
Airport Charges and Environmental issues and considerations

1. Background

- 1.1 The Airport Charges Directive sets common principles for the levying of airport charges at European Union (EU) airports. As stipulated in Article 3 of the Directive, airport charges should not discriminate among airport users and may be modulated for issues of public and general interest, including environmental issues. The criteria used for such modulation shall be relevant, objective and transparent.
- 1.2 The goal of the policy roadmap set as a priority and announced by the European Commission at the end of 2019, as the European Green Deal¹ for the European Union (EU), is to make Europe climate neutral by 2050. The Commission's proposal, as a response to climate and environmental related challenges by mainstreaming sustainability in all EU policies, prioritizes objectives that foster economic development through green technology, such as hydrogen and fuel cells, establish sustainable industry and manufacturing whilst also reducing pollution. In December 2020, the Commission also presented its Sustainable and Smart Mobility Strategy together with an Action Plan².
- 1.3 The Thessaloniki Forum of Airport Charges regulators is tasked with 1) working on and making recommendations for a better common implementation of the Directive 2009/12/EC on Airport Charges (the "ACD") and 2) promoting best practices in economic regulation of airports³. The ACD requires Member States to assign responsibility for supervising the setting of airport charges to Independent Supervisory Authorities⁴ ("ISAs").
- 1.4 In this paper, the Forum provides an overview of airport charges variations for environmental objectives and provides recommendations on principles for relevant, objective and transparent variation for issues of environmental interest, specifically CO₂ⁱ emissions-related, noise-related, NO_xⁱⁱ emissions-related, charging schemes modulated and other types of environmental variation of charges. The paper also considers cost relatedness in the context of environmental variations, the consultation process, and the possible assessment of the impact, such as societal or other benefits.
- 1.5 This paper has been produced by the 2020 Working Group of the Thessaloniki Forum of Airport Charges regulators, taking into consideration the views of the airport and airline communities. The ISAs who participated in the preparation of this paper are

¹https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

² https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2329

³ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0012&from=EN>

⁴ Throughout this document: '**Airport**' refers to the Airport Managing Body or The Airport Authority. User or Airline refers to airlines operating or planning to operate at the airport during the period in which the charges being consulted on will be applicable (airlines planning to operate should formally notify the airport of this intention prior to the consultation). '**ISA**' refers to the **Independent Supervisory Authority** referred to in the Airport Charges Directive 2009/12 and designated by the individual Member State.

those of Austria, Denmark, Finland, France, Germany, Greece, Ireland, Portugal and Slovenia.

- 1.6 This report has been adopted by the Thessaloniki Forum in January 2021.

2. Caveats

- 2.1 The recommendations do not represent the views of the European Commission and do not in any way change the requirements of the ACD.
- 2.2 The scope of this paper does not include arriving at a position on whether the ACD should be reviewed or that environmental variation of airport charges should be mandatory, or in the contrary, restricted.
- 2.3 This report should not be used as a limitation or constraint for Member States to apply their own methodologies when circumstances, regulation or other causes recommend it.
- 2.4 These recommendations will be kept under review and changed as and when deemed necessary by the Thessaloniki Forum.
- 2.5 These recommendations are mainly issued from existing international principles and observed practices. It may be considered desirable for this work to be further expanded to include ex-post studies on the actual effect of environmental variations.

3. Principles for a relevant, objective and transparent variation for issues of environmental interest

General principles

- 3.1 The Airport Charges Directive notes two types of variation of Airport Charges: modulation and differentiation. While the ACD does not explicitly define these terms, it does set out their respective purposes with regard to pricing. Article 3 of the ACD states that the modulation of airport charges is *“for issues of public and general interest, including environmental issues”* while Article 10, states that *“the level of airport charges may be differentiated according to the quality and scope of such services and their costs or any other objective and transparent justification”*.

In 2018 the Thessaloniki Forum published a paper on the topic of non-discrimination under the ACD.⁵ That paper sets out best practice and principles for assessing whether a given variation in the levels of airport charges⁶ payable should be considered

⁵<https://www.aviationreg.ie/fileupload/Incentives%20and%20Discounts.pdf>

⁶ACD, recital, par.10, The ICAO Council has considered that an airport charge is a levy that is designed and applied specifically to recover the cost of providing facilities and services for civil aviation, while a tax is a levy that is designed to raise national or local government revenues which are generally not applied to civil aviation in their entirety or on a cost-specific basis.

justifiable as non-discriminatory in accordance with the ACD. A variation must be justifiable in a way which is relevant, objective, and transparent.

For ease of reference, the key recommendations and definitions from that paper are restated here:

The Forum recommended that ISAs may use the following definitions of each criteria:

Relevant: The factors set out are applicable to the circumstances in question. They are factors that should be rightly taken into consideration in justifying varied charges.

Objective: The relevant factors have been assessed in a fair, balanced and repeatable way.

Transparent: The reasons and analysis underlying the charging strategy and the level of charges are clear to all so that users can establish if there is a justifiable complaint. The justification and criteria are made obvious and bear scrutiny in all elements, including any Terms and Conditions attached to elements of the strategy.

