

Workshop Summary

Integrating air quality and climate change mitigation – Is there a need for new metrics to support decision making?

Key Messages

- There is no single “meta-metric” which will deliver all information needed for a meaningful integrated approach for air and climate policies.
- The proposed way forward is the development of a framework or information portal combining a suite of existing metrics, where possible based on available studies, supporting simultaneous consideration of and highlighting the various environmental (and potentially economic) impacts of air quality and climate change policies at regional and local scales. This, with enough simplicity, should facilitate decision-making and integrated thinking, especially from city to regional level.

Motivation and Objective

This workshop focused on how the scientific knowledge base on air-climate interactions can be best made available to the users of this information such as policy makers and other stakeholders. The identification of the most significant co-benefits and trade-offs requires the application of appropriate metrics for comparing the effects of different substances emitted. For the purpose of this workshop, metrics were loosely defined as a quantified measure of effect or impact used to inform decision-making and to evaluate mitigation measures. The aim of the workshop was to discuss whether currently available metrics are “fit for purpose” or whether there is a need to develop alternative metrics or reassess the way current metrics are used and communicated in the context of integrating policies in the areas of air quality and climate change. Special attention was given to similar former and on-going efforts in order to avoid duplication.

27 participants from Asia and Europe representing climate and health sciences, environmental agencies, national and regional policy, NGOs and international organizations attended the workshop (see Annex I).

Session 1 “Information needs and current application of the end-users of metrics: perspectives from a variety of end-users”

Introduction presentations were given by Martin Williams (general introduction), Andre Zuber (European level policy perspective) and Tim Williamson (National policy perspective) followed by a round table discussion. Main points from session 1 are:

- Metrics can help identify trade-off and co-benefit options for air pollution and climate change mitigation.
- Current policies are served by available metrics, and once targets are fixed, the policy information needs are especially focused on compliance and not so much on taking new metrics based information into account in the present policy process. However, there is a need to think about new metrics to link the air and climate policy areas. Not only are new approaches in the mid- (after 2015/2020) and long-term needed, at present a need for further development of metrics has been identified for health and ecosystems impacts on short time scales, as well as better integration between EU-wide and national policies. Monetization or economic metrics could create more traction, especially in decision-making processes. Monetizing impact (damage) costs could be effective, as well as linked more easily to impacts on health (health care costs, lost work days etc.) and ecosystems (crop losses) through air quality. The caveat is that such impacts due to climate change are difficult to estimate and monetize (an often go back to air quality type effects), and sometimes require value judgments. Generally, for comparability, impact metrics might be more useful, however replacing action on CO₂ by mitigating SLCPs is not an option.
- Metrics should be clear, easy to understand, and hard to misinterpret as well as part of a larger coherent framework that is applied to inform policy making. The example of the human development index was given, as a metric that although never adopted for any formal regulatory scheme or otherwise can still be a powerful indicator that shifts attention and influences action.

Session 2 “Overview of the state of the science of currently used and newly developed/revised metrics”

Introduction presentations were given by Jan Fuglestad (climate metrics), Piers Forster (IPCC update), and Rita Van Dingenen (FASST assessment tool) followed by a round table discussion. Main points from session 2 are:

- The IPCC AR5 Working Group 1 report does not recommend any particular metric or time horizon for policy making. The choice of metric is policy-related and cannot be based on science alone. However, scientific studies can be used to analyse different approaches and policy choices. The choice of metric type and time horizon will depend on which aspects of climate change are considered most important to a particular application. To provide metrics that can be relevant to the users and policymakers a more effective dialogue between scientist and policymakers are needed,
- In addition to temperature responses other parameters such as precipitation or sea-level rise could be considered when evaluating climate effects of various emissions. Regional responses to climate change should be investigated further to be able to move past global mean values. Where emissions are reduced is still very important when considering exposure, especially for near-term climate forcers.

