Saltsjöbaden VI Workshop 2018

Clean Air for a Sustainable Future – Goals and Challenges

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Editors: Anna Engleryd and Peringe Grennfelt

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Preface

The 6th Saltsjöbaden workshop was held in Göteborg 19–21 March 2018. The workshop was organised by the Swedish Environmental Protection agency and the IVL Swedish Environmental Research Institute with support from the Nordic Council of Ministers and in close collaboration with and support from the UNECE Geneva Convention on Long-range Transboundary Air Pollution (in the following referred to as the “UNECE Air Convention”) and other international organisations active in the field of air pollution. It was attended by about 180 scientists, policymakers and experts from 35 countries and five continents. In addition, representatives from 20 international organisations and agencies attended the workshop.

The Saltsjöbaden workshops have offered unique opportunities for policymakers, scientists, industry and NGOs to meet under unconventional forms and discuss future directions with respect to international collaboration on air pollution. The earlier workshops have been important for the development of the international collaboration, in particular within the UNECE region.

This workshop was organised similar to the previous ones, at which first a plenary session set the scene of the workshop, followed by discussions in parallel working groups leading to conclusions and recommendations, and finally the outcomes were presented and discussed at a general session where a set of general conclusions and recommendations were agreed upon.

Since air pollution will remain an important issue that will deserve both political and scientific attention many years into the future, early career experts, scientists and policymakers in the international collaboration for cleaner air were invited to a pre-workshop in the form of a “negotiation-lab”.

An Advisory Board was established for the overall planning of the workshop, in particular for the selection of topics and for the final preparations of the general conclusions and recommendations.

This report contains general conclusions and recommendations as well as reports from each of the working groups. The plenary presentations can be found at the workshop’s web page; <http://www.saltsjobaden6.ivl.se/>. A key to the abbreviations is annexed.

We, the representatives for the organisers, are grateful to all those involved in the planning and running of the workshop, in particular those leading the working groups, giving presentations and taking active part in the discussions.

Further information about the workshop can be found at <http://www.saltsjobaden6.ivl.se/>, where also reports from previous workshops can be downloaded. For questions and additional information, please contact peringe.grennfelt@ivl.se, anna.engleryd@naturvardsverket.se or john.munthe@ivl.se.

Anna Engleryd and Peringe Grennfelt

Background

Air pollution is today a global threat that requires international collaboration and coordinated actions for its solution. Several international organisations have highlighted the problem and are taking action. In addition to the UNECE Air Convention, under which the initiative for this workshop was taken, WHO and UN Environment have recently decided on global actions to meet the long term challenges for clean air. Other organisations with large interest in international collaboration and forward-looking actions are the European Union, WHO, WMO, the Stockholm and Minamata Conventions, CCAC, Arctic Council and AMAP, OECD, IEA and various NGOs.

Representatives for the above mentioned organisations together with scientific and policy experts, in all about 180 persons from 35 countries, took part in the Saltsjöbaden VI Workshop in Gothenburg 19–21 March 2018. Under the theme *Clean Air for a Sustainable Future – Goals and Challenges* common issues, directions and options for future collaboration were discussed. The workshop was held under the Chatham House rule.

Air pollution is closely linked to the Sustainable Development Goals (SDGs) and several of the goals have air pollution issues implicitly included. How air pollution is linked and the ways for assessing air pollution specifically within the 2030 agenda have already been brought up in various fora but it needs further attention in particular with respect to its links to health, welfare and urbanization.

Air quality and its transboundary dimension have for long been of high priority within the UNECE region. The scientific assessment report *Towards Cleaner Air* from 2016 points specifically to the importance of transboundary air pollution for the exceedances of air quality limits in urban air; an area that needs a closer collaboration between international organisations, countries, NGOs, industry and urban authorities.

An issue of increasing concern is the hemispheric scale of air pollution and transport of pollutants into areas not normally considered under the UNECE Air Convention, in particular the Arctic. On this topic several initiatives are taken by international organisations such as AMAP and the Climate and Clean Air Coalition (CCAC). There is an increasing interest from these organisations to discuss how to proceed and collaborate. The Stockholm Convention on POPs and the Minamata Convention are also covering air pollution in a global context.

One particular issue of interest for the UNECE region is the ratification and implementation of the Air Conventions Protocols in the Eastern part of the UNECE region and there is a need to find new entrances for actions in these countries.

In 2016 the European Union agreed on a revised National Emissions Ceilings Directive, setting emission reduction commitments for 2030. The new directive has a

number of aspects, closely linked to the UNECE Air Convention's agenda and where further consideration is needed. One particular issue in this context is monitoring of ecosystem effects, which now appear both as part of the agenda under the convention and as a request within the EU.

To capture these concerns the workshop was organised around five overarching themes:

- Clean Air for cities – the importance of transboundary air pollution and international collaboration for achieving air quality standards;
- Clean Air Globally – needs and options for scientific support and policy cooperation;
- Clean Air in the East – how to achieve a faster ratification and implementation of the Air Convention's protocols in the Eastern part of the UNECE region;
- Clean Air, Ecosystems and Climate –in particular how to organise future monitoring of the air pollution impact on ecosystems within the UNECE region;
- Clean Air – Sectors and Solutions – in which three sectors of particular interest were discussed; shipping, wood combustion and agriculture.

1. Main recommendations from Saltsjöbaden- VI

Based on the approx. 50 recommendations from the different working groups, a set of key recommendations were drawn and agreed upon at the final session of the meeting. The recommendations include an indication of who should take the initiative for further action as well as suggestions of other organisations to be involved.

1. *Flexibility for parties in the Eastern region of UNECE in ratification of future review of the Gothenburg Protocol.* Several of the parties in the Eastern region of the UNECE have argued that they see limited possibilities achieving all requests under future reviews of the Gothenburg Protocol and the protocols on Heavy Metals and POPs within a limited scope of time. In order for these parties to get credits for measures undertaken in the process of a full ratification, the CLRTAP should explore the possibility for the Eastern region parties to allow for step-wise ratification. (The EECCA Coordination group together with WGSR with the aim to come up with a proposal to the EB and the Implementation Committee);
2. *Clean air in cities.* The WHO air pollution guidelines as well as national and EU standards will in many urban areas not be met without measures to reduce the regional background, which often to a large extent is caused by transboundary transport. Vice versa, activities in cities also cause considerable amounts of air pollution that will influence air quality outside the city and results in transboundary transport of air pollution. An Expert panel should be set up under TFIAM in order to support local air policy with respect to the linkages between regional and local air pollution and the cost-effectiveness of coordinated actions. (TFIAM together with European Commission, WHO and relevant urban networks);
3. *Global air quality and earth observation network.* For a broader approach to the global dimension, scientifically and as a basis for action, there is a need to develop a global harmonized monitoring network, preferably in an Earth System observation concept, including interactions with ecosystems but also emission inventories and projections. Such a network should take into account the most recent developments with respect to remote sensing, cheap remotely operated monitors and data collection/communication. Coordination with networks related to climate change is of importance and it could form part of a global earth "observatory". Finance is a key issue in particular in regions with economies in transition and further work needs involvement of the World Bank and similar organisations. (HTAP in close collaboration with WMO, TFMM, AMAP and others);

4. *Global air policy dialogue.* Establish a policy platform on a broader geographic scale to address air pollution involving international organisations (UN Environment, WHO, WMO, Arctic Council, CCAC, Stockholm and Minamata Conventions and others) and regional initiatives (including EANET, Malé declaration and others), taking a step-wise approach at the outset, with an initial focus on increasing regional cooperative efforts. (UNECE Air Convention/EB Bureau in collaboration with UN Environment);
5. *Improved ecosystem monitoring.* Monitoring of ecosystem impacts is a time and resource-consuming activity where coordination between different bodies is of crucial importance. The workshop recommended setting up an expert group to coordinate and harmonize the monitoring of air pollution impact on ecosystems for conventions and other bodies (e.g. UNECE Air Convention, CBD, TEEB) and the European Union. (Working Group on Effects together with the European Commission);
6. *Reduce emissions from shipping.* Encourage the establishment of maritime emission control areas in all seas and develop schemes to reduce emissions from existing ships. Important stakeholders within this field are in addition to the IMO and the UNECE Air Convention, HELCOM, OPSARCOM, REMPEC, European Commission and the Arctic Council (IMO and CLRTAP);
7. *Reduce domestic heating emissions.* Address health impacts of domestic solid fuel burning and develop schemes for awareness-raising and replacement of old stoves and other combustion equipment. (TFTEI involving other organisations such WHO, CCAC, UN Environment, UN FCCC, EU Parties and urban platforms);
8. *Reduce agricultural nitrogen losses.* The agricultural sector is lagging behind, in spite of the availability of cheap technical solutions for substantial emission reductions. There is a need for developing criteria to link agricultural subsidies to emission reduction obligations and healthy food production. A voluntary “30% club” for ammonia reductions should be launched to encourage immediate action in areas with intensive agriculture (TFRN together with European Commission, Parties, INMS);
9. *Early Career Workshop.* An Air Quality Negotiation Simulation exercise was held for new and early career researchers and professionals to learn about the nature of international negotiations and the different perspectives that play a role and to gain experience in finding creative solutions that can bridge contrasting stakes of various Parties. It was recommended that such Early Career workshops continue to be held, where possible, in order to encourage other young professionals to participate in air quality science and policy work, particularly under the UNECE Air Convention. (UNECE Air Convention).

2. Brief history of the Saltsjöbaden workshops

The first workshop was held at Saltsjöbaden outside Stockholm in April 2000. It was aimed to discuss and outline further initiatives within the UNECE Air Convention and the EU after the recent signing of Gothenburg Protocol and the protocols on Heavy Metals and POPs. The idea behind the workshop and the format was to discuss under informal conditions how science and policy should be developed to support further negotiations and actions on transboundary air pollution. The workshop became a starting-point for the continued work both within the Convention and the European Commission, not the least the outline of the CAFE programme.

All following workshops have taken place in Gothenburg; although they have been named "Saltsjöbaden workshops" since they have all followed the same concept originally developed for the first workshop.

All workshops have, as mentioned above, ended in a set of strategic recommendations with respect to further development of international air quality science and policy. The most significant recommendations from earlier meetings were:

- 2000:
The workshop pointed in particular to the increased importance of health effects for future international collaboration and in particular an increased role of the Task Force for Health;
- 2004:
The intercontinental and hemispheric dimension of air pollution received increased attention and, as consequence of the workshop, the UNECE Air Convention set up a task force on Hemispheric Transport of Air Pollution (TF HTAP);
- 2007:
A key recommendation from the workshop was to initiate integrated activities on Nitrogen under the UNECE Air Convention (TFRN). The workshop also brought up the importance of atmospheric pollutants for climate and the issue of short-lived climate pollutants (SLCP);
- 2009:
The workshop took a broad approach on the linkages between air pollution and climate change and in particular SLCP. The outcome was brought to the UNFCCC community and in particular to the COP 15 in Copenhagen 2009;

- 2013:
The workshop brought in particular up the issues of outreach to various stakeholders, including the public, but also the issue of implementation of signed protocols.

Several recommendations are repeatedly coming back both as consequence of difficulties to realise the ideas but also because they need to be repeated in order to not be forgotten. Such recommendations include:

- Better communication to the public
- Better communication to finance ministries
- Closer cooperation with the UN FCCC
- Stable funding of effects work.

The first three workshops were organised within the framework of the Mistra ASTA research programme and the following three mainly with support from the Swedish Environment Protection Agency. The Nordic Council of Ministers has been supporting all workshops. Other organisations, such as the European Commission and the UNECE have supported some of the workshops.

3. Topic 1. Clean Air in Cities

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3.1 Introduction

Despite improvements over the last decade, air pollution remains to be one of the major environmental causes of premature deaths. Exposure to air pollutants such as Particulate Matter (PM), nitrogen dioxide (NO₂) and ozone (O₃) is an ongoing threat to public health. The WHO estimated that worldwide more than four million people die prematurely every year due to exposure to ambient air pollution.¹ According to the OECD this number will increase to 6–9 million in 2060 if countries will not take measures to improve air quality.²

The negative impacts of air pollution are most distinctly felt in urban areas. Economic activities are to a large extent concentrated in or close to cities. Around 55% of the world's population lives in urban areas and for Europe this number is almost 75%. It is estimated that more than 80% of the population of European cities is exposed to annual PM_{2.5} concentrations that exceed the WHO air quality guideline.³

3.2 How to approach urban air pollution

The most significant air pollutants in cities today are PM_{2.5} and NO₂. NO₂ originates mainly from transport. PM_{2.5} originates to a large extent from the combustion of coal or wood for residential heating and from the formation of secondary particulates (mostly ammonia (NH₃) related) that can involve non local sources through long range transport. When the share of (older) diesel vehicles is high, transport might also contribute significantly to PM_{2.5}. It is impossible to identify one pollutant as the most important one, as concentrations vary substantially between cities and regions, depending (amongst others) on the presence of different sources and the time of the year (e.g. ammonium nitrate episodes in spring).

¹ Global Burden of Disease Study 2015. Lancet. (2016); 388: 1659–1724.

² OECD (2016) – The Economic Consequences of Outdoor Air Pollution.

³ EEA (2017) – Air quality in Europe 2017.

To identify cost-effective measures that can be taken by cities, it is important to not only look at the health effects of the individual pollutants, but also to the type of sources and geographical origin of the pollutants. PM_{2.5} is causing more premature deaths than NO₂. Local contribution to PM_{2.5} concentrations in cities ranges in Europe from less than 20% to more than 50%. NO₂ concentrations are in general caused by local emissions and thus easier to control by local authorities.

Development of local air quality policies should preferably start from locally known sources of air pollution, which also offer possibilities to identify measures that can be addressed locally. Such a source-based approach will also give a quick insight in the options that profit from co-benefits with other policy areas, such as climate/energy, noise, health and traffic/urban planning. Two key measures are reducing local coal and biomass burning to improve air quality and reduce greenhouse gases, and reducing congestion to improve mobility, improve air quality and reduce noise.

Another important aspect to take into consideration when developing a policy to improve air quality is to what extent people are actually exposed to air pollution. As people in general do not work at the same place as where they live, policies based only on residential information might not lead to the desired health improvement. Exposure-based policies will however need good coordination between air quality and urban planning policies.

Although in general an important amount of air pollution in cities originates from regional, national or even international sources, it is crucial to realize that activities in cities also create air pollution that will influence regional and national air quality. Thus, local air pollution policies should not only focus on exposure in hot spot areas in the cities, but also contribute to reducing background air pollution levels.

Existing tools for city support on their air quality situation:

- The Joint Research Centre (JRC) published in 2017 the *Urban PM_{2.5} atlas, Air quality in European cities*. In this Atlas, both spatial contributions and sectorial contributions to PM_{2.5} concentrations are quantified for 150 European urban areas, based on the SHERPA tool. (<https://ec.europa.eu/jrc/en/publication/euro-scientific-and-technical-research-reports/urban-pm25-atlas-air-quality-european-cities>) (EU-scale);
- A number of countries and cities developed their own air quality assessment tools based on monitoring networks and models. Guidelines to develop and evaluate such models are discussed in the FAIRMODE initiative (<http://fairmode.jrc.ec.europa.eu/>) led by the JRC to support use of modelling in the implementation of the EU directives.