- 3.2 An airport's '*Charging Strategy*' encompasses all elements that could affect airport charges, including the menu of charges, any rebates or discounts, incentive schemes, Service Level Agreements or bilateral contracts (where allowed).

The ACD notes two ways in which airport charges may vary under a given Charging Strategy: modulation (Article 3) and differentiation (Article 10). In many cases, these concepts overlap; what one airport might refer to as modulation, another might refer to as differentiation, while a third may term it an incentive scheme. Thus, the Forum refers to 'Variation', which refers to any such elements of a Charging Strategy in a non-specific way. A particular variation may be justifiable in different ways.

Article 3 allows modulations of airport charges for issues of public and general interest including environmental issues. A grounding in stated government policy is recommended⁷ in order to justify an element of a Charging Strategy on the grounds of public or general interest under Article 3. It is not the role of the ISA to aim for environmental objectives without any explicit instruction to do so or to monitor whether airports are sufficiently compliant or effective in this regard. Rather, it is the role of the ISA to consider whether a charging variation is justifiable under the ACD.

⁷As already defined in 2018 Thessaloniki Forum Paper, "*Non-Discrimination under the Airport Charges Directive*", par.4.3 A grounding in stated government policy is required in order to justify an element of a charging strategy on the grounds of public or general interest under Article 3. Beyond this, it is for individual ISAs to determine the allowed scope of Article 3 based justifications, such as whether a grounding in any government policy is sufficient or whether it must relate specifically to an element of government aviation policy.

The validity in principle of the justification for a variation is therefore for assessment by the ISA, on a case-by-case basis. Cost-relatedness is one potential justification under Article 10. Other justifications under Article 10 might relate to the quality or scope of services provided, or any other objective and transparent justification, incentivising efficient behaviour or utilisation of infrastructure (such as an off-peak discount).

In general, it is necessary but not sufficient for a particular variation within a Charging Strategy to be justifiable in principle under the ACD.

- 3.3 The Forum considers that the question of whether a variation is justifiable on the grounds of environmental factors is a sub-set of whether a variation is justifiable more broadly under the ACD. Thus, the broader recommendations set out above also apply to this more specific area of the environmental variations.
- 3.4 As one of the main aims of the ACD is to protect airlines from the possible abuse of a dominant position by airports, the assessment of an environmental variation boils down to balancing any possible negative consequences on competition between airlines against the strength of the justification provided, including the assessment of the proportionality and effectiveness of the variation in meeting the stated objectives.
- 3.5 As far environmental factors are concerned, it is noted that possible positive effects of environmental variations are mostly external. This means that they do not in general, directly benefit airport users, but for example local residents or the society as a whole. In some cases, legislation has internalised parts of some external costs, e.g. where noise insulation program costs are mandated on the airport by local authorities.

It is common practice in market regulation that measures restricting competitions are assessed by asking whether the users sufficiently benefit from the measures. As this is commonly not the case with environmental measures related to airport charges (since they address negative environmental impacts, which normally are not a cost factor for an airline operator and primarily benefit others), in the Forum's view, the following criteria are relevant in the assessment of environmental variations:

(1) the variation is aimed to prevent or restrict evident damage to the environment and

(2) the variation contributes efficiently to the compliance to a clear international or national principles and/or policies preventing environmental damage.

Specific Principles for Environmental Justifications in economic oversight

- 3.6 Variations associated with environmental factors should be economically neutral in terms of revenues. Revenue neutrality is treated in more detail in chapter 6 of this paper.
- 3.7 Variations should be effective in achieving any intended outcome, which should be

clearly defined by the airport. Where relevant, the targeted outcome should be clearly set out as part of the justification for a variation, together with evidence as to how the variation is likely to achieve the outcome in a proportionate way. In the longer term, it is key to investigate if that the incentives created generate proportionate changes in decision making or behaviour of the relevant parties. If such a variation cannot be shown to have likely made the desired impact or any impact at all, it is doubtful if that it can continue to be considered valid under the ACD. To the knowledge of the authors no studies of this type has been conducted.

In some jurisdictions the ISA can consider variations to be justified if the variation is related to the environmental effects. The charges should be higher for airport users that cause higher negative environmental externalities compared to airport users with lower negative environmental externalities. In other words, variations should be in accordance with the polluter pays principle.

- 3.8 There should be a coordinated approach with the existing policies at an airport to the creation of environmental incentives. The environmental variation should also be considered in the context of the broader charging strategy to consider the impact, if any, that other aspects of the charging strategy have on any incentive which the environmental variation is seeking to provide. For example, charges may be varied based on government policy, however if there is already applicable government policy or taxation related incentives, this may be taken into account when considering/adjudicating on a charging variation.

In particular, it is important to avoid unintended or un-assessed duplication or counterbalancing of incentives arising from an airport's charging strategy combined with other aspects of policy, meaning that the incentives weaken the relative impact of each other or even cancel each other out. Furthermore, a variation could give rise to unintended consequences, if not assessed properly. For example, one aircraft may be preferable on the basis of one environmental metric (such as noise), but perform poorly on another (such as emissions).

