

Annex I Questions to Subsidiary Bodies of the Convention for the Gothenburg Protocol Review

This annex gives a list of questions for subsidiary bodies of the Air Convention in the context of the review of the amended Gothenburg Protocol. Table 1 gives suggestions for the body responsible for answering the question with an indication of the timing for completion. Answers should refer to existing documents as appropriate, e.g. the 2016 scientific assessment of the Convention¹, the policy response to the 2016 scientific assessment of the Convention (ECE/EB.AIR/WG.5/2017/3 and Corr.1) and supplementary information to it (informal document no.6² of the fifty-fifth session of the Working Group on Strategies and Review), the trend reports from EMEP and WGE, and recent progress reports from the subsidiary bodies and the Parties³. Findings should be updated where needed in answering the questions. Where appropriate, new analysis may be required to answer some of the proposed questions. In this case, this new work should be flagged and could be added to the workplan. The questions refer to the whole UNECE region. Separate analysis could be undertaken in North America as appropriate.

The elements for consideration in the review are elaborated in the table below. The questions in the table are organized as follows. Sections 1-5 focus on the legal requirements of the review process as defined in article 10 (paras 2-4) of the present amended Gothenburg Protocol (GP), as well as some of the related additional elements that are listed in, the report of the 39th session of the Executive Body (ECE/EB.AIR/144, paras. 25-27), and those submitted as per Executive Body decision 2019/4:

- 1) Review of obligations in relation to emission reductions;
- 2) Review of progress towards achieving the environmental and health objectives of the Protocol;
- 3) Review of adequacy of obligations in attaining the environmental and health objectives of the Protocol;*
- 4) Evaluation of mitigation measures for BC emissions; and
- 5) Evaluation of ammonia control measures and consideration of the need to revise annex IX.

* Are the GP requirements sufficient to protect ecosystems and human health in 2020 and beyond? What long-term air quality and what impacts would be reached if all obligations of the GP were fully implemented by all parties to the Protocol (and by all Convention Parties, assuming ratifications by all Parties to the Convention)?

Section 6 of the table reflects the remaining additional elements.

In addressing the questions in the table below due consideration should be given to the possible short-term and long-lasting effects of the novel Coronavirus Disease (COVID-19) crisis on inter alia

¹ See Rob Maas and Peringe Grennfelt, eds., *Towards Cleaner Air: Scientific Assessment Report 2016* (Oslo, 2016); and United States Environmental Protection Agency and Environment and Climate Change Canada, *Towards Cleaner Air: Scientific Assessment Report 2016 – North America* (2016). Available at: www.unece.org/fileadmin/DAM/env/documents/2016/AIR/Publications/LRTAP_Assessment_Report_-_North_America.pdf.

² See http://www.unece.org/fileadmin/DAM/env/documents/2017/AIR/WGSR/INFORMAL_DOCUMENT_6_PRG_integrated_final.pdf

³ See i.a reports of the European Commission on progress of the implementation of the National Emission Ceilings Directive and the clean air outlook update; EEA status reports; and in-depth reviews of emission inventories; and the Canada-US Air Quality Agreement Progress Report (2016) – can likely use the 2018 version but at the time of writing it has not been published yet. Duplication of those efforts should be avoided. This would allow to focus the review more on other Parties (i.e. EECCA and West-Balkan)

emission levels and projections (including for the Gothenburg Protocol target year), environmental impacts, changes in activity levels, economic growth etc.

N°	Question	Who	Timing
1	Review of obligations in relation to emission reductions		
1.1	What is the status of meeting the 2020 emission reduction obligations by the parties ⁴	CEIP	Spring 2022
1.2	a. What is the quality of reported emission data by parties in terms of comparability, completeness, consistency, accuracy and transparency? ⁵ b. What are the uncertainties for key categories? c. What is the current coverage and quality of emission reporting for shipping? c. What are the key findings and recommendations of the stage 1, 2 and 3 reviews of the emission inventories reported by the EECCA and Balkan countries	CEIP, TFEIP	Spring 2021
1.3	How do updated and most recently reported emission estimates for the base year 2005 compare to the 2005 estimates listed in tables 2-6 of Annex II to the amended GP? For which pollutants and categories have Parties submitted an adjustment application between 2014 and 2020? What are the relative differences between reported totals and adjusted totals for these pollutants and categories for the historic years between 2010 and now?	CEIP, TFEIP	Spring 2022
1.4	a. What are the emission trends of the various pollutants from 2005-2018? b. What are the main causes of emission reductions? What is the contribution of climate / energy, transport and agricultural policies and measures? c. What are remaining large emission sources? d. What are key sectors with large reduction potentials, specifically in EECCA and Balkan countries?	TFEIP, TFIAM	Fall 2021 - Spring 2022
1.5	a. To what extent have best available technologies (BAT) and emission limit values and other technical provisions in annexes IV, V, VI, VIII, IX, X and XI been implemented by the Parties? b. Have Parties implemented additional or newer source-oriented measures? What are the contributions of these measures?	TFTEI, TFEIP CIAM, TFRN, Parties ⁷	Spring 2022