3.3 How to improve air quality at local level

A series of measures to improve air quality in cities already exist, but there is not one solution that fits all. What can be done in a city depends as said on the sources, but also resources of the city. Possibilities also depend on whether there is willingness at the political level to not only reduce emission via technological improvements but also by decreasing activity rates or implementing structural and societal changes. In order to be successful, it is crucial that there is public awareness about the need to take measures as well as acceptance of the measures by society. Assessment of actual health effects also requires consideration of actual exposure, using exposure indicators next to assessment of air quality limit values.

Even though there are differences between cities, it is possible to list best practices. It is then up to the authorities to assess the actual situation to choose for the measures that fits best to the local situation. For NO₂, the most implemented measures are:

- Reduce traffic, promote walking and cycling (implementing new mobility plans including modal shifts)
- A shift to electric vehicles, busses and LDVs/HDVs
- Introduction of low emission zones (where efficiency depends highly on size of the zone as well as the type of vehicles that are banned), congestion charges
- Reduced speed limits
- Changed traffic circulation.

For PM_{2.5}, the measures implemented most at local (city) level are:

- A reduction or ban on the use of fossil fuels or biomass for household heating
- District heating, clean alternatives, energy efficiency
- A reduction of the use old diesel vehicles in cities.

Existing tools for city support on measures:

- The JRC hosts the *Catalogue Of Air Quality Measures*, which provides a selected number of successful (best practice) and unsuccessful Air Quality measures. (<http://fairmode.jrc.ec.europa.eu/measure-catalogue/>) (global use).

There are many proven measures to tackle air pollution, but the question is where they will be most efficient, at city level and if so in which city, or at a regional level, but then again which region? It is clear though that, in order to solve air quality problems, regional and transboundary policy coordination remains necessary. Local actions are an effective means of improving air quality but these need to be supported by regional and national (sectoral) emission reductions. A large part of PM_{2.5} concentrations in cities is secondary PM formed by reaction of NH₃ with other

pollutants, such as NO_x and SO_x. To tackle this, reduction of NH₃ emissions is required, especially in areas where other pollutants are in excess in the atmosphere. Progress can also be achieved by reduction of emissions from other sources in the region and nationwide. Understanding chemical regimes that drive the chemical processes in the atmosphere and a good knowledge of emissions are essential to promote the best control decisions.

3.4 Gaps in technologies, products and services

Much information is already available, enabling cities to improve local air quality. In order to be able to achieve concentrations close to or even below the WHO guidelines, more knowledge is necessary. National governments as well as the EU and the UNECE Air Convention have here a clear role to play, as it is impossible to do the necessary research at city level, but also to ensure a harmonised approach.

3.4.1 *Emission inventories and source apportionment*

There are currently many assumptions and uncertainties in the emission inventories. Knowledge on real world emissions is lacking for some sources, such as wood stoves and road traffic, for which emission factors have been underestimated in the past. Theoretic values in general differ from real world emissions so there is at least a correction factor needed. The latter should be scientifically justified and approved by international and national authorities to reduce uncertainties and develop comparable approaches.

Activity data also needs to be improved, for instance for domestic wood burning. Using “wood sold” will generally result in an underestimation as a lot of wood used for household purposes comes from other sources than official sellers.

More information is also needed on how to assess the impact of local emission reductions at the regional scale, for instance in the production of secondary aerosols (NO_x contribution).

3.4.2 *Health issues*

Although limit values are appropriate – and necessary – as a basis for control, a thorough assessment on the health impacts requires a broader approach. Research shows that some components of PM_{2.5} might be more toxic than others. Black carbon is most likely part of the more toxic PM_{2.5}, as are particles that contain substances such as BaP, which is linked to combustion processes. Further complicating is the fact that there is also overlap in health effects between PM_{2.5} and NO₂. It is not clear to what extent health effects are different when people are exposed to a combination or cocktail of different pollutants. In real life, exposure to such a cocktail is the most likely situation. Scientific agreement is also missing on the health effects of ultra-fine

particles. Important to note is that there is no doubt that $PM_{2.5}$ has significant negative impacts on health and should be kept as a representative tracer of such effects.

Against this background, additional research on health impact as well a review of scientific knowledge is recommended on the quantification of the effects. To support the development of effective and state of the art policies on air quality, a quick update of the WHO air quality guidelines is necessary. The current version stems from 2005 and there is sufficient evidence that a tightening of the values would be justified.

3.4.3 Green infrastructure

It is known that trees can help extracting air pollution from the air, but trees can also create street canyons which will lead to an accumulation of pollutants below the canopy. It would be recommendable to invest in a thorough study of the actual effects of green in cities and how it can be used in the most efficient way.

3.4.4 Communication

In order to ensure effective implementation of air quality policies, proper information the public is a must. A first step would be to inform, regional and national authorities, as there appears to be a big difference in actual knowledge from the government side. It is important to find communication strategies that will reach as many stakeholders as possible. In order to guarantee reliable and harmonized information, there is an important role for international organisations such as the EU, UNECE, WHO and UNEP.

Special attention is needed for sensitive groups such as elderly and children if we want to involve citizens. Citizen science should be promoted and used to raise awareness.

The use of low cost sensors for air quality plays a particular role in this. It is important to stress though that the quality of the data from those low cost sensors is in general far from sufficient to be used for drawing conclusion on the actual air quality situation and form basis for control measures.

Communication to authorities should also include information on potential measures and methodologies to develop air quality plans, including information on benefits, trade-offs, cost-effectiveness and potential co-benefits with other policies. This links to the need for harmonization of practices for local measures, such as retrofit approaches and low emission zones. It is recommended to the parties to review and share their success story in the cities.

3.4.5 Governance

Tackling air pollution is a complex challenge that requires concerted action across societal actors and economic sectors. To find the best solutions it is necessary to bring together economic sectors like transport, energy, agriculture and industry, all levels of governance at the global, European, national, regional, and city level, and policy areas such as environment, climate and energy, mobility, agriculture, and fiscal policy, while

always keeping citizens at the heart of these issues. It is not only a problem of scale but also of balance between sectors and other policies.

Regarding potential action in cities it is necessary to assess what exactly is under control of the cities and to keep in mind that it can change from a country to another and from a city to another. Therefore local actions need to be city specific. Given the limited capacity of cities, especially the smallest ones that lack the capacity to develop complex studies, support on how to develop cost-benefits analyses would enable cities to do more. Supporting local policies with national and international ones is essential. It is crucial not only to focus on measures in affluent countries but also measures that can be implemented in low(er) incomes countries.

3.5 The role of the UNECE Air-Convention

Even if the Convention has as its main objective to consider transboundary air pollution, it has become increasingly evident that its strategies need to take into account the air quality in urban areas. One of the Conventions' strengths is the vast and committed scientific community supporting policy-making. This should remain to be at the core of the Convention and should also be the core when it comes to a focus on cities. As discussed above, air quality in cities is very much dependent on air pollution originating from regional and (inter)national sources, but cities also contribute highly to air pollution outside the cities. In this light, the scientific bodies under the Convention could focus also on the city scale and assess the contribution of long range transport to air pollution in cities.

This should however not be understood as a recommendation to provide support from the Convention to cities on an individual basis, but to provide cities with the tools that will enable them to take well-informed and justified decision on the most cost-beneficial approach to tackle air pollution. The scientific community can generate knowledge and methodologies to be used by local authorities, but also regional and national authorities to support their cities. Linkages between both scales should be considered in the tools developed and promoted by the scientific community. Next to this the Convention should also raise awareness (together with cities and countries), share knowledge and methodologies and ensure harmonization.

3.6 Conclusions

3.6.1 Measures and inventories

There is a need to further assess the impact of local emission reduction strategies at the regional scale (e.g. production of secondary aerosols, ozone) and the impact of long range air pollution at the city scale. Scientific questions that need further consideration include aerosols formation, uncertainties in emission data and health impacts. There is a need to assess cost-efficiency of trade-offs and co-benefits of combined strategies and interactions between different pollutants and sources.

3.6.2 Health

There is a need to have updated WHO Air quality guidelines as soon as possible to support health analyses and help in cost-benefits analyses (including priorities on the most sensitive pollutants). The update of the current WHO Guidelines won't be ready before 2020, so it would be good if the WHO could come up with intermediate results that focus at least on the European region. It would be possible for the European Commission to ask for a fast update of the HRAPIE conclusions.

3.6.3 Communication

There is a need for support with information on possible measures and the effects of those measures for the local level. For this it would be recommended to assess potential partnerships with existing city initiatives, such as the EU's Urban Partnership on Air Quality and the Global Urban Air Pollution Observatory (GUAPO). It would also be worthwhile to assess to what extent it is possible to make a link with the Covenant of Mayors. The Covenant of Mayors currently only focuses on local actions on climate and energy.

3.7 Recommendations for clean air in cities:

- There is a need to further assess the impact of local emission reduction strategies at the regional scale (e.g. production of secondary aerosols, ozone), and the impact of long range transport at the city scale: improve science and communication (*UNECE Air Convention's scientific bodies and WGSR*);
 - Local authorities need to be better informed about the stakes and the actual impacts of local air pollution control strategies
 - Scientific questions are still open: aerosols formation, uncertainties in emission data, health impacts, etc.

- Supporting local policies with national and international ones is essential (EURO standards, wood stoves regulation, etc.) to increase their efficiency (*UNECE Air Convention's scientific bodies (TFMM, TFIAM) for the demonstration and to WGSR for communication*);
- If thorough embedding of urban air quality is preferred, there is a need for the Convention to account for the city scale in its mandates. This should be considered in the revision of the long term strategy of the Convention and its bodies' work plans (*Executive Body*);
- A relatively low profile solution to embed the local level is to add an expert panel (under TFIAM or WGSR?) to work on the subject: define the needs, promote the results (*Executive Body*);
- There is a need for "user-friendly" guidance documents for local level air quality assessments and abatement options. For example, review and classification (even qualitative) of measures regarding their impact (high or low) and costs independent of scale (*WGSR, EMEP SB, and WGE*);
 - This could be done through extension of existing documents to include city scale issues (e.g. emissions inventories).
- There is a need to have updated AQ guidelines as soon as possible to support health impact and cost-benefits analyses (including priorities on the most sensitive pollutants): request for intermediate results for Europe (*European Commission, WHO*);
- There is a need to assess cost-efficiency of trade-offs and co-benefits of combined strategies (air pollution and climate, energy, mobility, health, etc.) and interactions between different pollutants and sources (*TFIAM and CIAM*).
 - Communication should target "air pollutants" rather than individual substances and use health indicators
 - Focusing on sources in the air pollution control strategies may be more important than targeting pollutant.

4. Topic 2 a. Clean Air Globally – Policy Track

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4.1 Recommendations

- Continue and enhance the good collaboration already happening between organizations working on reducing air pollution. (*All, see conclusions for list of organizations*);
- Work to implement the UNEA-3 resolution “Preventing and reducing air pollution to improve global air quality”. (*UN Environment in cooperation with countries and/or regional networks such as CLRTAP*);
- Establish a dialogue on a broader geographic scope in addressing air pollution, taking a step-wise approach at the outset, with an initial focus on increasing regional cooperative efforts. (*LRTAP/EB Bureau, UN Environment*):
 - Follow up on LRTAP’s planned information/expertise sharing with UN Environment, as well as its offer to help in the design and operation of the platform for cooperation and sharing information. (*LRTAP, UN Environment, countries and other organizations*);
 - Establish the platform called for by the UNEA-3 resolution, helping to organize the worldwide exchange of knowledge and techniques for solving similar air pollution problems at different places. (*UN Environment in cooperation with countries and/or regional networks such as CLRTAP*);
 - Ensure that the platform is both a repository for information, resources and tools as well as a framework for facilitating cooperation, and that it function in a straight-forward way that adds value to the existing stock of information already available online and provides a mechanism for support and technical advice across regions and organizations. (*UN Environment*);

- As a first step, to ensure broad participation, invite countries from all UN regions and organizations to an informal session at the EB meeting in December 2018 in Geneva, subject to appropriate funding. (*LRTAP/EB Bureau, UN Environment, countries and/or regional networks*);
- Consider creating and co-chairing a taskforce for the design and operation of the platform, and decide on appropriate representation on the taskforce and its tasks. (*UN Environment and CLRTAP*);
- Include lessons learned for abatement measures in the platform, including policies and specific measures such as open burning of crop residue (e.g., rice straw), forest clearance, dust, brush fires and solid waste burning, and potentially link to the clearinghouse on abatement techniques, developed by CLRTAP's Task Force on Techno-Economic Issues. (*UN Environment with support from other organizations*).
- Implement technical infrastructure for monitoring, capacity-building for emissions inventories and modelling, and health and ecosystems impact assessments in developing countries and work to provide and communicate the information to policy-makers. (*International capacity-building projects and partnerships*);
- Ensure equality in the distribution of resources and technical support to countries and ensure project ownership when capacity-building projects are implemented to maintain long-term success. (*International capacity-building projects and partnerships*);
- Initiate an overarching coalition, dialogue or mechanism to spur regional action and cooperation worldwide, work through existing regional agreements if available, or facilitate the establishment of such regional coordination mechanisms, and raise awareness through proactive communication. (*UN Environment with support from other organizations including CLRTAP as one possible model*);
- Work to ensure an integrated approach to air pollution policy development is pursued where possible, considering that air pollution is a central link for interactions between climate change, nitrogen, ecosystems and human health. (*All*);
- Continue work related to international law aspects of protection of the atmosphere. (*International Law Commission*).

In recent years, there has been a significant increase in global interest in improving air quality. This is due in part to a number of landmark studies that have highlighted the tremendous and growing health and environmental impacts of air pollution. For example, the Global Burden of Disease Project estimated that exposure to outdoor air pollution was responsible for 4.5 million premature deaths in 2015.

Advancing the policy discussion related to addressing global air pollution and enhancing cooperation between the various organizations with common interests is an important step to achieve the needed emissions reductions to improve health and

the environment. There are synergies between the Convention on Long-range Transboundary Air Pollution (Air Convention or CLRTAP) and the Minamata and Stockholm Conventions, the Arctic Council, the Climate and Clean Air Coalition, and UNEA resolutions that are related to reducing global air pollution, focusing in particular on best practices in reducing air pollution, specific air quality management tools, air quality data and harmonizing common data systems and information.

4.2 Joint Session Conclusions

Although in some regions (e.g. west-coast of Europe) ozone concentrations are currently stagnating or slightly declining, in other regions (e.g. North-west USA, Asia) they are still increasing due to hemispheric transport. Model analyses suggest that the impacts on health, ecosystems, and climate of ozone produced by extra-regional emissions remain of large concern, and merit targeted assessments for policy makers. It is likely that tropospheric ozone concentrations will increase again after 2020–2030, with a particularly important role for methane emissions.