- An “easy metric” for policy making to be deduced from the IPCC AR5 is the 800 GtC that may be emitted in order to stay below 2°C warming. This metric is not tied to a time horizon. It cannot be used for trading between gases in multi-component policies and gives only the relation between total cumulative carbon emitted and peak temperature.
- The Joint Research Center operates the Fast Scenario Screening Tool (FASST) which considers health, ecosystem and climate impacts. The Stockholm Environment Institute (SEI) is developing a support tool for National Action Plans (SNAP) as part of a CCAC initiative. It uses a suite of metrics to indicate impacts from measures on climate, health and food security. The International Institute for Applied System Analysis (IIASA) operates the GAINS model that is used for assessing strategies that reduce emissions of multiple air pollutants and greenhouse gases at least costs, and minimize their negative effects on human health, ecosystems and climate change.
- The current air quality metric for particulate matter is PM mass. However for health impacts, particle surface and number concentration as well as the specific chemical composition matter at least as much. Additional metrics for BC should be considered for both health and climate impacts, although not necessarily for regulatory determination of attainment.
- Climate metrics and air quality metrics are fundamentally different. Climate metrics are often based on emissions while air quality metrics refer to ambient concentrations. In addition, health and ecosystem metrics are impact focused (mortality, morbidity, crop losses etc.).
- Much of the discussion focused on how climate measures (mainly burning less fossil fuels) can help achieve air pollution targets and on how air pollution mitigation can help achieve climate targets. It was stressed that measures such as energy efficiency/savings and increased use of non-combustion renewables would bring clear co-benefits. However, trade-offs may also occur. Climate measures may lead to degraded air quality (e.g. biomass heating). In addition, a warming climate as such can aggravate air pollution, known as the ‘climate penalty’. This is especially relevant for the global ozone formation potential and the resulting health effects. Further research in this direction is needed, particularly on the climate penalty for PM.

Demand and need for metrics in policy are not very well defined. To specify these, targeted science-policy dialogues are needed.

Session 3 “Moving forward: Recommendations for new metrics/information exchange to support decision making”

Three breakout groups worked on suggestions for a coherent framework for climate change and air quality policies to be populated with a suite of metrics.

Group 1

- Target scale and audience: Small municipality/City scale

Integrated assessment model output is very useful at the national/supranational government level where the resources and information exist to be able to implement the models. Hence, the discussion focused on the more local, small-scale, city level, where initiatives may exist that would like to consider air quality and climate, and possibly other issues (e.g., noise) in an integrated way, but do not have the resources or data needed for integrated assessment models. A framework was discussed that would allow for the beginning of a dialogue about the measures that could be implemented and what co-benefits or trade-offs these measures would have for the different areas. The Dutch Clean Air Tool (http://www.solve-maatregelenmix.nl/maatregelen_selectie.php?Punten_ID=1) was given as an example, which although it has a focus area of air quality and traffic, might be a good model of such a framework.

This framework would have multiple levels where at the most basic level, the user would have a more generic output/information base (likely with correspondingly high uncertainty) but would provide a starting point and make sure that at least the direction of the action is correct. For those that had more information to input, more detailed layers could be accessed to understand where the uncertainties are, etc. It would need to be flexible to accommodate different scales and levels of complexity. The tool could also incorporate a simple scoring system so that impacts on the different areas could be easily compared (whether that is a +3 to -3 scale or color coded), to avoid trying to compare apples and oranges (or e.g., RF to SOMO35).

The brainstorming map (image) captured inputs and impacts that would inform such a framework, including simplifications of some of the information (e.g., population instead of emissions).

Group 2

The discussion started around what scientific information (whether or not in the form of metrics) is best suited to support decision making. Ideally policy provides relevant questions to the scientific community, whereas the scientific community should be aware that policy making cannot accommodate all scientific information, especially on the complex topic of air-climate interactions, so prioritization of information is needed.

The perspectives on looking at air-climate interaction might differ. When looking at the long term objectives of tackling climate change, the question is to what extent it will make addressing air quality less difficult. When from an air quality perspective strong emission reductions are made to meet WHO guideline values, the question is to what extent long-term climate goals are affected by reducing the amount of cooling air pollutants.

One of the areas where new information or application of the current science-policy toolbox requires new approaches is the fact that beyond the 2030 time frame, policies should go beyond technical control by taking into account systemic changes and environmental impacts.

Also the scale at which information should be provided differs. Most scientific assessments focus currently on the global to regional dimensions. With air pollution

exceedances needing to be dealt with at the local level, information should be made available from the global/regional level to the city scale.

During the discussion one of the options identified was to tackle the need for information at various scales and policy angles by providing a more general framework to link sectors with impacts. In particular using metrics to identify/support choices of action and policy options was discussed as a useful way forward.

Group 3

- Target scale and audience: city to regional

The framework the group proposed can be described as follows: The framework consists of a matrix which relates the individual measures from sectors, such as energy, transport, agriculture, etc., with the implications for the categories of short-term and long-term climate change, health and ecosystems. The number of categories can be extended. The implications are characterized on the basis of individual forcers and pollutants (CO₂, HFCs, BC, SO₂, VOCs etc.) – all relevant for air quality and climate, and all regulated substances – by means of metrics. Such metrics can include for example AGTP₂₀ and AGTP₁₀₀ for short-term and long-term climate change, respectively, disability adjusted life years (DALYS) and other burden of disease for health impacts and area prone to eutrophication for ecosystems. Target values for each metric, or for each category, or sector need to be defined through policy as well as where in the trade-off and co-benefit space the actor would like to be. The framework over all sectors and measures can be subdivided in individual matrices that stand for one sector with a series of measures. Also, the level of detail of the information entered into the matrix can be adapted based on the availability of data, model output and necessity. While calculated metric values might be important in one case (quantitative application), an indicative color-scheme for positive, neutral or negative implications per measure and category might be sufficient (qualitative application).