⁴ For EU MS: see the report from the European Commission on the progress made on the implementation of the NEC Directive (26 June 2020): see <https://op.europa.eu/en/publication-detail/-/publication/7199e9c2-b7bf-11ea-811c-01aa75ed71a1/language-en>

⁵ Check the in-depth-reviews of the emission inventories carried out by the European Commission under the NECD and carried out under the LRTAP convention (stage 3 review reports by CEIP): https://www.ceip.at/ms/ceip_home1/ceip_home/review_process/index.html

⁷ A questionnaire might be helpful to get the information needed. This was last done by TFRN on national ammonia code in May 2018. At the time, not many Parties were complying with their commitments.

	<p>c. Have Parties implemented other (non-technical or structural) measures that contribute in meeting the 2020 emission reduction obligations? What are the expected contributions of these measures in 2020 and beyond?</p> <p>d. What barriers have been identified by Parties and non-Parties to implement the obligations in the technical annexes?⁶</p> <p>e. What barriers have been identified by the Parties to meet the 2020 emission reduction obligations?</p>		
1.6	<p>a. Which ELV's and other technical requirements in the technical annexes are not up-to-date anymore?</p> <p>b. Which technical annexes should be adapted to better address key sectors in EECCA and Balkan countries?</p> <p>c. Where are the current technical annexes too detailed, complex and/or demanding?</p> <p>d. Which gaps or redundancies in technical annexes can be identified?</p>	TFTEI, TFRN	Spring 2022
2	Review of progress made towards achieving the environmental and health objectives of the Protocol		
2.1	<p>a. What are the observed and projected trends in air quality for ozone, SO₂, PM (species) and oxidised and reduced nitrogen?</p> <p>b. To what extent are these trends associated with emission trends in the region or dependent on transcontinental transport of air pollutants?</p> <p>c. What are the observed and projected trends in urban air quality? What is the contribution of long-range transport to air pollutant concentrations in cities? What is the distance to the WHO air quality guideline values (including to updated values, if available on time)?</p>	MSC-W, TFMM TFHTAP, TFIAM (EPCAC)	Spring 2021
2.2	<p>a. What are the observed and projected trends in deposition of reduced and oxidised nitrogen on land and waters (including marine ecosystems)?</p> <p>b. What is the change in exceedance of critical loads for acidification and eutrophication between 1990 and 2018/2019 in terms of percentage ecosystems with exceedances and accumulated excess, based on current critical loads⁸. What are projected changes?</p> <p>c. What is the change in water, soil and ecosystem quality indicators between 1990 and 2018/2019? What are projected changes up to 2030 and beyond?</p>	MSC-W WGE, ICP-M&M and other ICPs	Fall 2021
2.3	<p>a. What is the observed and projected trend in ozone exposure of the population above critical levels?</p>	WGE, TFH, ICP-V	Fall 2021

⁶ TFTEI used a questionnaire for EECCA countries to explore the barriers and the possible facilitating factors. Results are in the report of the 2019 Berlin workshop:
http://www.unece.org/fileadmin/DAM/env/documents/2019/AIR/Capacity_Building/BAT_workshop_2019/Report_on_EECCAWorkshop_2019_5.pdf

⁸ Possible additional question: if updated values for critical loads will be available on time to be considered for the review report that is to be delivered by December 2022, how and where will these updated values affect the exceedances?

	b. What are the observed and projected trends in vegetation risk of damage due to ozone (using various metrics)?		
2.4	a. What is the observed and projected trend in life years lost due to exposure to ozone, PM and NO ₂ ? b. What are observed and projected trends for other health metrics, e.g. morbidity?	TFH, CIAM	Fall 2021
2.5	a. What is the observed and projected trend in damage to materials and cultural heritage due to air pollution above critical levels and loads?	WGE, ICP-mat	Fall 2021
2.6	What has been the influence of improved atmospheric modelling (e.g. the higher spatial resolution) on the effectiveness of emission reductions for air quality improvement and deposition? Did this increase the challenge to meet environmental quality and health targets?	MSC-W TFHTAP	Fall 2021
2.7	Is the monitoring and modelling system of the Convention sufficient to observe, assess and project air pollution and its effects related to the Gothenburg Protocol in the UNECE region? If no, what are the main challenges and what is needed to meet them?	WGE, EMEP	Fall 2022
2.8	What are the expected impacts of new scientific findings on environmental and health effects assessments, e.g. on: - critical loads, - critical levels of ozone, PM, NO ₂ and NH ₃ - dynamic modelling of ecosystem recovery, - inclusion of marine ecosystems protection, ⁹ - interactions between air pollution, climate change, nitrogen fluxes and other stress factors for biodiversity (e.g. land use changes), - additional/new metrics on health, damage to crops, ecosystems and/or materials?	WGE	Fall 2022
3	Review of adequacy of obligations in attaining the environmental and health objectives of the Protocol		
3.1	a. What are the latest emission projections by the Parties, compared with the latest GAINS-scenarios, taking into account recent climate, energy and agricultural policies, new source legislations and latest updated emission inventories by the Parties? Will emission projections meet the Protocol obligations? ¹⁰ What would be the	CIAM, TFIAM, TFTEI, TFRN, TFEIP	Fall 2021