⁸These trade-offs are addressed in environmental standard setting. Furthermore, environmental charges could improve the cost-competitiveness of operating more environmentally friendly aircraft relative to less environmentally friendly aircraft. Airport charges variation gives a complementary signal to aircraft manufacturers which, combined with other environmental charges and broader incentive mechanisms, have the potential to efficiently guide technology development if correctly calibrated.

⁸ Additionally, a certain degree of emission or noise "leakage" occurs: modern aircraft used across EU are much less noisy than previous generations of aircraft. However, the latter are still flying in other parts of the world, leading to higher noise-pollution levels there. On the other hand, environmental charges in Europe (and other factors) incentivised the industry to produce aircraft which are better from an environmental point of view. These aircraft can now also be bought in other parts of the world. The same could apply with the introduction of CO2 emissions-related charges within the EU. Less efficient aircrafts could simply be moved to other continents and fly there.

Environmental Justifications under Articles 3 and 10 of the ACD for charges variation

- 3.9 The ACD does not set any specific provisions related to environmental variation. It has been left to the Members States to decide and implement any criteria to be applied in addition to general conditions set in the ACD.
- 3.10 As set out in the 2018 paper on Non-Discrimination, there might be an overlap between modulation and differentiation. The Forum therefore recommended that charging strategies be assessed in the same way regardless of the categorisation. As part of that assessment, the Forum recommended that charging strategies be assessed based on the validity of the justification provided with reference to either Article 3 or Article 10.
- 3.11 For the purposes of this paper, the Forum considers it helpful to distinguish between two types of environmental variations:
- Type 1: Variations which relate to a specific issue at the airport in question, such as noise and emissions from aircraft on the ground or in the Terminal Manoeuvring Area (TMA) that affect the local environment.
 - Type 2: Variations which do not specifically relate to the airport in question, but rather relate to broader environmental issues such as CO₂⁹ emissions from aircraft in operation.
- 3.12 For a type 1 variation, there is a range of potential justifications which could be made with reference to Article 10. For example, noise related variation may simply be cost-related, if the airport is or would be required to implement noise abatement measures, which come with an associated cost with this cost being passed to airport users in a varied way on the basis of the 'polluter pays' principle. Indeed, this approach can be justifiable by the fact that the associated cost is more attributable to specific users than to others, thus considering the mitigation measures as a specific differentiated service offered by the airport. Such a variation can also be justifiable under Article 3, if it aligns with policies for public and general interest.
- 3.13 Type 2 variations are more complex and primarily justifiable under Article 3 ACD only. A type 2 variation is unlikely to be justifiable under article 10. In the absence of any mechanism whereby airports are charged directly in relation to emissions produced by airport users, variation which relates to broader environmental issues would not be (airport) cost related.
- 3.14 The questions of cost relatedness and revenue neutrality for both type 1 and type 2 variations is treated in more detail in chapter 6 of this paper.
- 3.15 There are a range of mechanisms which are in place, or available to be put in place, to seek to address broader environmental issues. These include International Civil Aviation Organization (ICAO) standards for noise and engine emissions standards

⁹ Note that depending on the specific circumstances at a given airport NO_x might be most appropriately considered either a Type 1 or Type 2 issue.

including CORSIAⁱⁱⁱ, Carbon Offsetting Reduction Scheme for International Aviation the EU Emissions Trading Scheme (ETS^{iv}), and state taxation measures. In some cases, these mechanisms may be more effective than airport charging strategies at addressing the aviation sector's environmental issues in a coherent way. It has to be noted that ICAO technical regulatory limits are always set on existing technology (backwards looking) and environmental charges might provide incentives for products, which perform considerably better than what is required by regulation. The Forum however considers that there is a higher risk of incentive or policy misalignment in the case of type 2 variations. In this regard, the Thessaloniki Forum recommends that ISAs take into account any relevant overlapping regulations (e.g. EU ETS and ICAO CORSIA) or international agreements (e.g. ICAO) if assessing environmental variation of charges.

- 3.16 This does not mean that airport charging strategies should never be used to create incentives in relation to broader environmental issues. However, the Forum suggests that a narrower range of justification is appropriate. Specifically, the Forum suggests that type 2 variations are likely to be justifiable under Article 3 ACD only, where this direct action on the part of airports clearly fits in an overall stated government policy approach in this area.