Ground-level ozone, along with methane and black carbon, affect both air quality and climate. Ozone affects climate in two ways both by being a greenhouse gas and by inhibiting ecosystem uptake of carbon dioxide. Besides being a precursor of ozone, methane is the second most important greenhouse gas. Though the climate impacts of black carbon are less certain, actions to reduce all of these pollutants can provide benefits for addressing both climate change and air pollution.

Ground-level ozone is increasingly recognized as a hemispheric, or even global pollutant; in addition to continued domestic efforts to reduce ozone precursors such as NO_x, VOCs and CO, global reductions in methane are increasingly needed to address rising global background ozone levels.

Integrated, multi-pollutant environmental policies are needed to effectively address health, ecosystem and climate effects. In addition, integration of different decision-making levels (international, regional, national and local policies for microscale, urban, regional and transboundary sources) are also needed to evaluate win-win and win-lose policies.

Behavioral measures are also important for implementing integrated environmental policies. Awareness and public citizen involvement is now very important to adequately address pollution from sources (e.g., household, energy, transportation choices including shipping, agriculture) other than industrial sources.

4.3 Policy Track Conclusions

Global cooperation and collaboration is essential to effectively address air pollution and the time is ripe for improving the linkages between existing organizations and initiatives.

Collaboration already happening between organizations working on reducing air pollution should continue and be enhanced. Existing organizations (UN Environment, WMO, WHO, UNECE, Arctic Council, CCAC, IEA, IUAPPA, European Commission, IIASA, GMI and others) have a wealth of technical and scientific expertise and information that can be leveraged as we move forward both regionally and globally.

The UNEA-3 resolution, in particular, paragraph 7(d) on a platform for cooperation, can be a basis to work to enhance both global and regional cooperation, strengthen existing initiatives and provide a menu of services for countries that need to address all aspects of air quality management given available resources.

Efforts are needed to take into account the local political situation of each country.

Concrete cooperation that includes a place for all countries and involves sharing experiences and data will result in progress globally.

4.4 Annex: Background Documents

Report from Saltsjöbaden 5 (2013):

<http://saltsjobaden6.ivl.se/download/18.449b1e1115c7dca013ad1ad/1498486141045/Saltsjobaden%20V.pdf>

Scientific Assessment Report: <https://www.unece.org/index.php?id=42861> and the North

American Assessment Report: <https://www.unece.org/index.php?id=42947>

Policy Response to the Scientific Assessment Report:

https://www.unece.org/fileadmin/DAM/env/documents/2015/AIR/WGSR/_E__ece_eb_air_wg_5_2017_3.pdf

UN International Law Commission (2013) "Protection of the atmosphere":

http://legal.un.org/ilc/summaries/8_8.shtml

WHO resolution: http://apps.who.int/gb/ebwha/pdf_files/WHA68/A68_ACONF2Rev1-en.pdf

UNEA-1 air quality resolution 1/7 (2014) (page 23).

UNEA-3 Preventing and reducing air pollution to improve air quality globally resolution:

<https://papersmart.unon.org/resolution/index> (draft/unedited).

5. Topic 2 b. Clean Air Globally – Science

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5.1 Background

Ambient air pollution is associated with an estimated 4.1 million premature deaths year. It is also a threat to ecosystems and biodiversity as well an important contributor to climate change. One of the major sources is combustion and emissions are thus very closely related to CO₂ emissions. Air pollution is not only derived from emissions from energy production and transport, but also a multitude of other activities including agriculture and industry. It includes particles, gases and toxic compounds such as POPs and mercury, not only degrading human health, but also seriously affecting the global environment and its ecosystems. It is a global problem, also strongly affecting the most developed countries. It is estimated that air pollution causes more than 350 thousand premature deaths in the EU.

The increasing awareness and the transboundary scale of air pollution call for a coordinated action on a global scale. Even though there are large differences in societies and economies, there are several common factors such as the close connection to combustion for energy production, transport, heating and cooking. Another common factor is that public awareness of the health risks often is lacking.

The discussions in the science track of the Clean Air Globally session identified three main areas where more science is needed to better support the policy process aimed at a better air quality. *Observations* are the foundation of a good mitigation strategy and essential to monitor progress. Observations are necessary both for public awareness rising of air pollution and bringing the science forward. Funding and development agencies need to include investment in observational capacity in their

projects, where technical guidance can be provided by WMO. Currently an overall investment strategy is missing and organizations such as the World Bank, should team up with UNEP, WMO, WHO to provide this strategy. Even though satellite observations give very good global coverage it has basic limitation with resolution, it needs additional assumptions to convert column amounts into surface concentrations, and can at best only provide limited information on the chemical composition of the aerosol particles. In addition large parts of the world have insufficient observations of air pollution making it difficult to estimate the effects and making links to sources, and thus to develop cost effective mitigation.

There is also a basic need to develop accurate *emission inventories and scenarios* for large parts of the world. Scenarios should be based on a likely range of future development in different countries considering the fast moving technological development and possible transformation in energy production and transport systems.

The ability to *model* the transport and deposition of air pollutants has developed very well and today's models have a high accuracy. However still the abilities to model effects as e.g. climate change impacts and to include some pollutants lacks necessary accuracy to be fully exploited in the development of policy strategies for mitigation. Further the large integrative models e.g. Earth System models, and integrated models that connect biophysical models to economical or energy models still needs developments.

The scientific support for decision-making needs integration of the three above mentioned areas into fact-based quantitative knowledge, including visualization of the outcomes of various scenarios and control strategies. Large-scale projects and initiatives, such as the EU Copernicus, may help lifting air pollution policies to a global scale.

5.2 Recommendations

5.2.1 Investments in Observations

(To WMO, World Bank, EU with engagement of UNEP, UNECE Air Convention, AMAP, other experts and national/regional bodies).

Expansion and Improvement of Observation Infrastructure:

- Should be made in a globally coordinated fashion based on equality through the World Bank and other development agencies with technical guidance from WMO
- Should be shared in a way similar to other major research infrastructure investments (e.g., major physics experimental facilities)
- Should be multipollutant; include an appropriate mix of supersites and distributed sites, active and passive sampling, urban/rural/remote sites, new sensor technology; and be coordinated with new satellite observation capabilities, as the Global Earth Observation Systems and related activities where appropriate.

Investments need to be accompanied by Engagement:

- Design of infrastructure should be appropriate for local needs and circumstances
- Value of monitoring information needs to be demonstrated to local people and decision makers.

5.2.2 *Development of Emission Inventories & Scenarios*

(To UNEP through emission scientists (GEIA, UNECE Air Convention), scenario developers (IPCC, UNECE Air Convention, AMAP, CCAC, etc.).

Improve Consistency and Alignment of Emissions Inventories for Multiple Pollutants for Modeling and Assessment:

- Increase Transparency of Drivers/Methods
- Assure education and quality control (TFEIP, ICOS, ACTRIS)
- Improve current emission data repositories information on availability, quality and education to achieve high quality multiple pollutant inventories with a regional and global coverage.

Evaluate Emissions through Inverse Modeling:

- Particularly taking advantage of developed observation capabilities
- Methods Intercomparisons will be needed e.g. as through the IGAC/GEIA AMIGO.

Coordinate the Development of Future Emissions Scenarios:

- Make use of integration of Air Pollutants, GHGs, Hg, POPs
- Identify packages of measures of interest to different policy forums or stakeholder groups for wider community to analyze, e.g. coordinate with climate scenarios and make use of Shared Socioeconomic Pathway (SSP's) for reach relevant Sustainable Development Goals (SDG's).

5.2.3 *Necessary Model Development & Application*

(To European Commission with support of CLRTAP, AMAP, other Conventions).

Coordinate Models at Different Scales/Processes/Complexity:

- Global to Regional to Local scale linkages, downscaling techniques
- Seamless prediction from AQ to Climate
- Evaluate Fitness for Purpose.

Continue Move Towards Earth System Modeling:

- Multi-Pollutant, Multi-Compartment
- Decrease uncertainty in AQ – Climate projections.

Further Develop Attribution Methods and Tools:

- Source/Process/Policy Attribution
- A priori Evaluation of Costs and Benefits of Measures
- A posteriori Evaluation of Outcomes and Effectiveness.

6. Topic 3. Eastern region of the Air Convention – on the way to clean air

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6.1 Introduction

While emissions of key air pollutants have been reduced considerably over the past few decades as a result of integrated air pollution management strategies developed under the UNECE Air Convention, progress has been uneven across the UNECE region. In particular in Eastern and South-Eastern Europe, the Caucasus and Central Asia, due to the increase in energy production, industry growth and urban development, further efforts are needed. To assist countries in the sub-region to improve their air quality management, UNECE has organized a number of activities in the framework of the UNECE Air Convention assistance programme. And partly as response to the call of earlier Saltsjöbaden workshops, several UNECE countries have assisted in bilateral collaborations between experts as well as capacity building.

To avoid damage to the environment, public health and the economy, adopting targets to reduce emissions and introducing measures to enforce them is important. Providing a framework to facilitate these measures, the Convention assists countries in formulating policy responses to the air pollution challenge. Ensuring the implementation and ratification of the Convention and its protocols, most notably the

three latest, amended protocols to the Convention — namely: the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone and its 2012 amended version (Gothenburg Protocol); the 1998 Protocol on Heavy Metals and its 2012 amended version; and the 1998 Protocol on Persistent Organic Pollutants (POPs) and its 2009 amended version – within this region is imperative for the effectiveness of the Convention.

The idea for this session was to have an open discussion about the barriers to ratification and implementation of the Convention and opportunities and benefits in countries in Eastern Europe, the Caucasus and Central Asia to work on reducing air pollution. The first part of the session focused on identifying the barriers. The second part of the session zoomed in on options to overcome these barriers and benefits of improving air quality in the sub-region. The idea was to get a clear picture of the strengths, the weaknesses, and the opportunities for countries in the sub-region to work on improving air quality and to implement the Convention.

A questionnaire was sent out to countries in the sub-region in preparation of the session. The analysis of this questionnaire helped in identifying the main barriers that pose challenges in the implementation of the Convention. It formed the basis for the discussions at this session.

The session was held under the Chatham House rule. This rule allows people to speak as individuals and to express views that may not be those of their organizations or countries and therefore encourages free discussion. When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed. *The key objective of the session was to identify main barriers towards ratification and ways to overcome them.*

To lead the discussion, the following presentations were given:

- Results of the analysis of the questionnaire regarding barriers (Ketevan Kordzakhia)
- Main barriers towards ratification (all Eastern Region representatives)
- Results of the analysis of the questionnaire regarding opportunities (Ketevan Kordzakhia)
- Examples of management of air pollution in federations (Katja Kraus, Paul Almodovar, Alexander Romanov)
- Strategies to encourage the introduction and implementation of ELVs based on BATs in the sub-region (Jean-Guy Bartaire)
- EECCA Countries: CLRTAP Reporting and data compilation by CEIP (Melanie Tista)
- Increasing awareness and improving understanding of the costs and benefits (Stefan Åström)
- Possible ways to overcome barriers (all Eastern Region representatives)

All presentations are available at the Saltsjöbaden VI web page, <http://saltsjobaden6.ivl.se/>

6.2 Key conclusions and recommendations

6.2.1 *The session concludes that*

The national initiatives and actions have intensified in many parts of the region during the last decade. There are several examples of national initiatives and ongoing efforts to develop and implement legislation (including ELV/BAT standards), and improve emission inventories and air quality assessments.

The support from the international community has helped and is helping national capacity building, enhancing the possibility of ratification of the UNECE Air Convention protocols. Countries in the Eastern Region of the Convention are moving at different speeds, and have different needs; further assistance, tailored to specific needs, would improve the possibility for countries to move forward.

6.2.2 *The session recommends that (proposed lead body/stakeholder within brackets)*

Air pollution awareness needs to be further increased. Real time air quality information and communication tools can deliver relevant and simple messages concerning public health and quality of local environment directly affecting people's quality of life. (*National agencies*).

Further efforts are needed to improve emission inventories, including urban and background air quality monitoring. (*UNECE Air Convention, national agencies*).

BAT-based regulation should be further developed and promoted for all countries in the region. (*UNECE Air Convention, Parties of the Eastern Region*).

The international community should continue to promote action on air pollution in the region through the agenda of international fora at the highest political level. (*International bodies & collaborating governments outside the Eastern Region*).

The international community should continue and strengthen support on capacity building and training activities. Guidance are particularly needed on specific requirements in the annexes to UNECE Air Convention protocols, assistance in developing gridded emission data and emission projections, as well as in decision support analysis (Cost-Benefit Analysis [CBA] and Health Impact Assessments [HIA]). (*International bodies & non-Eastern Region governments*).

Stakeholders and their rationales should be identified, and the results from air quality analysis should be communicated to them in a tailored way. (*National agencies, industry, institutes, academia, NGOs*).

The calls for revising the provisions – which limit access to flexibility mechanisms – in the latest protocols, and the calls for possibilities for step-wise ratification of the protocols, need to be considered. (*UNECE Air Convention & national agencies*).

6.3 Condensed notes from the session

6.3.1 *Barriers for ratification*

There are many similarities in the identified barriers for ratification to the barriers previously identified in the 2009 Saltsjöbaden IV report: Long-term uncertainty in financing, lack of capacity and expertise, lack in awareness. The long-term uncertainty in financing is in some cases driven by institutional instability, sometimes due to lack of priorities. The lack of expertise exists on many levels of air pollution research and policy. Some regions face challenges financing labs, other face challenges financing modern monitoring technique. Still others face challenges in finding financing opportunities for investment in clean technologies. The lack of awareness exists in many levels of society. Politicians, industrial stake holders, and the general public, are all – to varying extent – not sufficiently aware of the benefits of improved air quality. There is in some cases a rather strong resistance from industrial stakeholders, and counterarguments (or alternative perspectives) are needed. But this resistance might also be driven by the multitude of different legislations that needs to be considered for corporations.

6.3.2 *Possible solutions encouraging future ratifications*

There are a number of existing (and potential) drivers that could be utilized to strengthen motivation for ratification of the protocols:

- The European Energy community
- The EU transition agreements
- The China Belt and Road initiative
- International industrial trade agreements
- International/National competitiveness (ongoing modernization of industrial facilities)
- Action-oriented initiatives, such as the Batumi Action on Cleaner Air (BACA) and the Batumi Initiative on Green Economy (BIG-E)
- Co-benefits between climate and air pollution under the Paris Agreement Nationally Determined Contributions (NDC) and the UNECE Air Convention
- International financing institutions such as the European Investment Bank.

There are also a number of opportunities.

In contrast to 2009 (Saltsjöbaden IV), there are now ample examples of ongoing efforts in the Eastern region:

- Academic and research institutions in the region are stable;
- Real time monitoring would enable increased awareness;
- Increased knowledge on public health impacts of air pollution can help awareness;

- The communication from air quality experts to stakeholders can be tailor made and better acknowledge the different priorities of the different stakeholders;
- The industry's competitiveness can (at least in some cases) be improved through modernization, improved resource effectiveness, recycling, and reduced waste, leading to emissions reduction. In fact, already today there are examples of some industrial actors taking action, and initiatives are in some cases already in place;
- The fact that several countries in the region focus on reducing odour can potentially reduce NMVOC emissions (one of the pollutants in the Gothenburg protocol);
- The past and existing international collaboration has been appreciated and successful, and potential continued and enhanced international collaboration is expected to further improve capacity building etc.