⁹ Given the lack of current expertise and knowledge on this issue within the WGE community, this question shall be addressed at a later stage when the review has assessed shipping and other relevant activities as important contributors, and as resources allow.

¹⁰ See the NECD reporting status 2020 from the EEA. While not taking into account inventory adjustments and effects of the CoViD-19 crisis, it indicates that the majority of EU MS and UK must make additional efforts to meet 2020 ERC's (NECD and thus also GP). <https://www.eea.europa.eu/themes/air/air-pollution-sources-1/national-emission-ceilings/national-emission-reduction-commitments-directive>
See the clean air outlook (impact assessment updates to track progress of the NECD) that IIASA has conducted in 2018 for the EU MS. A new update will be made available this year.
https://ec.europa.eu/environment/air/clean_air/outlook.htm. Section 7 of the 2018 report explores the

	<p>optimized emission reduction obligations, given the updated emission inventories and projections and the same gap-closure ambitions as used in the preparation of the revised Gothenburg Protocol?</p> <p>b. Are emission reduction obligations adequate for meeting long term environmental and health protection targets of the protocol? E.g. what will be the outcomes for ozone, PM-health risks and nitrogen deposition in 2030 and 2050?</p> <p>c. What are the best available emission projections for non-Parties to the revised protocol? Will these projections contribute to meeting long term environmental and health protection targets?</p> <p>d. Will implementation of BAT and emission limit values and other technical provisions set in the technical annexes be adequate for meeting long term environmental and health protection targets of the protocol beyond 2020? E.g. for ozone, PM-health risks and nitrogen deposition?</p> <p>e. What would be the contribution to meeting environmental and health protection targets if non-Parties to the revised protocol implemented BAT and the emission limit values and other technical provisions set in the technical annexes?</p> <p>f. What would be the impact of ambitious climate and energy measures in the long term (2030-2050)? What would be the impact of new policies and measures on biodiversity, bioeconomy, circular economy, nitrogen management etc.?</p> <p>g. What are the latest improvements of the GAINS model with respect to scenario development (i.e. cost updates)? What is the state of play of the GAINS model with respect to applied data for the EECCA and Balkan countries?</p>		
3.2	<p>What is the current contribution and will be the expected future contribution of emission sources outside the UNECE-region to ecosystems and health impacts in the UNECE region, in particular for ozone, PM (and BC)?¹¹</p>	TFHTAP. MSC-W	Fall 2021
3.3	<p>What is the projected future trend in methane emissions? What is the impact on ozone formation? In which regions and in which sectors outside the UNECE region is there potential for emission reductions that have a significant effect on reducing ozone effects in the UNECE region?</p>	TFHTAP. MSC-W	Fall 2021

improvements in health- and ecosystems impacts that can be expected from the implementation of the NEC emission reduction commitments, taking into account the overshoots in emission reductions that might result from the implementation of recent source-oriented EU legislation. For the non-EU countries and for international shipping, latest activity projections have been collected from various sources and recent emission control legislation has been introduced.

¹¹ E.g. see: Monica Crippa et al, Forty years of improvements in European air quality: regional policy-industry interactions with global impacts, Atmos. Chem. Phys., 16, 3825–3841, 2016, <https://doi.org/10.5194/acp-16-3825-2016>