Development of Environment Related Infrastructure

- 3.17 The development of appropriate infrastructure is a key way for airports to address or mitigate the impact of environmental issues.
- 3.18 The extent to which ISAs are involved in assessing the efficiency or desirability of infrastructure programmes varies across different Member States and airports. Some carry out a full assessment of capital investment programmes and effectively have the final say in whether a project can proceed, and at what cost, while others have no role in relation to decisions around infrastructure development. However, these investments are ultimately paid for by airport users through airport charges. Therefore, where an ISA is carrying out an assessment of environmental project, the Forum recommends that it do so as set out below.
- 3.19 Broadly, projects which have an associated environmental aspect can be divided into three categories:
- Projects which are required to directly meet environmental regulations (for example, ensuring that pollution limits in local river basins will not exceed mandated limits). In such cases, it is sufficient to assess that the project is efficiently scoped and costed. It is important to verify, however, that any claims made, relating to the specific requirements of such regulations, are accurate.
 - Projects which have an environmental element but the primary purpose is not environmental; rather the environmental aspect is an intrinsic aspect of the broader project and does not stand alone. An example would be the costs

associated with a house buyout scheme. In this case it is necessary to firstly verify that addressing the specific issue is necessary/proportionate and intrinsic to the main project, and then consider this aspect as part of the overall project, assessing for any scope/cost inefficiency.

- Projects, or aspects of projects, where the primary purpose is environmental (or at least the environmental aspect stands alone), and this is not directly required to meet any regulations. Examples would be the replacement of light fittings with low energy LED fittings, projects to recycle or reduce waste of water, or the development of a photovoltaic farm on the airport campus to provide renewable energy. The starting point in this scenario should be to request and validate a business case for the project or the environmental aspect of the project. The business case for environmental projects can be viewed more flexibly than might be the case for certain other types of projects; for example, positive externalities and/or alignment with broader environmental policy, for the airport or for the aviation sector more broadly, might be relevant when considering the business case for such a project.

4. Case studies of airport charges variation for environmental objectives

- 4.1 With respect to the variation of airport charges for environmental reasons, a differentiated practice exists in the Member States. Not all airports currently apply variations on airport charges for environmental objectives (e.g. noise, NO_x, CO₂). Nevertheless, numerous cases of different environmental schemes are applied. A combination of an environmental charge and a charge dependent on MTOW is also possible.
- 4.2 In general, it can be said that the variation of take-off and landing-charges according to aircraft noise (noise-related charges) and aircraft engine emissions (emission-related charges) are established in various European airports. While aircraft noise has an impact at the local level, aircraft engine emissions have an impact on both the environment and regional air quality on a local level (NO_x, SO_x, HC, PM^{vi}) and at the global level (CO₂, SO_x, PM, NO_x).
- 4.3 Where environmental variation of airport charges is in place, aircraft movement charges (landing, takeoff) focus on the local impact of noise and emissions at individual airports. Variations of airport charges are currently being used to address local environmental impacts at airports, due to local policies and requirements. Global environmental impacts, notably CO₂ emissions from aircraft, are not directly related to airport local environmental impacts and are addressed at the global level e.g. through the ICAO CO₂ standard for aircraft, ICAO's CORSIA Standard, the ICAO action plans on CO₂ emissions reductions. Additional measures have been implemented at European level through, notably, EU ETS and initiatives for Sustainable Alternative Fuels (SAF).
 - a. Noise-related charges

Noise-related charges were introduced in the late 1970s and have constantly been adjusted since then in order to seek to induce airlines to use quieter aircraft. At some airports, noise-related charges are an essential part of the Charging Strategy.

The complexity in the design of noise-related charges varies according to local circumstances and requirements. Noise-related charges may vary also according to local Authorities' regulations, which may forbid night flights and may incentivize flights in off-peak period (daytime). Thus, there is no "one size fits all solution" to noise-related charges. Airports and ISAs across Europe have therefore taken different approaches to the issue.

The most basic forms of variations are surcharges or rebates depending on the classifications of aircraft types according to their noise categories¹⁰. When the noise categories were introduced, airports could easily encourage the use of quieter aircraft and/or discourage the use of noisier aircraft. Airports still use it as a basic form of variation, often in combination with more advanced types of variation of charges.

Alternatively, airports may use noise certification data for variation of noise-charges. Standardized noise certificates can be taken from different databases¹¹ and aircraft can then be easily put into different noise categories. The advantage relative to the simple use of ICAO noise-categories is a fine differentiation between different aircrafts and the use of an enlarged number of noise categories to better reflect local circumstances.

Most advanced noise-based charging systems use actual noise measurements to modulate noise charges. Generally, airports use an average of several measurements of aircraft noise to put them into different noise categories. The number of noise categories and the spread of noise level between the different noise categories is subject to different factors such as the overall level of noise-pollution, aircraft fleet mix and noise allocation over time. Airports with a broad mix of different aircraft, or airports which are geographically located near urban areas usually have more noise-categories to offer an incentive to the use of marginally quieter aircraft for each category of aircraft. Noise requirements at airports are also sometimes based on national noise restrictions, therefore the application and methodology for measuring/estimating as well as the categorisation of noise levels may also vary between member states and/or airports.

The use of a single measured event (take-off and/or landing) would involve defining variations for noise charges on the basis of noise measurement of the event. A disadvantage is the potential for external noise to interfere with the measurement, and in such a case the measurement is not reliable. For this reason, we are not aware of this approach being used in practice at Community airports. Airports may also use the ACI World Noise Rating Index (NRI)¹² to define variations for noise charges, recognizing that the variation needs to be appropriate for the specific local objectives

¹⁰ ICAO Annex 16, Chapters 2, 3, 4 and 14

¹¹ ICAO classifications on aircraft types and noise categories (ICAO Annex 16), EASA database of certification noise levels containing all approved aircraft configurations.