There are also a number of international conventions that interact with the UNECE Air Convention protocols. It should therefore be possible to explore co-benefits between: The Stockholm Convention and the UNECE Air Convention's POP protocol; The Minamata Convention and the UNECE Air Convention's HM protocol; as well as the PRTR Protocol and the Gothenburg protocol.

With respect to more specific opportunities, many countries in the Eastern region already have implemented "polluter-pays" legislation. This legislation could, if strengthened, promote cost effective emission reduction. Encouraging use of cleaner cars, which are already on the market in the Eastern region countries, could also have a large impact on air quality. Finally, increased networking and exchange between countries and experts within the Eastern region is yet an opportunity.

6.3.3 *Summary of the session*

As a summary, the honest and open discussion during the session *Eastern region of the Air Convention – on the way to clean air* clarified some key barriers and opportunities for ratification of the latest Air Convention protocols. Some of the barriers should be easy to solve, such as problems in interpretation of technical annexes. Other barriers would require a more intertwined chain of events to be removed, such as long term uncertainty in financing. There are however many opportunities that could help motivate further action to clean the air and ratification of protocols, where awareness raising, increased focus on industrial competitiveness and increased international collaboration are overarching themes.

7. Topic 4 – Clean Air – Ecosystem and Climate

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7.1 Background

While Sulphur deposition has been very successfully controlled, reductions in nitrogen deposition have been smaller, and excess nitrogen loading remains a major threat to biodiversity and ecosystem functioning, especially in regions where exceedance is driven by ammonia emissions. Biodiversity concerns have been increasing the latest decades, and national and international policies (like the CBD and the EU Nature Directives) put in place to counteract the decline. As a consequence, an increasing part of natural ecosystems have been protected and more adequate management or nature restauration measures put in place for many areas. The relative importance of nitrogen as a pressure on biodiversity is therefore increasing.

The session was focused on ecosystem effects and further developments of monitoring and research to support effect based policies to control air pollution effects on ecosystems and biodiversity. In addition, links to ozone effects, forest productivity and carbon sequestration were discussed in the session.

Due to time limitations other impacts of air pollution were not discussed at the workshop, but it is recognized that (e.g.) both acidification and N deposition is still a problem in some aquatic environments, and that pollution with mercury and POP's will require attention in the future.

Each topic was presented by an invited speaker as introduction to the debate:

- "Ozone impacts in Mediterranean areas" by Dr. Rocío Alonso, Research Center for Energy, Environment and Technology- CIEMAT (Spain)
- "Links to forest production and forestry/climate interests" by Professor Per Gundersen, University of Copenhagen (Denmark)
- "Biodiversity effects and the link to the CBD and EU Directives" by Dr. Jesper Bak, University of Aarhus (Denmark)

- “The future of effect monitoring, including reporting under EU NEC Directive” by Dr. Anke Lükewille, European Environment Agency.

There were 30 participants (annex 1), where several contributed short presentations, and on the basis of the talks given and the ensuing discussions, the following main conclusions and recommendations were agreed:

7.2 Ozone Effects

AOT₄₀ and ozone dose are metrics that provide an indication of ozone risk to vegetation. Ozone dose flux (Phytotoxic O₃ dose) provides a more biologically meaningful metric for the assessment of ozone risk as it takes into account the varying effect of climate conditions, soil moisture and phenology on the amount of ozone absorbed by vegetation. Ozone impacts vary depending not only on where atmospheric ozone concentrations are high but also where ozone uptake is high (and where the vegetation in question grows). Currently it is possible to generate flux based ozone risk maps for different crops, including wheat, forests and different types of natural vegetation. It is possible to assess and map ozone risk for biodiversity but only for some grasslands based on flower/seed output as proxy. More information on interactions between ozone and nitrogen/climate change/soil moisture are required to improve risk assessment as well as on ecological dynamic processes.

7.2.1 Recommendations

- To perform ozone risk assessment for different biogeographical regions and vegetation types based on flux uptake together with AOT₄₀ (ICP Veg, ICP Forest, EMEP);
- To explore interactions between ozone and nitrogen/climate change/competition and ecological dynamics, and to better evaluate risks and impact due to ozone taking into account flux exposure, nitrogen and climate (ICPs, EMEP);
- To extend ozone target values and long term values to different types of vegetation (crops, forest and seminatural vegetation) in legislation;
- To use ozone flux modelling for ozone risk assessment on crop production, taking into account not only crop quantity but also crop quality (ICP-Veg, TFIAM);
- To improve the modelling of the influences of soil moisture on ozone fluxes and physiology and to use the flux-based approach for climate change scenarios since it considers changes in the meteorological parameters and the profiles of ozone exposure (ICP-Veg, ICP Forest, EMEP);
- To support epidemiological studies on ozone impacts on forest trees and semi-natural vegetation (ICP Veg, ICP Forest);

- To improve air pollution monitoring networks with better dry deposition data and inclusion of mountain areas not present in current networks (EMEP, Air Quality networks);
- Explore other possible response parameters more related to ecosystem services (Research).

7.3 Links to forest production and forestry/climate interests

Atmospheric N pollution impacts forest production and thus forest carbon (C) sinks and processes. Furthermore, there is an increasing interest to use forest biomass for bioenergy production, as a measure to mitigate climate change. The increasing use of bioenergy from forest is debated since there are still some uncertainties regarding the actual climate benefits, as well as documented negative impacts on biodiversity, nutrient balances and increased acidification of forest soils. In contrast to some earlier published very high C sequestration rates with extra N, there is now growing evidence that the rate for aboveground biomass is around 10–20 kg C per kg N added, depending on other limiting nutrients (P, base cations, etc.). The availability of water would affect the relationships in arid areas, which might have increasing importance in the future because of climate change. Increased C sequestration caused by N addition will in many cases not be sustained because growth can be reduced when the areas become nitrogen saturated. There is evidence that the effect on C sequestration ceases at deposition above 15 kg N per ha per yr.

For unmanaged forest, which is important for biodiversity, there is in contrast an increased risk of N saturation because of the low N removal, and critical loads for unmanaged forests should thus be lower than for managed forests.

7.3.1 Recommendations

- Need to consider biomass production vs. nature protection efforts (e.g. deadwood needed for maintaining biodiversity). Ash recycling needed for high production in sensitive areas (countries);
- Important to harmonize air quality and climate policies to avoid negative effects of intensified forestry for biomass production on ecosystems (UNECE Air Convention, European Commission, countries);
- Decreasing acid deposition has decreased soil acidification and it should be ensured that intensified forestry does not reverse this trend (UNECE Air Convention, European Commission, countries);
- Need to better consider land-use management in CL calculations for N using mass-balance CL for N (National Focal Points);
- Better data needed particularly on N impacts on soil C sequestration in forested ecosystems (Research community);

- Better data needed on base cation deposition and mineral weathering rates (Research community);
- Data needed for other ecosystems than forests (Research community).

7.4 Biodiversity effects and the link to the CBD and EU Directives

Critical loads for N are still exceeded over large regions in Europe, and impacts on ecosystems have been documented in numerous publications. These impacts are important both for the UNECE Air Convention, and for e.g. the CBD and the EU (e.g. Habitats Directive). Air pollution effects remain in widespread areas of Europe one of the most important threats to the conservation status for habitats and species and the protection of biodiversity. Achievement of the goals of EU and national nature policies will in many cases only be possible with – or very costly without – substantial reductions in nitrogen load. Ecosystem effects and effect-based policies will therefore also be important in the future.

7.4.1 Recommendation

- To improve the mitigation of threats to biodiversity and ecosystems, there should be a strong linkage between air pollution, nature and agriculture policies (European Commission);
- Arrange a scientific workshop to enhance/verify methodologies for assessing impacts of N on biodiversity (e.g. habitat suitability index) (WGE, ICPs);
- Continue long-term harmonized vegetation monitoring to assess ecosystem and biodiversity effects by air pollution and climate change (WGE, countries);
- Increase number of habitat types and sensitive species in N impacts assessment (WGE, ICPs, countries);
- Assess the critical level for NO₂ regarding impacts on sensitive species (e.g. lichens) (ICPs, research);
- Assess ozone critical levels for biodiversity (ICPs, research).

7.5 The future of effect monitoring, including reporting under EU NEC Directive

Emphasis on biodiversity effects will require adjustments of the monitoring and research activities to ensure sufficient coverage, both geographically, of ecosystem types, as well as parameters to monitor and model effects. The EU directive on national emissions ceilings (NECD) requires mandatory monitoring on ecosystem impacts (Annex 5). This monitoring is to a large extent expected to be based on the existing monitoring programmes of the ICPs of the UNECE Air Convention /WGE, as well as EMEP monitoring and modelling activities (particularly for ozone). Synergies with new ecosystem research infrastructures (RI) under the European RI framework (ESFRI) are also foreseen, since there could be joint funding/saving opportunities, and co-location of sites.

7.5.1 Recommendation

- Constitute a European working group for implementation of ecosystem monitoring under Article 9 (NEC Directive) in cooperation with the member states and the scientific support from the WGE. This WG should be managed by the Commission (European Commission);
- Harmonize efforts of the WGE and the Commission regarding impact assessment, as well as between the different directives (WGE, European Commission);
- Share the monitoring data reported to EEA also to ICPs and enhance ICP participation (countries);
- The WGE shall develop and present a common ecosystem monitoring platform to evaluate effects of air pollution in a coordinated manner (WGE);
- Establish cooperation with ESFRI Research Infrastructure (e.g. to enhance monitoring infrastructures and get experimental data) (WGE, ICPs, countries).

8. Topic 5 a. Sectors and Solutions – Shipping

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Near-term (up to 2030) priorities and recommendations for ship air pollution reductions:

- SECA/NECA in all European sea areas and in the Arctic (countries; EU; IMO; Arctic Council)
- Ensure monitoring/compliance/enforcement of global S-standards and SECA/NECA-standards. Evaluate the introduction of mandatory CEMS. (Countries; EU; IMO)
- NOx-reduction schemes for existing ships, for example by economic instruments such as a Levy & Fund system – use example from Norway (EU, HELCOM/OSPARCOM/REMPEC, countries)
- Mandatory speed reduction schemes (IMO; EU; national/local)
- PM/BC emission standard (IMO; EU)
- Economic instruments for PM/BC-reduction measures (EU; countries; ports)
- Strengthen energy efficiency requirements (EEDI) (IMO)
- Ensure availability in ports of cleaner/alternative fuels (and fuel quality) as well as of on-shore power supply (e.g. bigger ports in California have minimum requirements to provide on-shore power).

8.1 Background

International shipping contributes significantly to air pollution damage to health and the environment. While emissions from most land-based emission sources have come down in EU and North America, and are expected to continue to decline, those from shipping have been steadily increasing. The global ship-fuel sulphur limit of 0.5% from 2020 should result in significant reductions in ship SO₂ emissions.

Regionally, the establishment of Sulphur Emission Control Areas (SECA) in the Baltic Sea and the North Sea also reduces SO₂ emissions.

However, emissions of NO_x from international shipping in sea areas around Europe are estimated to at best stabilise or even increase over the next few decades. The recent establishment of the Baltic Sea and the North Sea as NO_x Emission Control Areas (NECA) will help to reduce NO_x emissions, but as the stricter emission standards apply only to newly built ships and while they are within the NECAs, emissions will only slowly decline over several decades.

Even if there is an increasing concern over shipping emissions as a significant contributor to health and environmental impacts, and there are cost-effective techniques to reduce emissions, there are obstacles on the policy side due to difficulties in reaching agreements within the main international regulatory body, the International Maritime Organisation (IMO).

For shipping, the international dimension of the sector is an important factor, which means that national or EU actions may have wider impacts. Air pollution from ships is not only a concern in Europe, but also in other parts of the world, such as North America, China and South-East Asia. It should be noted that the ocean-going ship fleet is rather homogenous, while fleets in regional sea areas are more segmented. This means that more targeted instruments for specific ship types could be applied at regional levels. Furthermore, as ships have a life-length of 25–30 years, regulations – or other types of emission abatement measures – may need to differentiate between new and existing ships.

8.2 Conclusions

Shipping is contributing to air pollution on local (e.g. in port areas), regional, and global scales and also has an impact on climate. All scales are important and impacts should be considered together in order to set the right priorities for abatement.

Historic developments in IMO have been slow, and measures agreed so far are not sufficient to resolve the problem. Therefore, action at other levels (for example by the EU, countries, or ports) is needed to push – but not replace – action in the IMO.

As agreements on and introduction of new or stricter legally binding emission requirements usually take time to develop and implement, economic instruments can be used to promote faster emission reductions. Such instruments can also be used as a complement to binding standards, to promote additional emission reductions beyond the minimum requirements. The role of financing institutions for making investments in cleaner ships possible is important, especially regarding retrofit/reconstruction of existing ships.

A wide variety of technical emission abatement options are readily available (see list of examples in the annex below). As different technologies may be suitable for different types of ships, it may be effective to combine different technical options.

8.3 Annex: Discussion on measures and instruments to reduce ship emissions

8.3.1 *Examples of readily available technical options*

Cleaner energy sources

Distillate low-sulphur fuel oil (usually referred to as marine gas oil, MGO); low-sulphur blended fuels; liquefied natural gas (LNG); methanol; biofuels; battery-electric.

Exhaust gas cleaning/engine modifications

Scrubbers (closed-loop; open-loop; hybrids); selective catalytic reduction (SCR) (note that SCR may be difficult to combine with scrubbers); low-NO_x-engines (for example using exhaust gas recirculation [EGR]); diesel particle filters (DPF).

Alternatives

Energy efficiency; wind-assistance; solar-assistance; on-shore power (OSP).

8.3.2 *Stimulation of non-technical measures*

Examples include among others reduced speed, improved efficiency, environmental ship indices, and economic instruments. Some specific examples:

1. Speed reduction scheme with economic incentives (used in California)
2. Norwegian NO_x Tax & Fund
3. Ports using ship indices, such as Environmental Ship Index (ESI) or Clean Shipping Index (CSI)
4. Tax reduction on electricity used for on-shore power supply
5. Ports applying environmentally differentiated port dues
6. Public information/visibility on environmental impacts of cruise ships.

9. Topic 5 b. Sectors and Solutions – Domestic solid-fuel heating

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Short to long term priorities and recommendations for domestic solid fuel air pollution reductions:

- Information and awareness raising campaigns addressing the public, politicians, municipalities etc. to foster behavioural changes and facilitate introduction of regulations (short timeframe; local and national governments, NGOs);
- Accelerating replacement of old stoves/boilers with lower/zero emission heating system (e.g. new stoves/boilers, district heating, solar, heat pumps) alongside insulation (medium to long-term; local and national governments);
- Introduce new ambitious legislation including emissions standards, mandatory regular inspection, instructions e.g. by chimney sweepers for proper operation etc. (medium timeframe; local and national governments, international bodies);
- Economic incentives (e.g. taxation of residential burning, public procurement) to reflect the polluter pays principle (medium timeframe; local, national government);
- Improvement of data basis to allow introducing cost effective measures and regulations (number, type, age, location of appliances, emission factors,...) (short timeframe/continuous work; national governments, international bodies).