The structure of the matrix allows applying it to a very local up to a global scale. In addition to the detailed information in each box of the matrix, summarizing versions can be produced for policy making including the production of maps, bar charts etc. depending on the specific policy questions.

Session 4 “Moving forward – part II: where do we go with this information? What format does it need to take? What avenues are most effective for distribution?”

Developing the framework

A consensus on how a useful and basic coherent framework for simultaneous consideration of air quality and climate change impacts could look like was reached. The development of a prototype based on physical processes should follow, recommending a set of metrics which

can subsequently be tested and debated. This will include conducting further scientific research where knowledge is lacking to fill in the gaps, and thinking on how uncertainties can be reflected in the matrix to inform without distracting from the main messages and the way forward. Models like GAINS, FASST and SNAP can be used to fill in the gaps using for example the UNEP report data. At the same time the framework will gain in significance if it is kept as simple as possible. Following the scientific advancement of the framework, economic evaluations like cost-benefit analyses can be conducted. Considering current political developments making the framework useful for city-scale decisions is promising, as cities are the “owners” of air quality problems and will be of climate change impacts. In the end the framework should provide a better overview of indicators, making disconnected information more useful by merging it for informed decision making.

The development of the framework will need the input from both science and policy. It is recommended that targeted science-policy dialogues are facilitated in the course of the development.

Open questions

While the question of which tool to use for policy integration could be answered preliminarily during the workshop, the question of how policy integration can be seeded and started remains open. It seems that both strategic top down as well as self-motivated bottom up approaches are needed to mainstream the idea of policy integration for a one atmosphere approach. Within the CCAC, member countries’ actions for such integration are driven from the national level. Regardless of the direction of the approach the main actors need to be motivated and enabled to promote such action.

Recommendation for dissemination

- A technical report portraying and populating the framework should be produced.
- The outcome of this workshop should be shared with the LRTAP community, DG Environment and DG Climate Action as well as the Climate Clean Air Coalition and other interested communities.
- National environmental agencies should be invited to discuss the integrated framework and give feedback to the approach, this can for example be achieved through EEA’s network.
- The science community will follow up with specific discussions at conferences like AGU and EGU in dedicated metric sessions.
- After the matrix has been populated and tested, a follow up meeting should be organized to discuss further research needs and lay out a plan for a review process and sanity checks.
- A series of targeted dialogues between the different scientific disciplines as well as between science and policy should accompany the process and provide input to it.

Key messages

The integration of air quality and climate change policies must not distract from reducing CO₂, the main driver of long-term climate change. There is no “either-or” option for reducing short-lived climate pollutants and long-lived GHGs, nor the option of “buying time”.

There is a somewhat illogic twist to the co-benefit and trade-off debate: Sometimes climate action is problematic for air quality (e.g., biomass heating), but the main climate measure (i.e. cutting fossil fuel use) provides significant air quality co-benefits; the latter point was stressed repeatedly. Another discourse focuses on how air pollution mitigation can change radiative forcing and thus support climate change mitigation. However, when strong CO₂ emission reductions are achieved co-benefits or trade-offs on global climate forcing due to air pollution reduction might not be that significant for climate change, especially on the longer time scales.

There is no single “meta-metric” which will deliver all information needed for a meaningful integration of air and climate policies. Instead, a coherent framework that uses a suite of metrics and relates hitherto disconnected pieces of information is more useful. No rocket science is needed. We have enough information to start the process of policy integration now.

The workshop concluded that the best way forward is the development of a framework based on a suite of metrics supporting simultaneous consideration of various environmental (and potentially economic) impacts of air quality and climate change policies at regional and local scales. The framework shall facilitate discussion between science and policy at different levels regarding co-benefits and trade-offs in relation to existing policy targets. The aim is not to reproduce or replace more detailed efforts, but to combine the relevant information in such a way as to provide guidance and improving awareness, especially at city and regional level not always covered by integrated assessment modelling. It will also support the development of new more integrated environmental policies in the long term.

However, while the proposed framework has the potential to provide an important information base for discussion, it cannot replace but support the efforts that serve the urgent need for greater communication and integration of air and climate policies.



Annex I

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