¹² NRI is not in widespread use in Europe.

desired. NRI may be used as single form of variation or in combination with noise-certification or noise measurements. NRI is especially designed to incentivise the use of marginally quieter aircraft in each category of aircraft.

Regardless of whether the variation is based on measurements or certificates, the system may also include differentiation by time of day to particularly disincentivise the use of noisy aircrafts for night flights. The differentiation is usually done by night surcharges or peak period pricing. While noise-related charges intend to lower the overall level of noise by incentivizing airlines to use quieter aircraft, night surcharges are especially designed to tackle noise issues in the most sensitive time periods.

b. NOx emissions-related charges

NOx emissions-related charges were first developed and introduced in Switzerland and Sweden in 1997/1998. In 2003, the original NOx classification scheme was further developed and harmonised with the publication of the ECAC recommendation ECAC 27/4 "NOx Classification Scheme for Aircraft", which has been introduced at various European airports since then. In Switzerland and Sweden, the original models have been changed to the harmonised ECAC 27/4 scheme. In Germany the introduction started in 2008 as a pilot project under the supervision of the Ministry of Transportation at the two biggest airports Frankfurt (FRA) and Munich (MUC) and soon after it was implemented at a large number of airports within Germany.

With respect to NOx, emission charges four Member State authorities stated at the time of this Paper, that NOx-related charges are being levied. In three of those four Member State's airports, noise-related charges are also being levied.

The use of the ECAC 27/4 Recommendation is internationally recognised and has proven useful in this context. An independent and central database was set up and is currently operated by the German Airspace Center (DLR) and financed by the German Airport Association (ADV). This database includes engine data of all aircraft landed at German airports using NOx emissions-related charges.

c. CO2 emissions-related charges

None of the Member State authorities stated at the time of publication of this Paper, that airport charges directly related to CO2 emissions are being levied or calculated on the basis of CO2 emissions.

At this time, the only charging mechanism related to climate change in place is at Stuttgart (STR). The airport has introduced a discount for aircraft using a certain percentage of alternative-fuels¹³ or electric powered flying not only intended to

¹³ As alternative fuels can be referred the bio-based aviation fuels obtained from sources other than petroleum, such as woody biomass, hydrogenated fats and oils, recycled waste or other renewable sources.

In the STR-Charges Regulation exists the following definition (Page 31): "Alternative aviation fuel is admixable kerosene which, according to the certified calculation methods for the specific reduction of greenhouse gases defined in the Renewable Energy Directive RED II of the EU, permits a reduction of at least 60% relative to the replaced quantity of fossil kerosene and was produced with the aid of hydrogen produced from renewable energy and a renewable carbon source (e-Kerosin/re-Fuel). A renewable carbon

reduce CO₂-emissions but also to send a signal to industry and politics to further research and develop the use of alternative fuels in aviation but also increase the production of alternative fuels on an industrial level.

d. Other

Apart from the parameters cited above (noise, NO_x, and CO₂), no other parameters in EU member States serve at the time of publication of this Paper as a basis for the variation of airport charges for environmental reasons.

5. Discussion on CO₂ emissions-related, noise-related, NO_x emissions-related, landing charging schemes modulated and other types of environmental variations of charges

a. Noise-related charges

The Forum suggests that noise related and other type variation of airport charges, should be designed revenue neutral, as discussed in Section 6 of this paper.

In some states, there may be also noise-charges outside the airport cost-base and thus the scope of this paper, which are not recovered through airport charges. These independent and fully separate noise-charges are used to fund the costs of specific noise abatement measures in the local area, such as noise insulation in homes. These specific noise-charges are usually fully used or refunded to the airlines.

b. NO_x emissions-related charges

For many years, NO_x emissions-related charges have been levied at some Swiss and Swedish airports only. When introduced at London-Heathrow, this sent a first signal of broadening the scope of such charges. The subsequent introduction of NO_x emissions-related charges at many airports in Germany within a very short time sent a further signal of strengthening the environmental component of airport charges in general. This also holds true for other types of environmental variation of charges.

Noise and NO_x emissions-related modulated landing charges may be used simultaneously where justifiable under the ACD in line with the principles outlined above. Where both are in effect, NO_x emissions-related charges usually have a smaller share in airport Charging Strategies than noise-charges. In any case it is key that the simultaneous use of two types of variations remains sufficiently simple to be readable and thus send a clear price signal. Depending on their geographical position, airports may face a lot of pressure from local communities.

But there can also be trade-offs between noise, NO_x- and CO₂-emissions in certain

source is defined as carbon dioxide from air and unavoidable carbon dioxide emissions (cement production, etc.) as well as processes for the use of residual materials or biomass that do not compete with food production."