Recommendations for UNECE Air Convention:

- Develop a guidance document for proper operation of solid fuel stoves and boilers, replacement programs for old stoves and boilers, and further measures to reduce PM/BC emissions, especially economic instruments (UNECE Air Convention, TFTEI);
- Review and revise Table 12 of Annex X of the revised Gothenburg Protocol concerning emission limit values for new stoves by addressing testing protocols for BC and PM_{2.5}, and by reviewing and revising emission limit values, taking into account the development of BAT since 2012 (UNECE Air Convention, TFTEI);
- Guidance on undertaking voluntary performance labelling of new stoves using more stringent emission limit values under real life conditions for PM_{2.5} and BC (UNECE Air Convention, TFTEI).

9.1 Background

The use of solid fuels for domestic heating and hot water in small combustion sources can cause high emissions of pollutants, such as fine particulate matter (PM₁₀, PM_{2.5}), Black Carbon (BC), SO₂, NO_x, VOC and benzo(a)pyrene, with negative impacts on human health and the environment.

There is a long tradition of using solid fuels (coal and biomass) for heating in cold and moderate climate zones. However, in many countries, coal and wood as the main heat supply source have been gradually replaced by cleaner supplies for heat, including natural gas, district heating and electricity. Nevertheless, coal as well as wood still constitutes an important fuel for domestic heating in many areas, especially in rural regions. This is also due to social aspects in some countries whereas in some countries and especially cities stoves and fireplaces became increasingly popular for aesthetic reasons. In addition, some countries are actively promoting the use of biomass for heating as a climate policy measure to increase the share of renewable energy sources, which, however, neglect emissions of BC, an important SLCP.

Overall, in 2005 biomass combustion in the residential sector accounted for 1.9% of total primary energy use in the EU-28, and coal combustion for 0.7%. Despite this small share in total energy consumption these sources caused 46% of total primary emissions of PM_{2.5} in the EU-28 (biomass burning 36% and coal burning 10%), thereby outweighing emissions from the road transport by a factor of three. By 2030, the PRIMES 2016 REFERENCE scenario foresees for the EU-28 a 36% increase of biomass use in the household sector (inter alia due to enhanced renewable energy policies), while coal use is projected to decline by 42% (IIASA 2018)

In addition to these officially reported numbers there is an unknown amount of (illegal) waste burning in manual operated stoves, which might cause even more severe emissions of various pollutants.

Despite being such an important source for air pollution, the data quality for quantifying the emissions is weak compared to other sources such as traffic or industrial installations. This refers to almost all aspects relevant for emission calculations, i.e. the number, type and location of appliances, the types and amount of fuels and the emission factors. In addition, current taxation of fuels and heating systems do not account for their environmental impact.

Best practice examples are available throughout Europe of how to reduce the impact on air quality from domestic heating. Also, new technologies have been developed, which show considerably lower emissions compared to manually operated stoves, boilers and fireplaces. Nevertheless, these still emit much higher levels than low/zero emission sources such as district heating, geothermal energy or solar heating.

9.2 Conclusions

- Domestic solid-fuel heating is substantially contributing to air pollution on local and regional scales, and also has an impact on climate. It will remain so in future despite the overall sharp decline in energy related emissions;
- The domestic heating sector suffers from a low quality of data, which results in large uncertainties of the resulting emissions and the effectiveness of abatement measures;
- Climate policies are sometimes in contradiction to air quality problems; thus integrated strategies are required to tackle both environmental problems, taking into account the polluter pays principle;
- A wide variety of emission abatement options, guide documents and best practice examples are readily available (see list of examples in the annex below).

9.3 Additional reading

Measures to address air pollution from small combustion sources
http://ec.europa.eu/environment/air/pdf/clean_air_outlook_combustion_sources_report.pdf

9.4 Annex: Discussion on measures and instruments to reduce domestic solid-fuel heating emissions

9.4.1 *Examples of readily available technical options*

- Replacement of open fireplaces and manual stoves with low/zero emission technologies after energy efficiency improvements (insulation, new windows,...)

- Ban of specific types of fuels, specific types (most polluting) of stoves in specific geographic areas and/or for during specific periods
- Mandatory regular inspection and chimney sweeping.

9.4.2 *Examples of readily available non-technical measures*

- Information campaigns for best practices in firing of existing stoves, boilers and fireplaces
- Regulations for second hand stoves/boilers and their resale
- Enforcement of (illegal) waste burning ban, illegal fuels
- Guideline for strategic use of biomass
- Support for replacing old stoves and boilers with low/zero emission technologies
- Taxation of domestic heating, taking into account the polluter pays principle
- Green public procurement (only BAT technology).

9.4.3 *Examples of future work*

- Development of harmonized BC emission testing protocol
- Improvement of the data basis.

10. Topic 5 c. Sectors and Solutions: Opportunities and challenges to reduce air pollution from agriculture

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10.1 Key conclusions

(Headline conclusions agreed in plenary):

- While voluntary and economic approaches are popular, they will need to be complemented by further regulation in order to meet the NECD and GP goals for NH₃ (e.g. low-emission manure spreading, covered manure storage) (⇒ Governments);
- Joined up approaches across the nitrogen cycle are needed to achieve air, climate, water and economic co-benefits. (⇒ Air Convention, Climate Convention, European Commission, UN Environment, INMS);
- Reduction in meat and dairy intake in the UNECE region will be necessary to meet the suite of air and other environment and development goals for 2030 and offers opportunity for health co-benefits. This includes a goal to include environment into national and international dietary guidance (⇒ Education, Health Agencies & Governments, WHO);

- A new “30% Club” would offer an opportunity to share best practices in meeting ammonia goals, where leading countries commit to a few priority measures with at least 30% mitigation efficiency (⇒ Governments);
- Reform of EU Common Agricultural Policy (CAP) offers a major opportunity to integrate air pollution solutions into agricultural financing schemes (⇒ EU Council, European Commission);
- There is an opportunity to include large cattle farms under Industrial Emissions legislation (such as the IE Directive in the EU) alongside the pig and poultry sector, especially given the ongoing upscaling to larger cattle farms, where use of Best Available Techniques would be appropriate;
- There is a need to explore how to link agricultural subsidies to emission reduction obligations and healthy food production (⇒ EU-Com, Parties Air Convention, UNFCCC);
- There is a need to establish guidance how to reduce emissions from agricultural residue burning (⇒ Parties Air Convention, TFRN in cooperation with TTFFI).

10.2 Overall Approach

The group addressed the challenges in two ways: Firstly, what would be needed to meet the national ceilings for ammonia emissions from agriculture under the Gothenburg Protocol and National Emissions Ceilings Directive for 2020 and 2030. Secondly, the group considered what would be needed to meet the full suite of air and other environmental goals for 2030 (including avoidance of damaging air pollution to human health and ecosystems, to water quality, to avoiding greenhouse gas emissions and to meeting the Sustainable Development Goals).

The group took an approach that asked: will voluntary action be sufficient to achieve goals within the specified time frames, and if not what can economic approaches achieve (including subsidies, taxes etc.)? It was then asked to what extent regulation would be necessary if these first two approaches would be insufficient to meet the goals.

The group first discussed options for improved agricultural management to reduce emissions, including proposals for the most-favoured approaches and then considered the relationship to dietary choice in the UNECE area, considering to what extent there is a need to optimize human diets by reducing meat and dairy consumption to meet environmental and health goals. For each of the topics, target groups were identified as receivers of the key messages.

Additional discussion across the “Sectors and Solutions” groups identified the importance of developing UNECE guidance for practices to reduce air pollution emissions from agricultural residue burning. The summary conclusions were agreed in cooperation with the wider “Sectors and Solutions” group and then in plenary.

10.3 Voluntary, Economic and Regulatory Approaches

It was recognized that there were a range of benefits and limitations of different voluntary, economic and regulatory approaches. For example:

- Voluntary approaches are often preferred by farming organisations as compared with regulations. However, the results of such voluntary approaches can often be difficult to see. There can also be a significant transaction cost to assess the extent to which measures have been adopted and to which measures have contributed to emission reductions;
- A heavy focus on regulatory approaches can have a negative outcome in promoting antagonism between farming organisations and environmental regulators. In order to foster acceptability, farmers want to be convinced of the advantages of regulation (e.g., market protection, common standards etc.);
- There remain different views on whether and when it is better to focus on voluntary actions that require a higher level of reporting, as compared with a focus on simple regulatory benchmarks that all should meet, with simply defined exemptions;
- The only countries to achieve major emissions reductions of ammonia by around 50% (e.g. Netherlands and Denmark) had achieved it by a regulatory approach.

It was noted that in many cases ammonia emissions are *currently increasing* rather than decreasing. Based on the published official data for the UNECE region (2013–2015, WebDab database of the Centre for Emissions Inventories and Projections), ammonia emissions are increasing in 24 out of the 31 countries committed to reduce emissions, as listed in Table 4 of the revised Gothenburg Protocol. Based on current trends, several countries are on track to exceed National Emissions Ceilings for 2020, with the EU as a whole currently on track to be having ammonia emissions 10% above the committed level.

In most countries of the UNECE there are currently few or no national regulations in place to meet the ammonia emission targets for 2020. The following points were noted:

- Voluntary approaches were widely welcomed, but it was recognized that this may result in very slow change, so that emission ceilings are not achieved by a certain date. This had been highlighted by a recent report for the Nordic Council of Ministers comparing experiences across Nordic countries (Hellsten et al. 2017, Nordic Nitrogen and Agriculture, TemaNord 217/547);
- There is opportunity for increased use of economic levers to promote ammonia emission reduction, with examples shared of how the EU Rural Development Programmes could be used to stimulate ammonia emission control, as well as of nitrogen levies or taxation or other national grant schemes to support capital investment in ammonia emission control. However, at present the scale of funds

allocated is rather modest, and larger investment would be needed in many cases to meet national emissions ceilings;

- While a nitrogen tax had operated successfully in Sweden for many years, the extent of environmental improvement resulting remained debated, with the suggestion made that the tax (at 20% of fertilizer price) was too small to mobilize change. Conversely, a temporary doubling of fertilizer prices in 2007–2008 had been found to mobilize change for better manure management in several European countries.

Considering these points and the timescales involved, it was concluded that additional regulation will be necessary to meet the ammonia emissions ceilings for 2020, since a solely voluntary and economic approach cannot be expected to deliver the scale of necessary change within the timescale.

It was also concluded that reform of EU Common Agricultural Policy (CAP) offers a major opportunity to integrate air pollution solutions into agricultural financing schemes.

It was considered that there is a need to explore how to link agricultural subsidies to emission reduction obligations and healthy food production.

10.4 Key techniques to reduce ammonia emissions

A comprehensive listing of techniques to reduce ammonia emissions is listed in the “UNECE Ammonia Guidance Document” (Bittman et al., 2014, *Options for ammonia mitigation: Guidance from the UNECE Task Force on Reactive Nitrogen*, ECE.EB/AIR/120), which are also summarized in the “UNECE Ammonia Framework Code” (*United Nations Economic Commission for Europe Framework Code for Good Agricultural Practice for Reducing Ammonia Emissions*, 2015). In evaluating options for revision of the Gothenburg Protocol Annex IX, the UNECE Task Force on Reactive Nitrogen had identified a short-list of the main ways to reduce ammonia emissions (UNECE, AIR/WG.5/2011/16):

1. Low emission techniques for land spreading of cattle/pig/poultry manures and mineral fertilizers.
2. Animal feeding strategies, inc phase feeding.
3. Covers on new slurry stores.
4. Farm N balance on demonstration farms.
5. Low emission new pig & poultry housing.

Of these techniques, it was noted by the Task Force that low-emission spreading of liquid manure offered the largest potential to reduce ammonia emissions. This also offers opportunities for cost-savings by farmers by allowing them to reduce inputs of

mineral fertilizer nitrogen considering the nitrogen saved by the measure. Together with covered manure storage, this makes a coherent package allowing farmers to reduce emissions substantially.

When done well, such techniques can be seen as farm investments with a pay-back period after which they could be profitable. However, further provision of tools would help confidence building, while availability of capital grants would help mobilize change, especially considering the many competing calls faced by farmers when considering capital investments.

It was noted that experience from a shipping scheme considering NO_x emissions offered the opportunity for a positive approach to nitrogen taxation, one of the major risks of which is that farmers do not benefit directly if the revenues raised are transferred to general treasury funds. Under this approach, it would be proposed that there is an *exemption from taxation*, if an equivalent (or reduced amount) is deposited in a specific nitrogen fund that can then be used to mobilize technology development and investment in low emission approaches (e.g., capital grants).

10.5 Coordination and International Leadership

It was recognized that there is a need to promote and communicate existing techniques to those who have yet to adopt them. For those that are already in the process of implementing these techniques, there is also the opportunity to go beyond this and provide landscape-specific and region-specific solutions.

10.5.1 A new "30% club" for ammonia

Given the slow progress in achieving ammonia emission reductions reported by many countries, as well as the wide availability of measures to reduce emissions, it was noted that there is an opportunity for countries to coordinate more effectively and offer international leadership on meeting this challenge. In particular, it was noted that:

1. Many of the measures listed in Annex IX of the Gothenburg Protocol refer to a benchmark of 30% emission reduction compared with a standard reference method.
2. That the most cost-effective measures noted by the TFRN (AIR/WG.5/2011/16) concern low emission manure and fertilizer application, where several technical measures are available to reduce emissions by 30% or more.
3. That the revised EU National Emissions Ceilings Directive will require Member States to submit National Air Pollution Reduction Plans (NAPRPs) in meeting the committed ceilings, but that these are focused on *individual* action by Member States.

4. That there is an opportunity for an informal approach where countries take leadership in *sharing technologies and committing to a package of measures that meet a basic standard.*

In this context, it was noted that a new "30% club" would offer an opportunity for member countries to share best practices in meeting the ammonia goals. Under this approach leading countries could commit to a few priority measures with at least 30% mitigation efficiency.

Such an approach would provide the opportunity for countries to demonstrate leadership in championing the opportunities for improving nitrogen resource efficiency on farms, while reducing air pollution impacts on human health and ecosystems. At the same time, it would provide a significant step to meeting the goals of Annex IX of the Gothenburg Protocol, while promoting more effective coordination and technology sharing.

For example, as part of such a "30% club" a country might commit to high efficiency/low emission application of liquid manures and chemical fertilizer (that achieve at least 30% emission reduction compared with the reference defined in Annex IX of the Gothenburg Protocol), when used on medium and large size farms. It is for leading countries to take the initiative.

10.5.2 Emission control regulations for large pig, poultry and cattle installations

The group recognized that farming is extremely diverse, ranging from small-holder family businesses to large "industrial scale" operations. The strategies to respond optimally to such different farming types are therefore expected to vary.