3.4	What is the projected future trend in NO _x -emissions from shipping? What is impact on ozone formation and nitrogen deposition? What and where is the potential for emission reductions that have a significant effect on reducing ozone effects in the UNECE region?	TFHTAP, MSC-W	Fall 2021
3.5	a. What will be the costs of additional (air pollution) measures in the UNECE region that would not exceed the external costs of inaction, with due consideration of synergies and other interactions with and more cost-effective measures potentially available in other policy areas (e.g. climate, energy, nitrogen management, ...)? b. In which sectors can such measures be found? c. What are the best available non-technical measures, what policy instruments are effective to trigger behavioral change and what can such measures contribute to environmental and health improvement?	TFIAM, CIAM, TFTEI	Fall 2021
3.6	Are additional local air quality measures sufficient and cost-effective to reduce health risks or strive towards WHO air quality guideline values (or to strive towards updated WHO values, if available on time)?	EPCAC/TFIAM	Fall 2021
4	Evaluation of mitigation measures for BC¹² emissions		
4.1	What is the current coverage and quality of BC (EC and OC) emission reporting?	CEIP, TFEIP	Spring 2021
4.2	a. To what extent have the measures implemented to meet the emissions reduction obligations for PM contributed to reduce BC and PAH emissions (see art 2(2) of the amended GP on prioritization). b. What are projected trends in BC and PAH-emissions? c. What is the contribution of residential solid fuel burning to BC and PAH-emissions? ¹³ d. Which additional PM-measures (technical and non-technical) are also effective for reducing BC and PAH-emissions? ¹⁴ e. What are best available techniques to reduce BC emissions? f. What would be appropriate definitions and calculation methods (emission factors) for BC and the condensable part of PM?	TFTEI, TFIAM, CIAM	Spring 2021
4.3	The formation of condensables is currently not fully included in PM-exposure. What is the contribution of condensables to the population exposure and what are associated health impacts if these can be established separately?	MSC-W, CIAM	Spring 2022

¹² BC is considered to cover both elemental carbon and organic carbon (including PAH)

¹³ See the Code of good practice for wood-burning and small combustion installations (ECE/EB.AIR/2019/5) prepared by TFTEI.

¹⁴ A TFIAM/TFTEI Guidance Document on Prioritization of PM sources is foreseen (ECE/EB.AIR/2019/1 workplan 2020-2021).

4.4	What will be the impact of the inclusion of condensable particles in PM reporting for residential heating on the national emission trends and on the importance of the residential heating sector? What will be the effect of the inclusion of condensable particles on the effectivity of abatement measures? What PM emission reductions will be achieved between 2005 and latest reported year based on the inclusion of condensable particles in PM reporting compared to its non-inclusion?	CEIP, CIAM, TFTEI	Spring 2022
5	Evaluation of ammonia control measures and consideration of the need to revise annex IX		
5.1	What are the main barriers to effectively reduce ammonia emissions and implement annex IX or existing Guidance Documents? What barriers exist for non-Parties?	TFRN	Spring 2021
5.2	a. What are best available control measures to further reduce NH3 emissions? b. Which elements of Annex IX and guidance Documents need to be updated?	TFRN	Spring 2021
5.3	To what extent will new agricultural or integrated nutrient management policies (e.g. the EU 'Farm to Fork' strategy and the reform of EU agricultural funding policies (CAP reform)) contribute to NH3-emission changes?	TFRN	Spring 2022
5.4	a. What is the potential for dietary change? b. What environmental and health benefits are associated with dietary change? c. What policy instruments are available to change diets?	TFRN, WGE	Spring 2022
6	Additional inputs for the review		
6.1	a. Are current flexibility provisions adequate and/or effective for ratification and implementation (focus on EECCA and Balkan countries) b. What new flexibilities and/or approaches would potentially help non-Parties to move towards ratification and implementation? c. What are other options for achieving emission reductions (in lieu of technical annexes?)	WGSR	Fall 2022
6.2	a. Are key articles on inter alia objectives, reporting obligations and amendments still fit for purpose? b. Do articles 4 (exchange of information) and 8 (research development) adequately address international cooperation and integrated environmental policy as indicated in the updated Long-term Strategy?	WGSR	Fall 2022
6.3 ¹⁵	a. What are the (best) available emission abatement technologies and measures for the reduction of methane emissions from key sources?	TFTEI, TFRN, TFIAM, WGSR, WGE	Spring 2021 (a., b.)

¹⁵ Check i.a the EU strategy on methane focusing on reducing methane emissions in the energy, agriculture and waste sectors (see https://ec.europa.eu/energy/topics/oil-gas-and-coal/methane-gas-emissions_en), its

	<p>b. What is the contribution of implemented and new climate measures on the reduction of CH₄ emissions?</p> <p>c. What is the projected future trend in methane emissions and subsequent improvements in air quality, human health effects and ecosystems impacts?</p> <p>d. How could methane be addressed in a future instrument?</p>		Spring 2022
6.4	Which guidance documents require an update in view of new available information, new emerged challenges and in view of further contributing to meet the long term environmental and health targets of the protocol? What new guidance documents are needed?	WGSR, TFTEI, TFRN, TFIAM, WGE	Spring 2022
6.5	What are the policy implications of including condensables in PM-reporting? Implications include ability to report and compliance.	WGSR	May 2021