<https://www.flughafen-stuttgart.de/media/306384/airport-charges-stuttgart-airport-valid-from-1st-of-july-2019.pdf>

aircraft engines¹⁴. This leads to a conflict in goals, as explained above, in 3.8.

c. CO2 emissions-related charges

There is no standard for CO2 emissions-related charges on global, European or national level. ICAO defines two areas for the use of charges for the purpose of environmental protection: aircraft noise and aircraft engine emissions. Aircraft engine emissions have an impact on the environment on local air quality (LAQ) and globally. At the global level, ICAO's policies are in favour of using mechanisms other than charges¹⁵. This aligns with the view of the Forum, where we discuss 'Type 2' variations above.

Climate protection is already tackled by emissions trading (ETS) in the EU and the global climate protection instrument CORSIA. By taking CO2 emissions into account in airport charges, there would be more focus on climate protection in charging strategies. On the other hand, additional contribution could also come from the (mandatory) use of alternative fuels and technical innovations, not local charges.

It is not finally clear, if variation of landing charges according to CO2-emission could have a significant positive effect on the global goal of avoiding CO2-emissions. Locally introduced CO2 emissions-related charges might disincentivise the use of certain aircraft at a certain airport but might not lead to a significant reduction of global CO2-emissions as these aircraft could simply fly somewhere else. CO2-emissions are not limited to local boundaries. Nevertheless, in the longer term, airlines could potentially increase their focus on reducing CO2 emissions of aircraft they are using. Further investigation on this topic is needed. Actions also by airports for their own CO2 footprint could be included in the airport cost base and assessed by the ISAs for the efficiency of the investments proposed. It is noted that the overall goal of decarbonising aviation is at the core of ReFuelEU initiative¹⁶ that aims to incentivise the development and use of sustainable alternative-fuels instead of conventional / kerosene jet fuels.

Any CO2 emissions-related charges variations would need to take into account NOx emissions, since there can be trade-offs between noise, NOx - and CO2- emissions in certain aircraft engines. In any event, any such CO2-based variations would need to comply with the requirements of the ACD, in particular objectivity and non-discrimination.

¹⁴ ACI, Information on the use of modulations of airport charges for environmental reasons, June 2020, 2.3.Reference: „Inter-dependencies between emissions of CO2, NOX & noise from aviation“, Sustainable Aviation (2017): <https://www.sustainableaviation.co.uk/>

¹⁵ [https://www.icao.int/environmental-protection/Documents/ICAO-ENV-Report2019-F1-WEB%20\(1\).pdf](https://www.icao.int/environmental-protection/Documents/ICAO-ENV-Report2019-F1-WEB%20(1).pdf)

¹⁶ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12303-Sustainable-aviation-fuels-ReFuelEU-Aviation>

6. Discussion on the cost relatedness of environmental variations, the consultation process, the possible assessment of the impact, such as societal or other benefits and the international coordination of charging schemes

Discussion on the cost relatedness of environmental variations

- 6.1 Airport charges are designed to recover the cost of facilities and services provided by airports (ICAO Council - 9082). Article 2 of the ACD defines an «*airport charge*» as «*a levy collected for the benefit of the airport managing body and paid by the airport users for the use of facilities and services, which are exclusively provided by the airport managing body and which are related to landing, take-off, lighting and parking of aircraft, and processing of passengers and freight*». Airport charges should thus be cost related. The cost-relatedness principle states that airport charges should be set “in a reasonable relation to the cost of the facilities and services provided (...)”¹⁷
- 6.2 Cost-relatedness may apply at different level of granularity¹⁸. Although varying individual aviation charges to reflect cost is a valid justification, from an economic point of view, they can be varied on the basis of other justifications, provided the overall cost system is cost-related. The principle of revenue neutrality of environmental charging variations implies that a charging strategy which includes variation on environmental grounds should generate the same ex-ante total revenues as a charging strategy which does not include such variation.
- 6.3 Type 1 variations should always be revenue neutral. On cost-relatedness, at a minimum the overall charging strategy must be cost-related. The environmental variations within that charging strategy may or may not be specifically cost-related themselves, as explained in footnote 18. Thus the impact of a type 1 variation on the principle of cost relatedness of the individual aviation charges will vary from case to case: it might make them either more or less cost related.

Examples of direct costs are investments for noise mitigation, or systems implemented to control for water pollution. The cost of such investments can be covered by a variation of charges, designed so that these charges do not generate income above the incurred costs.

- 6.4 If a variation has to be revenue neutral to the airport, it is not possible for the airport to set higher charges for all levels of emissions, thereby internalizing all negative externalities. To make the variation revenue neutral, charges for higher levels of emissions always have to be combined with lower charges for lower emissions. Therefore, a type 2 variation, as referred to in Section 3, will not properly internalise the negative environmental externality created by the industry while remaining

¹⁷ https://ec.europa.eu/commission/presscorner/detail/en/IP_97_339

¹⁸ for example, in some cases it may be a justification for variation under article 10 of the ACD, in individual aviation charges or bundles of charges, in other cases it may be that an airport's overall charging strategy should be overall cost related with the individual aviation charges varied on the basis of other justifications, while for an airport network it may be the network charging strategy itself that should be network cost related

revenue neutral. Equally, it is unlikely that these variations will be related to any difference in the quality or scope of airport services provided to airport users. The airport being made more profitable should not be considered an internalisation of the externality. The Forum recommends that the principle of revenue neutrality should also be maintained for any Type 2 variations. A revenue neutral Type 2 variation implies that the airport cost-relatedness principle would be respected at least at the level of the overall charging strategy.