It was also recognized that significant point source emissions result from the largest farms, especially large pig, poultry and cattle farms. This is particularly relevant, as there is a major ongoing transition towards fewer larger farms in order to maintain profitability in farming.

In the European Union it was recognized that the largest pig farms (>2,000 places for fatteners, > 750 places for sows) and poultry farms (>40,000 places for birds) are required to be permitted under the Industrial Emissions Directive (IE Directive, ref), where they must apply Best Available Techniques (BAT) to reduce emissions, with guidance provided by published BAT Reference (BREF) documentation. However, there is a gap at present, as large cattle farms are not included in this legislation. This means that there is increasingly large number of very industrial-scale cattle farm installations, none of which are required to follow BAT.

It is understood that similar issues may apply in other parts of the world, where large cattle farms (e.g., feedlots and dairies) will in many cases operate with little environmental regulation.

This highlights an opportunity to include large cattle farms under Industrial Emissions legislation (such as the IE Directive in the EU) alongside the pig and poultry sector, especially given the ongoing upscaling to larger cattle farms, where use of Best Available

Techniques would be appropriate. Further work would be needed to consider appropriate farm-size thresholds considering both environmental and business perspectives.

10.5.3 *Next steps towards sustainability*

A few countries such as the Netherlands and Denmark have already taken substantial action to reduce ammonia emissions from agriculture. Where such countries already had ambitious technical measures in place (e.g. having already halved emissions), it was noted that innovative approaches would be needed if further emission reductions should be achieved. This raised the following points:

- *Technical measures may be complemented by landscape optimization, where additional actions are taken within local context, in order to maximize the environmental benefits. Such additional local policies can work to support nature and water protection in “hot spot” areas, by providing buffer zones and promoting “nature based solutions” for nitrogen recapture and utilization (e.g., re-capturing ammonia in growing biomass);*
- *While such landscape solutions offer significant benefits for the local environment, they typically offer a smaller contribution to total emissions reductions, which are needed to reduce impacts of secondary air pollution, such as the health impacts of particulate matter;*
- *It is vital to support new investment in technological innovation in emission reduction.* For example, earlier versions of the UNECE Ammonia Guidance Document considered that slurry acidification was not a recommended method, but this has since been revised following demonstration of operational success across Denmark as an alternative to high ambition emission reduction by slurry injection. Such ongoing investment is needed to develop the next generation of more-efficient measures;
- *There is opportunity to develop more holistic approaches to pollution mitigation and increased resource efficiency. Here an approach that covers the full nitrogen cycle, may help bring together issues to help overcome barriers (see below);*
- *It is expected that societal changes in consumption patterns will also be necessary to meet the 2030 goals for environmental quality and sustainability, including the Sustainable Development Goals (see below).*

10.6 Strategic approach across the nitrogen cycle

It was recognized that current policies and regulatory approaches were often fragmented between environmental problems, leading both to complexity and concerns of incoherency between solutions. An example, concerns the emission of nitric oxide (NO) from agricultural soils, which alongside with biogenic volatile organic

compounds (BVOCs) is excluded from the calculation of ceilings in the revised EU National Emissions Ceilings Directive and the revised Gothenburg Protocol as being a natural source. Yet as NO_x emissions from combustion sources reduce in Europe and North America, soil NO emissions contribute an increasing share of regional NO emissions.

The fact that ammonia emissions from agriculture are considered a pollutant as part of the Gothenburg Protocol, while nitric oxide emission is excluded, demonstrates the lack of coherency in current policy. This perspective can be widened, when it is considered that policies to reduce nitrous oxide (N₂O) from agriculture are typically considered separately from those for ammonia, while policies to reduce nitrate and other forms of nitrogen leaching from agriculture are typically considered separately ("Nitrogen Input in the Biosphere", German Ministry of Environment, 2017).

While each of these policies focus on reducing pollution, this is only one side of the coin. Based on the European Nitrogen Assessment, it is estimated that nitrogen pollution represents a major loss of resource, worth about EUR 14 billion annually. This is equivalent to losing around 25% of Europe's Common Agricultural Policy. This means that a strategic approach across the nitrogen cycle can become a positive approach, by focusing on improving resource use efficiency, reducing nitrogen waste, and reducing multiple forms of environmental pollution all at the same time. Such holistic approaches also offer the opportunity to incorporate reduction of methane emission from agriculture (e.g., Hellstedt et al., 2014, "Nordic initiatives to abate methane emissions" ANP 2014: 741).

A particular concern was noted in the discussion: Would Europe lose competitiveness in a global market if it changed its food production systems to be more environmentally conscious? It was concluded that a nitrogen cycle perspective offers the opportunity for the opposite, where reduced pollution and increased resource efficiency go together in making the transition to a circular economy.

It is noted that technical work on these challenges is being addressed under the UNECE through the Task Force on Reactive Nitrogen, and in partnership with UN Environment under the International Nitrogen Management System (INMS). These activities are developing the foundation for approaches that could see a stronger cooperation between conventions and strategies for air pollution, climate, water, biodiversity and stratospheric ozone depletion.

It was noted that at present the European Union has no overarching nitrogen policy, while there is similarly no Nitrogen Coordination Mechanism currently within the UN system.

It is concluded that joined-up approaches across the nitrogen cycle are needed to achieve air, climate, water and economic co-benefits. (⇒ Air Convention, Climate Convention, European Commission, UN Environment, INMS).

10.7 Air pollution, agriculture and food choice

The group discussed the linkages between air pollution, agriculture and food choice, noting that several recent reports had shown that reduced meat and dairy consumption in Europe would be associated with substantially reduced air pollution emissions from European agriculture, alongside several other benefits (reduced greenhouse gas emissions, reduced nitrate leaching, reduced dependence on soybean imports, reduced land requirements for EU agriculture, land opportunities for increased bioenergy production).

Example reports noted include: "Nitrogen on the Table" (Westhoek et al. 2015, Task Force on Reactive Nitrogen), "Future Nordic Diets" (Karlsson et al., 2017, Nordic Council of Ministers, TemaNord 2017/566) and "What is on our plate?" (Ocké et al., 2017, National Institute of Public Health and the Environment, The Netherlands). For example, the Nitrogen on the Table report found that a demitarian scenario that halved European meat and dairy intake would reduce ammonia emissions by around 40%. This did not include any technical measures to reduce emissions from agricultural sources, so it is obvious that a combined strategy of food choice optimization, agricultural emission reductions and efficiency improvement, plus food waste reduction could achieve much larger reductions.

The group noted that there is substantial food trade across Europe, with the relationships varying across regions and countries. For example, it was noted that the Netherlands has simultaneously reduced its meat consumption but increased its livestock farming with a growth in exports. It was therefore acknowledged that there was not a direct relationship between eating less meat and dairy and reducing environmental impacts, as the level of exports also needed to be considered. Conversely, it was noted that high meat and dairy consumption in developed countries fostered an aspiration to increase their consumption in other parts of the world. Therefore further interactions could be expected. For example, if Europe really did choose to halve its meat and dairy intake this would be anticipated to have consequent interactions with the aspirations of citizens elsewhere in the world.

Overall, it was noted that the current commitments achieved through international agreements in the revised Gothenburg Protocol and the revised National Emissions Ceilings Directive, make a contribution to reducing the environmental and health impacts of agricultural air pollution, but do not remove these problems entirely.

It was noted that targeting health issues when encouraging reduced meat consumption could provide incentives to optimize meat and dairy consumption, such as by demitarian and other dietary choices. It was agreed that one way to address this would be to ensure that environmental considerations are incorporated into dietary guidelines in future.

It was concluded that reduction in meat and dairy intake in the UNECE region will be necessary to meet the suite of air and other environment and development goals for 2030 and offers opportunity for health co-benefits. This includes a goal to include environment into national and international dietary guidance (⇒ Education, Health Agencies & Governments, WHO).

10.8 Final Messages

The discussion closed with several members of the group offering suggestions of what might be the most effective actions needed to reduce emissions and adverse effects of air pollution from agriculture. The following list illustrates the diversity of views, with a note given in each case of the actors suggested to be best placed to take action:

- Optimising the implementation of specific techniques ⇒ farmers
- Regulation on low emission practices ⇒ national authorities
- Ammonia emissions regulations ⇒ ministries
- Use of low emission slurry storage, low-tech options ⇒ farmers
- Working on air quality programmes, link a range of sectors and players ⇒ Environmental agencies
- Progress the public/farmer consultation ⇒ farmers unions
- Development of regulatory measures ⇒ environment protection agencies & ministries
- Establishing a cap on methane emissions ⇒ European council, air convention
- Establish “cross compliance” between agricultural payments to farmers and the EU National Emissions Ceilings Directive ⇒ European Commission, farmers
- More ambitious ammonia targets ⇒ European Commission
- Implement a ban on broad spreading liquid manure and focus on technical measures ⇒ European Commission
- New Common Agricultural Policy is being drafted, should use opportunity to achieve goals set out for air pollution ⇒ European Commission
- Important to pick low hanging fruits through use of the most cost-effective measures ⇒ farmers, farmer associations and ministry level
- Closer working relationship with UN Air Convention and Climate Convention, low carbon and low nitrogen strategies ⇒ Parties, UNECE and UNFCCC.

11. Основные рекомендации шестого семинара шестой семинар «Saltsjöbaden» (Main recommendations)

11.1 Введение

Шестой международный семинар «Saltsjöbaden» был проведен в Гётеборге 19-21 марта 2018 года. Семинар организован Шведским Агентством по Охране Окружающей Среды и Шведским Институтом Природоохранных Исследований IVL, при поддержке Совета Министров Северных стран и в тесном сотрудничестве с Конвенцией о трансграничном загрязнении воздуха на большие расстояния (КТЗВБР) и другими международными организациями, активно работающими в области охраны атмосферного воздуха. Семинар посетили около 190 ученых, лиц ответственных за принятия стратегических решений (политиков) и технических экспертов из 35 стран, расположенных на 5 континентах. Кроме того, в семинаре участвовали представители 20 международных организаций и агентств.

Семинар «Saltsjöbaden» предоставил уникальную возможность встретиться в неофициальной обстановке политикам, ученым, представителям промышленности и НГО и обсудить будущие направления развития с учетом текущего международного сотрудничества по вопросам охраны атмосферного воздуха. Более ранние семинары играли важную роль в развитии международного сотрудничества, в частности в рамках региона ЕЭК ООН.

Семинар был организован по ранее использовавшейся схеме: открывающее пленарное заседание, после которого следовали обсуждения в параллельных рабочих группах с выработкой заключений и рекомендаций, и наконец результаты были представлены к обсуждению на общем заседании, где в итоге был выработан и согласован ряд общих заключений и рекомендаций.

В связи с тем, что загрязнение воздуха будет оставаться важной проблемой, заслуживающей пристального внимания политиков и ученых, еще в течение долгих лет, непосредственно перед семинаром был организован мини-семинар – «симулятор переговоров» – для молодых экспертов, ученых и политиков, работающих в области международного сотрудничества по вопросам охраны атмосферного воздуха.

Для планирования семинара, в частности для выбора тем и для подготовки заключительных выводов и рекомендаций, был организован Программный комитет (Приложение 2).

В данном отчете содержатся общие заключения и рекомендации, а также отчеты каждой из рабочих групп. Доклады представленные на пленарном заседании можно найти на странице семинара – <http://saltsjobaden6.ivl.se/>. Расшифровка сокращений представлена в Приложении.

Мы, представители учреждений-организаторов, выражаем благодарность всем принявшим участие в планировании и проведении семинара, в частности руководителям рабочих групп, докладчикам и активным участникам обсуждений.

Более подробную информацию о семинаре можно найти по ссылке <http://saltsjobaden6.ivl.se/>. На странице семинара также можно найти и загрузить отчеты с предыдущих семинаров. За дополнительной информацией и с вопросами обращайтесь к peringe.grennfelt@ivl.se, anna.engleryd@naturvardsverket.se или john.munthe@ivl.se.

Анна Энглерид, Перинге Греннфельт

11.2 Предыстория

Загрязнение атмосферного воздуха сегодня является глобальной проблемой, требующей сотрудничества и координированных действий для ее решения. Ряд международных организаций осознают серьезность вопроса и предпринимают активные меры. Помимо Конвенции о трансграничном загрязнении воздуха на большие расстояния (КТЗВБР), в рамках которой возникла инициатива проведения данного семинара, ВОЗ и Программа ООН по окружающей среде недавно приняли решение о глобальных действиях с целью решения проблемы чистого воздуха в долгосрочной перспективе. Другие организации, проявляющие активный интерес к вопросам международного сотрудничества и мер, направленных на решение проблемы, включают Европейский Союз, ВОЗ, ВМО, Стокгольмскую Конвенцию, Конвенцию Минамата, Коалицию в защиту климата и чистого воздуха (CCAC), Арктический Совет, Программу Арктического Мониторинга и Оценки (АМАР), Международное Энергетическое Агентство Организации экономического сотрудничества и развития (OECD IEA) и ряд НГО.

Представители вышеупомянутых организаций, совместно с учеными и политиками – в сумме около 190 экспертов из 36 стран – приняли участие в шестом семинаре «Saltsjöbaden» в Гётеборге 19-21 марта 2018 г. В рамках темы *Чистый воздух для Устойчивого Будущего – Цели и Проблемы* обсуждались общие вопросы, направления и варианты будущего сотрудничества. Обсуждения на семинаре проходили в соответствии с правилом «Чатем-хаус».

Загрязнение атмосферного воздуха тесно связано с Целями Устойчивого Развития (SDG); несколько целей косвенно включают в себя проблему загрязнения воздуха. Вопрос о связи загрязнения воздуха с Целями Устойчивого Развития и о возможных способах оценки загрязнения непосредственно в рамках Повестки дня 2030 уже поднимался на различных форумах – однако необходимо

его дальнейшее исследование, в частности с учетом связей со здоровьем и благосостоянием населения и урбанизацией.

Качество атмосферного воздуха и его трансграничный аспект являются высоко приоритетными вопросами в регионе ЕЭК ООН в течение долгого времени. Доклад о результатах научной оценки *Путь к чистому воздуху* от 2016 г. делает особый акцент на важности вклада трансграничного загрязнения в превышение норм качества атмосферного воздуха в городах. В этой области необходимо более тесное сотрудничество международных организаций, стран, НГО, представителей промышленности и администрации городов.

Все большую важность приобретает проблема загрязнения воздуха в масштабах всего полушария и переноса загрязнений в регионы, обычно не рассматриваемые в рамках Конвенции КТЗВБР – в частности, в Арктический регион. В данной области существует несколько инициатив, возглавляемых международными организациями – такими как Программа Арктического Мониторинга и Оценки (АМАР) и Коалиция в защиту климата и чистого воздуха (ССАС). Эти организации выражают растущий интерес к дискуссиям о том, как лучше продолжить сотрудничество. Стокгольмская Конвенция о СОЗ и Конвенция Минамата также рассматривают загрязнение атмосферного воздуха в глобальном контексте.

