, and public involvement in monitoring and city planning. Incorporating communication strategies that suggest or promote a (modal) shift toward less polluting options. These may not be able to effectively change individual behaviour but can contribute to gaining societal support for the use of one of the other policy instruments mentioned above and to adapting social norms that in turn influence individual behaviour.
4. Public investments: These could include physical planning and targeted investment in infrastructure that could provide an important opportunity for the public sector to bring about structural change. For example, investment in public transport, the removal of parking spaces and the replacement of car lanes by bus or cycle lanes have a proven effect on traffic intensity and thus on emissions. Additionally, country governments could adopt policies to expand electric vehicle (EV) infrastructure, and to replace government motor vehicle fleets with EVs.

Benefits

Discussions on structural changes have taken place over a number of years. The 2007 report of the TFIAM on the review of the original Gothenburg protocol already concluded: "*In addition to available end-of-pipe emission control measures, non-technical and local measures will be of increasing relevance, especially if multiple policy objectives are pursued.*" [3]

This conclusion is still relevant and has become even more pertinent in order be able to meet long-term targets of the Air Convention. The benefits for putting more emphasis on structural measures are:

1. Non-technical measures/structural changes will lead to lower air pollution control costs to reach certain objectives than if estimated on the basis of end-of-pipe measures.
2. In general, GAINS optimizations do not take into account the potential for structural changes nor the potential for non-technical and local measures. GAINS has a focus on add-on technical solutions (measures with direct impact on the emission factors). Structural changes can be simulated by introducing changes in the baseline activity levels (i.e. the energy scenario input data). This requires analyses using a set of linked European wide models, e.g. for energy use (PRIMES), agriculture (CAPRI) and transport (COPERT), but also input from national and local experts on envisaged or potential structural changes would be valuable.
3. Structural measures will have larger (synergetic) reduction potentials than simple add-on controls addressing one pollutant by reducing emissions of different air pollutants (as well as greenhouse gases) simultaneously.
4. Given policy developments in other areas (climate, energy, nutrient management, transport, agriculture, biodiversity, …) it is more prudent to take into account other measures than only

technical end-of-pipe techniques (ELVs in the technical annexes). A switch to cleaner fuels and cleaner technologies, energy saving and energy efficiency action, structural changes in transport or agriculture, behavioural changes in diets, modal shift to public transport could prove to be more cost-effective than applying end-of-pipe technologies. This may reduce the relevance of setting stricter ELVs as a means to further reduce emissions in the longer term.

5. Structural change could play a key role to further reduce emissions in sectors such as domestic wood combustion, transport and agriculture:
    - For domestic wood burning (a coherent package of) 'non-technical' measures are likely to be more effective and suitable than technical measures for the reduction of emissions: for instance: (i) programs providing grants, incentives or rebates to accelerate the removal or replacement of old and polluting wood burning appliances, (ii) policies for prohibiting use of less efficient devices during high pollution events, (iii) training programs for proper installation and regular maintenance schemes, (iv) encouraging good burning practices and use of dry wood, (v) energy renovation (reducing heat demand), etc. All these measures will likely be more effective than retrofitting the existing stock with a catalyst or an ESP (technical measure). See the new code of good practice for solid fuel burning (TFTEI). [4]
    - For mobile sources 'non-technical' measures could include programs to expand EV infrastructure and provide incentives for increasing EV sales; enhanced inspection and maintenance schemes; expanded programs to reduce emissions from port activities and goods movement activities; environmental zones, scrapping schemes and modal shifts. [5]
    - For agriculture a behavioural change to reduce milk and meat consumption could form a powerful way to reduce emissions of ammonia and methane. A structural shift towards less intensive farming could also contribute to these emission reductions. See also the 2017 report from IIASA on measures to address air pollution from agricultural sources.[6]

Challenges

There are however still a number of challenges that need to be addressed and resolved. One of these challenges is to estimate potential emission reductions, the costs, health benefits, and other effects of specific structural measures that are currently not accounted for within GAINS. As an example, the GAINS model does not consider 'transactional costs', such as publicsector expenses for enforcing measures. Whilst this is not an important cost item for technical measures, it may very well represent a considerable share for several structural changes. Furthermore,efforts are needed to understand the perceived welfare effects of structural changes aimed atindividual behaviour. Both diets and domestic wood combustion are household decisions and incentives from the public sector to change these behaviours are often met with strong opposition from citizens, despite their cost-effectiveness. [7]

It should also be taken into account that while the rates of application (implementation) of most structural measures are predictable in modelling and verifiable (ex-post), the degree of application of certain measures more closely related to behavioural changes is not predictable or verifiable with reasonable certainty (i.e. modal shift from private cars to public transport or the use of best practice in residential wood heating). The same goes for the related costs (savings or implementation costs).

Conclusion

Overall, exploring the potential emission reductions from structural changes during the review of the Gothenburg protocol and bring together expertise within the Convention on this topic, e.g. from TFIAM, EPCAC, TFRN, TFTEI and the Parties would be recommended.

The WGSR at its 59th session recommended to develop a guidance document on non-technical measures. The development of such a document is included in the draft workplan 2022-2023 of the Air Convention. Such a guidance document should identify best practices that can contribute to the objectives of the Gothenburg Protocol, as well as having relevance for addressing local health and ecosystem damage in hot spot areas.

[1] The outcome of Research & Development is per definition uncertain and is excluded from further consideration. Note that the entire concept of 'nudging', which often proved to reduce household energy consumption with some 5-10%, originated from decades of research in behavioural economics.

[2] See Guidance document on economic instruments to reduce emissions of regional air pollutants, 2013: https://www.unece.org/fileadmin/DAM/env/documents/2013/air/eb/ECE_EB.AIR_118_ENG_01.pdf.

[3] See TFIAM report on the review of the Gothenburg protocol, 2007: http://www.unece.org/fileadmin//DAM/env/lrtap/TaskForce/tfiam/TFIAM_ReportReviewGothenburgProtocol.pdf

[4] See Code of good practice for solid fuel burning and small combustion installations, 2019: https://www.unece.org/fileadmin/DAM/env/documents/2019/AIR/EB/ECE_EB.AIR_2019_5-1916518E.pdf [5]

[5]. See Guidance document on emission control techniques for mobile sources, 2016: https://www.unece.org/fileadmin/DAM/env/documents/2016/AIR/Publications/ECE_EB.AIR_138_En.pdf)[6]

[6]. See IIASA report on measures to address air pollution from agricultural sources, 2017: https://iiasa.ac.at/web/home/research/researchPrograms/air/policy/SR11-AGRICULTURE-FINAL.pdf

[7] E.g. the potential emission reductions and associated health benefits of changes in wood burning behavior can be very significant. For example, the U.S. Environmental Protection Agency in a study estimating the benefit per ton of reducing PM2.5 precursors from seventeen sectors has estimated that health benefits of reducing PM2.5 emissions from the residential wood combustion sector are on the order of $400,000 per ton. https://www.epa.gov/sites/default/files/2018-02/documents/sourceapportionmentbpttsd_2018.pdf