Examples of costs generally not directly covered by the airports are environmental externalities.

Since such externalities do not yield cost borne by the airports, they cannot justify an increase in the total level of airport charges.

- 6.5 To generate optimal incentives, variations would need to be calibrated to reflect to the external costs generated. But, to develop a complete overview of the external costs is complicated. The complexity deals with both the factors of uncertainty relating to the effects, but also the likelihood of the effects taking place. Take the case of air pollution: aircrafts emit local pollutants, such as nitrogen oxide (NO_x), that have adverse effect on health and the biodiversity of the local environment. This yields economic costs borne by the community as whole. If a variation based on local pollution is set, the mark-up on high emission aircrafts should be in line with the social cost¹⁹ of its emissions at landing or take-off. If it is not, this would lead to an inefficient allocation of resources. The Forum does not recommend that airports should vary charges to fully reflect their estimate of the social cost, but even if external costs are reflected, in a way which is justifiable under the ACD, the revenue neutrality principle has to be applied.

Discussion on the consultation process

Variations are part of airport charging systems. Every time an airport managing body wishes to introduce or modify a variation, airport users should be consulted. The consultation process should respect the principles stated in the Thessaloniki Forum paper of 2016 on Recommendations on Consultation and Transparency. More specifically:

- *“The consultation timeline and introduction of charges should be in line with the timelines in the directive.*
- *Detailed consultation documentation should be provided in advance of any consultation meeting, with enough time to allow airport users to analyse the information.*
- *There should be enough opportunity to prepare comments and to seek clarifications, (...)*

¹⁹ Impact on agricultural productivity, human health, property damages from increased flood risk, and changes in energy system costs, such as reduced costs for heating and increased costs for air conditioning.

- *Incentive schemes resulting in rebates or discounts on charges should be consulted on.*
- *Consultation and transparency on these schemes are required to discourage discriminatory schemes,*
- *Airports should show how the incentive schemes affect the charges payable by the generality of users. (...)*

Discussion on the possible assessment of the impact, such as societal or other benefits

- 6.6 It is not up to the ISA to set the global environmental or social objectives to be achieved. However, this should not prevent the ISA from *assessing the justification or evidence*, to ensure that the variations are proportionate to the objectives and permissible under the ACD. As discussed in Section 3, other relevant policy instruments should also be taken into account as part of this assessment^{vii}.

The *a priori* evaluation of the effects of variation is a difficult task. Such an analysis implies the construction of a counterfactual scenario and as a consequence requires a deep understanding of how incentives are likely to impact airline decision making. Indeed, variations may be aimed at generating incentives to renew aircraft fleets with low emission aircrafts. Yet the renewal strategy of an airline is driven by many factors, such as the projected route network, the characteristics of the current fleet, cost or maintenance constraints. Therefore, in addition to *a priori* assessment, *a posteriori* assessment can be conducted.

- 6.7 It is not necessarily up to regulator to determine the social impact of variations. However, it can be useful the ISA to assess the social impacts and to compare it to the environmental impacts, in a cost-efficiency analysis logic, provided by the airport as part of the justification. The overall impact of a variation involves various dimensions, which makes a global assessment difficult. For instance, by increasing the costs of some flights, a variation can have adverse effects on the accessibility of a territory if served by carrier whose main aircraft type is dis-incentivised and, in turn, lead to economic and social consequences. Such measurements can be difficult to produce in a reliable way. Furthermore, evaluating the overall impact requires a comparison of economic, social and environmental effects. Giving priority to one dimension over the others is difficult without a mandate explicitly setting out a hierarchy, or the equivalent, between what can be viewed as various and potentially conflicting objectives.

International coordination of charging schemes

Coordination actions, such as several airports together may enhance the efficiency of the measures through, for example harmonized classifications to the degree possible and practicable.

A widespread application of the same approach to charging variations may boost its

efficiency and reduce the risk of discrimination.

If an operator comes across the same charging mechanism at a number of airports in every day operation, this will have an impact on the fleet planning incentives, if there is a cost benefit.

7. Relevant ICAO principles

The EU legal framework relating to the economic regulation of airport charges, and thus the variations of airport charges on environmental grounds, is the ACD, as set out above.

The Directive builds upon policies on airport charges developed since 1974 by the ICAO. ICAO's policies on charges for airports are intended for the guidance of Contracting States and States are encouraged by ICAO to incorporate key charging principles. ICAO contracting State is not legally bound to adhere thereto but States are morally committed to follow these global principles. The principles are based on recommendations by major international conferences. They are adopted by the ICAO Conference on the Economics of Airports and Air Navigation Services (CEANS) and endorsed by the ICAO Council.