Одним из заслуживающих внимания вопросов в ЕЭК ООН является ратификация и осуществление протоколов Конвенции КТЗВБР странами ее восточного региона, где необходимо искать новые пути для более активной деятельности в рамках Конвенции.

В 2016 г. Европейский Союз пересмотрел Директиву о национальных потолках выбросов, устанавливающую обязательства по снижению выбросов к 2030 году. В новой директиве есть ряд аспектов, тесно связанных с Конвенцией КТЗВБР и требующих более детального рассмотрения. В частности, одним из вопросов в данном контексте является мониторинг воздействий на экосистемы, который в настоящее время является как частью повестки дня Конвенции так и требованием со стороны Евросоюза.

Для того, чтобы принять во внимание все вышеуказанное, семинар включал в себя обсуждения пяти основных тем:

- *Чистый воздух в городах* – важность трансграничного загрязнения воздуха и международного сотрудничества для соблюдения стандартов качества атмосферного воздуха в городах.
- *Чистый воздух в глобальном масштабе* – необходимость и варианты научной поддержки и сотрудничества на стратегическом уровне.
- *Чистый воздух в Восточном регионе* – как ускорить процессы ратификации и осуществления протоколов Конвенции КТЗВБР в странах восточного региона ЕЭК ООН.

- *Чистый воздух, экосистемы и климат* – как организовать дальнейший мониторинг воздействия атмосферного загрязнения на экосистемы в регионе ЕЭК ООН.
- *Чистый воздух – секторы и решения* – обсуждение трех секторов: судоходство, сжигание древесного топлива и сельское хозяйство.

11.3 Основные рекомендации шестого семинара «Saltsjöbaden»

На основании приблизительно 50 рекомендаций различных рабочих групп был разработан набор ключевых рекомендаций, согласованный с участниками семинара на завершающем заседании. Рекомендации включают указания о том, кому следует взять на себя инициативу по дальнейшей работе по их реализации, а также предложения о том, какие еще организации стоит вовлечь в данную работу:

1. *Механизмы гибкости для стран Восточного региона Конвенции относительно ратификации Гётеборгского протокола (подлежит пересмотру).* Несколько сторон Конвенции из Восточного региона выразили мнение об ограниченных возможностях достичь соответствия всем требованиям Гётеборгского протокола в условиях ограниченного времени. Для поощрения шагов, предпринимаемых странами Восточного региона Конвенции на пути к ратификации ее протоколов, Конвенции следует рассмотреть возможность поэтапной ратификации. (Координационная группа стран ВЕКЦА совместно с Рабочей группой по стратегиям и обзору – с целью разработки предложения для Исполнительного органа и Комитета по осуществлению Конвенции)
2. *Чистый воздух в городах.* На территориях многих городов будет очень сложно соблюсти рекомендации ВОЗ по качеству воздуха, а также национальные и европейские стандарты, без принятия мер по снижению регионального фона загрязнения, во многих случаях обусловленного трансграничным переносом загрязнений на большие расстояния. В рамках Целевой группы по разработке моделей для комплексной оценки следует учредить группу экспертов для поддержки локальных стратегий в области охраны атмосферного воздуха, с учетом связей между региональным и локальным загрязнением воздуха и затратно-эффективности координированных действий. (Целевая группа по разработке моделей для комплексной оценки совместно с Европейской Комиссией, ВОЗ и релевантными группами экспертов по вопросам устойчивого развития и загрязнения воздуха в городах)
3. *Глобальная сеть мониторинга качества атмосферного воздуха.* Для более широкого подхода к глобальному аспекту загрязнения, как с научной точки зрения так и в качестве основания для действий, необходимо развивать

глобальную согласованную сеть мониторинга, включающую инвентаризации и прогнозы выбросов. Такая система должна учитывать новейшие разработки в области дистанционного зондирования, недорогих дистанционно управляемых мониторов, а также сбора, обработки и представления данных. Ключевым фактором тут является финансирование, особенно в регионах с переходной экономикой – поэтому в данной работе необходимо задействовать Всемирный Банк и подобные организации. Также важно координировать работу с сетями экспертов по вопросам изменения климата. (Целевая группа по переносу загрязнения воздуха в масштабах полушария в тесном сотрудничестве с Целевой группой по измерениям и моделированию, ВМО и Программой Арктического Мониторинга и Оценки)

4. *Глобальный диалог на уровне стратегий.* Создать базу стратегий по вопросам загрязнения воздуха, в широком географическом масштабе и с привлечением как международных организаций (Программа ООН по окружающей среде, ВОЗ, ВМО, Арктический Совет, Коалиция в защиту климата и чистого воздуха, Стокгольмская Конвенция, Конвенция Минамата и другие) так и региональных инициатив (EANET, Malé declaration). Рекомендуется пошаговый подход к созданию такой базы, с акцентом на рост регионального сотрудничества на начальном этапе. (КТЗВБР/Бюро Исполнительного органа в сотрудничестве с Программой ООН по окружающей среде)
5. *Улучшение мониторинга экосистем.* Мониторинг воздействий на экосистемы требует времени и ресурсов – поэтому координация действий между различными организациями здесь имеет решающее значение. По итогам семинара рекомендуется создать группу экспертов для координации и согласования мониторинга воздействий загрязнения воздуха на экосистемы – для конвенций и других организаций (КТЗВБР, Конвенция о биологическом разнообразии, Экономика экосистем и биоразнообразия (ТЕЕВ)), а также для Европейского Союза. (Рабочая группа по воздействию совместно с Европейской Комиссией)
6. *Снижение выбросов от судоходства.* Поощрять учреждение районов контроля за выбросами (Emission Control Areas – ECAs) применительно ко всем морям и развивать схемы снижения выбросов от существующих судов. Важными заинтересованными сторонами тут являются, помимо Международной морской организации (ИМО) и КТЗВБР, HELCOM, OPSARCOM, REMPEC, Европейская Комиссия и Арктический Совет. (Международная морская организация и КТЗВБР)
7. *Снижение выбросов от отопления в бытовом секторе.* Исследовать воздействия сжигания твердого топлива в бытовом секторе и разрабатывать схемы повышения уровня информированности населения и замены старых плит и другого отопительного оборудования. (Целевая группа по технико-экономическим вопросам с привлечением других организаций, таких как ВОЗ, Коалиция в защиту климата и чистого воздуха, Программа ООН по

окружающей среде, Рамочная конвенция ООН об изменении климата, а также сторон Европейского Союза и групп экспертов по вопросам устойчивого развития и загрязнения воздуха в городах)

8. *Снижение потерь азота в сельском хозяйстве.* Сельскохозяйственный сектор отстает от других, несмотря на доступность недорогих технических решений для значительного снижения выбросов. Необходимо разработать критерии для связи субсидирования сельского хозяйства с обязательствами по снижению выбросов. Следует основать добровольный «клуб 30%» по снижению выбросов аммиака для поощрения незамедлительного принятия мер в регионах с интенсивным сельским хозяйством (Целевая группа по химически активному азоту совместно с Европейской Комиссией и сторонами Европейского Союза, Международная система управления азотом (INMS))
9. *Семинар для молодых экспертов.* Для молодых исследователей и экспертов был организован Симулятор Переговоров по вопросам качества атмосферного воздуха – с целью изучения природы международных переговоров и роли различных точек зрения, а также для получения опыта в поиске креативных решений, являющихся компромиссными для сторон с противоположными позициями. Рекомендуется проводить подобные семинары по возможности регулярно, для поощрения участия молодых экспертов в научной и стратегической работе в области улучшения качества атмосферного воздуха, в частности в рамках КТЗВБР.

12. Отчет заседания группы Восточный регион КТЗВБР – путь к чистому воздуху (Recommendations from Topic 3)

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12.1 Введение

В то время как выбросы основных загрязнителей воздуха были значительно снижены в последние десятилетия в результате применения комплексных стратегий управления качеством атмосферного воздуха, разработанных в рамках Конвенции о трансграничном загрязнении воздуха на большие расстояния (КТЗВБР), прогресс в различных странах региона ЕЭК ООН идет разными темпами. В частности, в результате роста энергетики и промышленного производства и урбанизации в странах Восточной и Юго-Восточной Европы, Кавказа и Центральной Азии необходимы дальнейшие усилия по снижению выбросов. С целью содействия странам в данном регионе в улучшении менеджмента качества воздуха, ЕЭК ООН был организован ряд мероприятий в рамках программы содействия КТЗВБР. Отчасти следуя рекомендациям предыдущих семинаров «Saltsjöbaden», некоторые страны региона ЕЭК ООН активно содействовали развитию двустороннего сотрудничества экспертов и участвовали в проектах укрепления потенциала.

Для того чтобы избежать ущерба окружающей среде, здоровью населения и экономике, необходимо ставить цели по снижению выбросов и принимать меры для достижения данных целей. Создавая рамки, упрощающие процесс принятия таких мер, Конвенция содействует странам в формулировании ответных стратегий для решения проблемы загрязнения воздуха. Для эффективности Конвенции крайне важно обеспечить ратификацию и осуществление протоколов Конвенции странами данного региона, в особенности последних трех пересмотренных протоколов, а именно – Протокола о борьбе с подкислением, эвтрофикацией и приземным озоном (Гётеборгского Протокола) от 1999 г. в версии 2012 г.; Протокола по Тяжелым Металлам от 1998 г. в версии 2012 г.; и Протокола по Стойким Органическим Загрязнителям (СОЗ) от 1998 г. в версии 2009 г.

Основная идея данного заседания заключалась в открытом обсуждении препятствий на пути к ратификации и осуществлению протоколов Конвенции, а также возможностей и выгод в странах Восточной и Юго-Восточной Европы, Кавказа и Центральной Азии касательно работы по снижению загрязнения воздуха. Первая часть заседания была посвящена препятствиям. Во второй части заседания были детально рассмотрены возможные способы преодоления этих препятствий и выгоды от улучшения качества воздуха в регионе. Целью являлось получение более ясной картины относительно наличия сильных и слабых сторон, а также возможностей стран в данном регионе в области работы по улучшению качества воздуха и осуществлению Конвенции.

В ходе подготовки к заседанию странам региона был выслана анкета. Анализ ответов на вопросы анкеты помог идентифицировать основные препятствия и трудности на пути к осуществлению Конвенции, и послужил отправной точкой для обсуждений заседания.

Заседание проводилось в соответствии с правилом «Чатем-хаус». В основе правила лежит следующий принцип: участники могут выражать свое собственное мнение в качестве индивидуумов, а не представителей своей организации или страны. Применение данного правила поощряет таким образом свободное обсуждение. В случаях когда совещание проводится в соответствии с правилом «Чатем-хаус», участникам разрешено использовать полученную информацию, однако запрещается раскрывать ее источник, то есть имена предоставивших информацию. *Основной целью данного заседания являлась идентификация основных препятствий на пути к ратификации и путей их преодоления.*

12.1.1 Следующие доклады послужили основой для последующих обсуждений:

- Результаты анализа ответов на вопросы анкеты относительно препятствий (Ketevan Kordzakhia).
- Основные препятствия на пути к ратификации (все представители стран Восточного региона Конвенции).

- Результаты анализа ответов на вопросы анкеты относительно возможностей (*Ketevan Kordzakhia*).
- Примеры менеджмента качества воздуха в федерациях (*Katja Kraus, Paul Almodovar, Alexander Romanov*).
- Стратегии поощряющие внедрение в регионе предельных значений концентраций выбросов (ELV), основанных на наилучших доступных технологиях (*Jean-Guy Bartaire*).
- Страны ВЕКЦА: отчетность в КТЗВБР и подготовка данных CEIP (*Melanie Tista*).
- Повышение уровня информированности и улучшение понимания затрат и выгод (*Stefan Åström*).
- Возможные пути преодоления препятствий (*все представители стран Восточного региона Конвенции*).
- Все презентации можно найти на странице семинара <http://saltsjobaden6.ivl.se/>

12.2 Ключевые заключения и рекомендации

12.2.1 По итогам заседания сделаны следующие заключения:

В последнее десятилетие во многих странах региона усилилось внимание к национальным инициативам и мерам. Существует несколько примеров национальных инициатив и текущих проектов по разработке и внедрению законодательства (включая стандарты ELV/BAT) и улучшению инвентаризаций выбросов и оценки качества атмосферного воздуха.

Поддержка со стороны международного сообщества способствовала и продолжает способствовать укреплению потенциала в странах региона, повышая вероятность ратификации протоколов Конвенции. Страны Восточного региона движутся в направлении ратификации разными темпами и имеют разные потребности; дальнейшая поддержка с учетом специфических потребностей значительно способствует прогрессу на пути к ратификации.

12.2.2 По итогам заседания рекомендуется (в скобках указана предлагаемая ведущая организация):

Необходимо еще более повысить уровень информированности о проблеме загрязнения атмосферного воздуха. Системы информирования в реальном времени и инструменты представления информации могут быть очень эффективны в целях уведомления населения о локальном качестве воздуха и его влиянии на здоровье населения и качество жизни (*национальные агентства и ведомства*)

Необходимы дальнейшие усилия по улучшению качества инвентаризаций выбросов, а также мониторинга качества воздуха в городах, включая мониторинг фонового загрязнения *(КТЗВБР, национальные агентства и ведомства)*

Следует продолжить разрабатывать и поощрять внедрение законодательства, основанного на наилучших доступных технологиях, во всех странах региона *(КТЗВБР, стороны – представители Восточного региона)*

Международному сообществу следует продолжать поощрять меры, направленные на улучшение качества воздуха в данном регионе, путем включения их в повестку дня различных международных форумов на высшем политическом уровне *(международные организации & сотрудничающие правительства стран за пределами Восточного региона Конвенции)*

Международному сообществу следует продолжать и усиливать поддержку проектов укрепления потенциала и обучающих тренингов. В частности, необходимы консультации по вопросам специфических требований, изложенных в Приложениях протоколов Конвенции, содействие в разработке выбросов с привязкой к ячейкам сети ЕМЕР и прогнозов выбросов, а также в анализе для поддержки принятия стратегических решений (анализ затрат-выгод, анализ воздействия на здоровья населения). *(международные организации & правительства стран за пределами Восточного региона Конвенции)*

Следует идентифицировать заинтересованные стороны и их интересы и мотивацию, и представлять результаты анализа качества атмосферного воздуха с учетом специфики и интересов этих заинтересованных сторон *(национальные агентства и ведомства, представители промышленности, научное сообщество, НГО)*

Необходимо рассмотреть запрос о пересмотре некоторых положений последних протоколов, ограничивающих возможности использования механизмов гибкости, и запрос о возможностях поэтапной ратификации протоколов *(КТЗВБР & национальные агентства и ведомства)*

12.3 Краткие заметки с заседания

12.3.1 Препятствия на пути к ратификации

Идентифицированные препятствия во многом схожи с препятствиями, выявленными в ходе 4-го семинара «Saltsjöbaden» (в 2009 г.): неопределенность долгосрочного финансирования, недостаток потенциала и экспертного опыта, недостаток информированности. Неопределенность долгосрочного финансирования в некоторых случаях обусловлена институциональной нестабильностью, а иногда – недостаточной приоритетностью вопроса. Недостаток экспертного опыта наблюдается на многих уровнях работы с вопросами загрязнения воздуха – как в области науки, так и в политических кругах. Некоторые регионы испытывают трудности в финансировании лабораторий, другие – в финансировании современных технологий мониторинга,

третьи сталкиваются с затруднениями в финансировании инвестиций в чистые технологии. Недостаток информированности существует на многих уровнях в обществе. Политики, представители промышленности и широкая общественность – все в недостаточной (хоть и в разной) степени информированы о выгодах от улучшения качества атмосферного воздуха. В ряде случаев существует серьезное сопротивление со стороны представителей промышленности, требующее поиска контр-аргументов и изложения альтернативных точек зрения. Такое сопротивление может быть вызвано наличием большого числа законодательных актов, регулирующих деятельность промышленных организаций.