The relevant documents that the Members States may wish to take into account when setting provisions or rules for and assessment of the environmental variation are "ICAO's Policies on Charges for Airports and Air Navigation Services" (Doc 9082) and "Airport Economics Manual" (Doc 9562).

ICAO's four key charging principles (mentioned also in ACD's recital 9) are non-discrimination, cost-relatedness, transparency and consultation. ICAO's policies on airport charges also gives guidance on individual charges including noise-related charges and emissions-related aircraft charges to address local air quality (LAQ) problems at or around the airports.

For both noise-related and emissions-related charges, costs incurred in implementing such measures may, at the discretion of States, be attributed to airports and recovered from the users. States have the flexibility to decide on the method of cost recovery and charging to be used in light of local circumstances. Additional guidance on LAQ emissions-related charges appears in Guidance on Aircraft Emissions Charges Related to Local Air Quality (Doc 9884).

- For reference only ICAO principles for noise-related charges are that they should:
 - o be levied at airports experiencing noise problems and designed to recover no more than the costs applied to their alleviation or prevention;
 - o be associated with the landing fee, possibly by means of surcharges or rebates,

- o take into account the noise certification provisions of Annex 16²⁰ — Environmental Protection to the Convention on International Civil Aviation in respect of aircraft noise levels; and
- For reference only ICAO principles for emissions-related aircraft charges to address local air quality (LAQ) problems at or around airports are that:
 - o they should be levied only at airports with a defined LAQ problem, either existing or projected, and designed to recover no more than the costs of measures applied to the mitigation or prevention of the damage caused by the aircraft;
 - o they should be established in a transparent manner, and the share directly attributable to aircraft should be properly assessed;
 - o consultations with stakeholders should take place before any such charges are imposed on users;
 - o they should be designed to address the LAQ problem in a cost-effective way;
 - o they should be designed to recover the costs of addressing the LAQ problem at airports from the users in a fair and equitable manner, should be non-discriminatory between users, and be established at such levels as to be proportional and effective for the operation of certain aircraft;
 - o it is recommended that in levying LAQ emissions-related charges special consideration be given to the need to reduce the potential impact on the developing world;
 - o they could be associated with the landing charges, possibly by means of surcharges or rebates, or in the form of separate charges but should be subject to the proper identification of costs;
 - o it is recommended that the aircraft emissions charges scheme be based on data that most accurately reflect the actual operations of aircraft. In the absence of such data, ICAO standardized landing/take off (LTO) cycle times-in-mode should be used (Annex 16 — Environmental Protection to the Convention on International Civil Aviation, Volume II — Aircraft Engine Emissions); and
 - o any State imposing LAQ emissions-related charges on aircraft that are in international operation should annually report the existence of such charging schemes to ICAO. The charging authority should maintain records regarding the fees collected and the use of funds to be made available to all users.

²⁰Or any other relevant standard and substantiate it, as referred in 4.3A

Acronyms and Definitions

ⁱ**CO₂ emission**: carbon dioxide.

Environmental impact: CO₂ emissions in the atmosphere increase the greenhouse effect. More thermal energy is trapped by the atmosphere, causing the planet to become warmer than it would be naturally. This increase in the Earth's temperature is called global warming.

ⁱⁱ**NO_x**: Oxides of Nitrogen.

Environmental impact: NO_x is a deleterious air pollutant which can be poisonous at high concentration levels. Nitrogen oxides (NO_x) emissions, and in particular NO₂ are a known precursor to the formation of ozone and of secondary aerosol largely contributing to PM₁₀ and to PM_{2.5}. NO_x therefore is not only criteria pollutant on their own, but they contribute sensibly to other pollutants of major health and environmental concern. In addition, NO_x can react with volatile organic compounds to form photo-chemical smog, a phenomenology mainly connected with high temperatures and insolation concerning areas and seasons characterized by mild to hot conditions such as for example the Mediterranean region, at least in the summer season. (Ref. Global Journal of Engineering Sciences, Health and Environmental Impacts of Nox : An UltraLow Level of Nox (Oxides of Nitrogen) Achievable with A New Technology, Raimondo Alberto Bernabeo, Kirk Webster and Massimo Onofri, <https://irispublishers.com/gjes/pdf/GJES.MS.ID.000540.pdf>)

ⁱⁱⁱ**CORSIA**, the ICAO Carbon Offsetting and Reduction Scheme for International Aviation.

^{iv}**ETS**, the EU Emissions Trading System.

^v**SO_x**, Sulphur oxides, can harm trees and plants by damaging foliage and decreasing growth. SO₂ and other sulfur oxides can contribute to acid rain which can harm sensitive ecosystems.

^{vi}**PM** stands for particulate matter (also called particle pollution): the term for a mixture of solid particles and liquid droplets found in the air. A further distinction can be made between volatile and non-volatile particles. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye.

^{vii} A simple review of extra charges and taxes that applies for a given environmental externality (say noise) and a comparison with a reasonable external cost (for example assessed in a methodology similar to this article: <https://www.sciencedirect.com/science/article/abs/pii/S0264837719301450> seems to be like a good first step for an assessment.