12.3.2 Возможные решения, способствующие скорейшей ратификации

Ряд существующих и потенциальных инициатив может быть использован для усиления мотивации на пути к ратификации протоколов:

- Европейское энергетическое сообщество.
- Транзитные соглашения Евросоюза.
- Китайская инициатива Пояса и Пути (China Belt and Road initiative).
- Международные соглашения о промышленной торговле.
- Международная и национальная конкуренция в области ведущейся модернизации промышленных объектов.
- Инициативы ориентированные на принятие мер, такие как Батумская инициатива по борьбе за чистый воздух (BACA) и Батумская инициатива по зеленой экономике (BIG-E).
- Сопутствующие выгоды от снижения выбросов загрязнителей и парниковых газов согласно КТЗВБР и определяемым на национальном уровне вкладам (NDC) соответственно.
- Международные финансирующие организации, такие как Европейский инвестиционный банк.

Существует также ряд возможностей:

- В отличие от ситуации в 2009 году (4-й семинар «Saltsjöbaden»), сейчас наблюдаются примеры мер, предпринимаемых в странах Восточного региона Конвенции.
- В научных организациях региона наблюдается стабильность.
- Мониторинг в реальном времени может способствовать улучшению ситуации с информированностью населения.
- Повышение уровня знаний о воздействии загрязнения воздуха на здоровье может также улучшить информированность населения.

- Представление информации экспертами в области качества атмосферного воздуха заинтересованным организациям может в большей степени учитывать специфику, интересы и приоритеты этих организаций.

Конкурентоспособность промышленных предприятий может быть (по крайней мере в некоторых случаях) повышена путем модернизации, повышения эффективности использования и повторного использования ресурсов, снижения объемов образования отходов – все это также снижает выбросы. Уже сегодня существуют примеры инициатив и мер, предпринимаемых на уровне промышленных предприятий.

Существующий интерес некоторых стран к проблеме неприятных запахов может потенциально отразиться на снижении выбросов неметановых ЛОС (один из основных загрязнителей, включенных в Гётеборгский протокол).

Отмечены эффективность и успешность международного сотрудничества в прошлом и настоящем; ожидается что продолжение и усиление такого сотрудничества внесет большой вклад в укрепление потенциала и наращивание опыта стран региона.

Существует взаимосвязь некоторых международных конвенций и протоколов Конвенции КТЗВБР. Поэтому представляется возможным рассмотреть сопутствующие выгоды в отношении: Стокгольмской Конвенции и Протокола по СОЗ Конвенции КТЗВБР; Конвенции Минамата и Протокола по тяжелым металлам Конвенции КТЗВБР; Протокола о Регистре выбросов и переноса загрязнителей (PRTR) и Гётеборгского протокола.

С учетом более специфических возможностей, многие страны Восточного региона уже внедрились принцип «загрязнитель платит» в законодательство. Такое законодательство, если его усилить, может способствовать внедрению затратно-эффективных мер по снижению выбросов. Поощрение использования более чистых автомобилей, уже присутствующих на рынке стран Восточного региона, также может иметь значительное влияние на качество воздуха. Наконец, еще одной возможностью является развитие сети контактов и обмена опытом между странами и экспертами региона.

12.3.3 Резюме заседания

Подводя итоги заседания *Восточный регион КТЗВБР – путь к чистому воздуху*, следует отметить, что в результате честного и открытого обсуждения были освещены некоторые основные препятствия и возможности на пути к ратификации последних протоколов Конвенции КТЗВБР. Некоторые из препятствий не должны являться серьезной проблемой – например, сложности в интерпретации технических приложений протоколов. Преодоление других препятствий требует устранения целого ряда взаимосвязанных проблем – это касается например неопределенностей в долгосрочном финансировании. Тем не менее, существует целый ряд возможностей для мотивации принятия дальнейших мер по улучшению качества воздуха и ратификации протоколов

Конвенции странами региона. Основными темами в области возможностей являются повышение информированности населения, повышение промышленной конкурентоспособности и усиление международного сотрудничества.

13. Saltsjöbaden VI – Workshop kring framtida internationella luftvårdsstrategier

Rapporten utgör en sammanfattning av resultaten från den sjätte "Saltsjöbaden Workshop" kring internationellt samarbete kring luftföroreningar. Cirka 180 forskare, förhandlare och internationella experter från 35 länder och 20 internationella organisationer deltog i mötet som hölls i Göteborg den 19–21 mars 2018. Workshopen innehöll fem specifika teman:

- Ren luft i städer, speciellt betydelsen av gränsöverskridande föroreningar för åtgärdsarbetet i urbana områden.
- Ren luft globalt med inriktning mot samarbete mellan olika internationella organisationer.
- Ren luft i östra UNECE-området, där hinder och möjligheter för åtgärder diskuterades.
- Luftföroreningar ekosystem och klimat, där samarbete och fortsatt kartläggning av ekosystemeffekter diskuterades.
- Sektor och lösningar med inriktning mot tre områden, där åtgärdsarbetet behöver intensifieras – internationell fartygstrafik, småskalig vedeldning och jordbruk.

Inom varje tema har i olika arbetsgrupper kritiska frågor identifierats och rekommendationer för fortsatt arbete tagits fram. Alla rekommendationerna har tydliga adressater i form av internationella organisationer eller processer. Vid mötet enades man också om sju övergripande rekommendationer kring frågor som ansågs särskilt angelägna: Rekommendationerna förs nu vidare till de olika organisationerna.

Erfarenheterna från tidigare workshops är att rekommendationerna tagits upp i de olika organisationerna och resulterat i olika aktiviteter.

Denna rapport innehåller de allmänna slutsatserna liksom rapporterna från var och en av mötets sju arbetsgrupper. Föredragen som hölls under de gemensamma sessionerna återfinns på mötets hemsida; <http://www.saltsjobaden6.ivl.se/>. Förkortningsnyckel återfinns i Annex D.

Appendix

A: Advisory Board

- Markus Amann
- Jesper Bak
- Richard Ballaman
- Scott Brocket
- Sergey Dutchak
- Martin Forsius
- Hans Christen Hansson
- Hilde Fagerli
- Valentin Foltescu
- Jennifer Kerr
- Rob Maas
- John Munthe
- Krzysztof Olendrzynski
- Isaura Rabago
- Laurence Rouil
- Kimber Scavo
- Till Spranger
- Sergey Vasiliev
- Stefan Åström
- Christer Ågren
- Eli Marie Åsen

B: Saltsjöbaden VI Programme

Sunday 18 March

14.00 – 19.00

Early Career Workshop

Monday 19 March

09.30 – 11.30

Early Career Workshop

Monday 19 March

Saltsjöbaden Workshop

12.00

Lunch,

13.00

Opening

Karolina Skog, Minister of Environment, Sweden

Dagfinn Høybråten, Secretary General, Nordic Council of Ministers

13.25

Air pollution science

Chair, Peringe Grennfelt

Climate forcing of air pollutants (short-lived climate forcers, SLCFs), Annica Ekman, Department of Meteorology and Bolin Centre for Climate Research, Stockholm University

Health effects of particles and other pollutants – impacts of study methods and sources, Bertil Forsberg, Umeå University

Nitrogen – a global problem with many facets. Where are the solutions? Mark Sutton, Chair International Nitrogen Initiative (download)

Early Career scientists and policymakers, presentation of results from the preceding workshop

15.00

Coffee break

15.30

Air pollution policies

Chair, Anna Engleryd, Chair Executive Body CLRTAP

EU Commission, Francois Wakenhut, Head of the Clear Air Unit DG Environment

CLRTAP, Kimber Scavo, US EPA, Chair of the Policy Response Group

UN Environment, Soraya Smaoun, Air quality coordinator

UNECE, Zaal Lomtadze, Chief, Environment for Europe and Sustainable Development Section

WHO, Maria Neira, Director, Department of Public health

Arctic Council, Martin Forsius, Vice- chair, AMAP

16.30

Panel discussion

17.20

Planning of working groups

17.45

Reception,

Tuesday 20 March

08.30

Working Group Sessions

Working Groups

Clean Air for the Cities

Clean Air Globally – policy session

Clean Air Globally – science session

Clean Air for the EECCA countries

Clean Air – Ecosystems and Climate

Clean Air – Sectors and Solutions, shipping

Clean Air – Sectors and Solutions, wood

Clean Air – Sectors and Solutions, agriculture

19.00	Workshop dinner
Wednesday 21 March	
09.00	Summing up of the working groups
	Working group chairs and rapporteurs
	Each working group will have maximum 10 minutes
10.30	<i>Coffee break</i>
11.00	Workshop conclusions
	Rob Maas and Dominique Pritula
11.50 – 12.00	Concluding remarks
	Anna Engleryd

C: List of Participants

Aas	Wenche	NILU - Norwegian Institute for Air Research	waa@nilu.no
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D: Abbreviations

ACTRIS	The European Research Infrastructure for the observation of Aerosol, Clouds, and Trace gases.
AMAP	Arctic Monitoring and Assessment Programme, a working group under the Arctic Council.
AOT ₄₀	The accumulated amount of ozone over the threshold value of 40 ppb.
BACA	Batumi Action Plan for Cleaner Air.
BAT	Best Available Technique.
BIG-E	Batumi Initiative on Green Economy.
BREF	EU Best Available Techniques reference documents.
CAFE	Clean Air For Europe – The European Commission’s thematic strategy programme for air pollution 2001-2005.
CBD	Convention on Biological Diversity (UN).
CCAC	The Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants.
CEMS	Continuous Emissions Monitoring Systems (within shipping).
CIAM	Centre for Integrated Assessment Modelling under the UNECE Air Convention.
CSI	Clean Shipping Index.
DPF	Diesel Particle Filter.
EB	Executive Body of the UNECE Air Convention.
EEA	European Environment Agency.
EECCA	Eastern Europe, Caucasus and Central Asia.
EEDI	Energy Efficiency Design Index, (technical measure and aims at promoting the use of more energy efficient (less polluting) equipment and engines).
EGR	Exhaust Gas Circulation.
ELV	Emission Limit Values.
EMEP (SB)	European Monitoring and Evaluation Programme (Steering Body) under the UNECE Air Convention.
ESFRI	European Strategy Forum on Research Infrastructures.
ESI	Environmental Ship Index
EU	European Union.
GEIA	Global Emissions Initiative.
GMI	Global Methane Initiative.
GP	Göteborg Protocol under the UNECE Convention.
GUAP	Global Urban Air Pollution Observatory.
HELCOM	Baltic Marine Environment Protection Commission – Helsinki Commission.
HDV	Heavy Duty Vehicles.
HRAPIE	The “Health risks of air pollution in Europe” project.
ICOS	The European Integrated Carbon Observation System.
ICPs	International Cooperative Programmes under WGE.
IEA	International Energy Agency.

IGAC/ GEIA AMIGO	Analysis of eMissions using Observations (AMIGO) Scoping Meeting under Global Emissions Initiative (GEIA) under International Global Atmospheric Chemistry Project (IGAC).
IIASA	International Institute for Applied Systems Analysis.
ILC	The International Law Commission, established by the UN.
IMO	International Maritime Organisation.
INMS	International Nitrogen Management System.
IPCC	Intergovernmental Panel on Climate Change.
IUAPPA	International Union of Air Pollution Prevention and Environmental Protection Associates.
JRC	Joint Research Centre.
LDV	Light Duty Vehicles.
LNG	Liquefied Natural Gas.
MGO	Marine Gas Oil.
Minamata Convention	The Minamata Convention on Mercury.
NDC	Nationally Determined Contributions under the Paris Agreement (UNFCCC).
NECD	National Emissions Ceilings Directive (EU).
NGOs	Non-Governmental Organisations.
OECD	The Organisation for Economic Co-operation and Development.
OPSARCOM,	OSPAR Commission an organisation set up by the Convention for the Protection of the Marine Environment of the North-East Atlantic in order to administration the Convention's work.
OSP	On-Shore Power.
PM	Particulate Matter.
POP	Persistent Organic Pollutants.
PRTR	The Kyiv Protocol on Pollutant Release and Transfer Registers.
REMPEC	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea.
SCR	Selective Catalytic Reduction – SCR – NO _x Control Systems.
SDGs	Sustainable Development Goals.
SECA/NECA	Sulphur Emission Control Area and NO _x Emission Control Areas (Regulation under IMO).
SLCP	Short-Lived Climate Pollutants.
SSP	Shared Socioeconomic Pathway.
Stockholm Convention	The Stockholm Convention on Persistent Organic Pollutants.
TEEB	The Economics of Ecosystems and Biodiversity (hosted by UN Environment).
TFEIP	Task Force on Emission Inventories and Projections (UNECE Air Convention).
TFH	Task Force on Health under WGE.
TFIAM	Task Force on Integrated Assessment Modelling (UNECE Air

	Convention).
TFHTAP	Task Force on Hemispheric Transport of Air Pollution (UNECE Air Convention).
TFMM	Task Force on Measurement and Modelling (UNECE Air Convention).
TFRN	Task Force on Reactive Nitrogen under WGSR.
TFTEI	Task Force on Techno-Economic Issues (UNECE Air Convention).
UNEA	United Nations Environment Assembly.
UNECE	United Nations Economic Commission for Europe.
UNECE Air Convention	The UNECE Convention on Long-Range Transboundary Air Pollution, often named CLRTAP.
UNFCCC	United Nations Framework Convention on Climate Change.
WGSR	Working Group on Strategies and Review (CLRTAP).
WHO	World Health Organisation.
WMO	World Meteorological Organisation.

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Saltsjöbaden VI Workshop 2018

Air pollution is a global threat that requires international collaboration and coordinated actions for its solution. Several international organisations have highlighted the problem and are taking action. In order to meet future challenges and develop collaboration, an international workshop was held in Göteborg 19–21 March 2018. It was the 6th in the series of the so called “Saltsjöbaden workshops” and was attended by approx. 180 participants and 20 international organisations. It was organised by the Swedish Environmental Protection Agency and the IVL Swedish Environmental Research Institute with support from the Nordic Council of Ministers and in close collaboration with and support from the UNECE Geneva Convention on Long-range Transboundary Air Pollution. The workshop ended in a set of recommendations directed to actors and processes in order to facilitate and intensify future work.

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