



## 工 作 文 件

### 第二次航空与代用燃料会议

2017年10月11至13日，墨西哥，墨西哥城

#### 议程项目3：挑战和政策制定

#### 关于布署可持续航空燃料的可能政策和协调做法的指导

(由国际民航组织秘书处提交)

#### 摘要

本文介绍了国际民航组织航空与环境保护委员会 (CAEP) 在制定“关于布署可持续航空燃料的可能政策和协调做法的指导”方面的进展，并请各国评价用于评估代用燃料政策效果的拟议的定性方法。

会议采取的行动见第4段。

#### 1. 引言

1.1 自 2009 年第一次国际民航组织航空与代用燃料会议 (CAAF/1) 以来，国际民航组织一直积极鼓励成员国和业界推动和统一鼓励开发可持续航空燃料 (SAF) 的举措。

1.2 在国际民航组织第 39 届大会上，A39-2 号大会决议要求各成员国“根据各自国情，在国家行政机关内设定政策行动及投资的协调一致的做法，以便制定政策行动，加快航空清洁和可再生能源来源的适当开发、部署和使用，包括使用可持续的航空代用燃料的适当开发、部署和使用”。

1.3 关于这一要求，理解是各方期望在业已实施、并被证明是可行、有效且具备成本效益的各项政策中所汲取的经验教训和最佳做法基础上，采取协调一致的做法，制定具有共同组成部分和相似的一般性要求的统一政策。

1.4 不同的成员国和当局已经制定、目前正在制定、或者可能将要制定多种多样的支持手段，以利于部署和使用可持续航空代用燃料。

1.5 某些现行机制和政策若被证实行之有效，可作为其他成员国设法实施类似政策的参考。在实施现行框架过程中取得的正反两方面的经验教训可有助于制定更为适当的有关可持续航空燃料的政策行动。

## 2. 国际民航组织航空环保委员会 (CAEP) 关于政策的工作

2.1 2016年2月的航空环保委员会第十次会议给航空环保委员会替代燃料工作组(AFTF)委以一项新任务,即制定“关于部署可持续航空代用燃料的可能政策和协调做法的指导”(下文简称“可能政策指导”)。目的是制定指导原则和建议,以支持采纳国家/地区政策。

2.2 具体而言,这项工作将提供有关不同政策机制效果的详实信息,包括其效益和外部效应,同时认识到一项政策的施行不可能在各国之间产生完全相同的结果。

2.3 该任务的第一个目标是摸清鼓励部署可持续替代燃料(不仅用于航空)的政策手段,以及将障碍或有碍积极性的机制根据相似特征和性质分为不同的类型或类别。

2.4 作为第二步,工作应查明已被证明可行、有效且实用的“可能政策”。此类查证工作应在实施这些政策文书(其中可能包含为其他部门制定、但适用于航空运输的政策)的最佳做法、汲取的经验教训以及经证实的积极成果基础上,通过航空环保委员会开展评估来进行。

2.5 最后,这种分析应确定哪些方面可从改善国家间协调中受益,并制定“指导原则”,以利各国或各地区实施这些政策和激励机制,在被视为有益的情况下采用有效的政策做法。

## 3. 工作进展

### 3.1 文献审查:

3.1.1 初步收集了有关文献资料,包括57篇不同来源的研究论文。其中23个主要关注美国或欧盟,其余大部分论文重点关注巴西、澳大利亚、中国和加拿大。57篇论文中12篇专门讨论航空燃料政策,其余的论文则侧重于公路运输或所有运输方式。文献审查中所包含的文章清单见附录C。

### 3.2 政策类别:

3.2.1 各种政策选项被初步归类为以下类别:

- 与量相联的支持
- 补贴
- 建厂生产的援助
- 研究和开发援助

3.2.2 主要侧重于宏观类别的政策措施已经对其做了相关描述。总共描述了14项政策措施。这被视为初步评估,绝非详尽无遗的列表。支持机制的类型、政策措施和相关描述可见于附录A。

### 3.3 定性衡量标准:

3.3.1 替代燃料工作组政策专家组根据第A39-2号大会决议的要求,提出以下一套定性衡量标准,对于计划审查或实施可持续航空燃料政策行动的国家可用作“检查单”手段。每个要素的描述见附录B。

- 灵活性
- 确定性
- 财政成本和效益
- 对外部因素的价格敏感性
- 易于实施性
- 对可持续航空燃料部署和温室气体减排的贡献
- 意外的后果
- 政策的稳健性

3.3.2 这样，各国一方面可以有在不同情况/地区运用的已查明的政策选项汇总，同时还有一套定性衡量标准作为工具，评估在各自国情和条件下运用这些政策选项的可行性、有效性和实用性。

3.3.3 作为下一步，建议通过要求来自不同国家的专家来评估自己所在国家/地区不仅在航空业、也在其他交通运输部门现行政策的有效性，来“检验”这套衡量标准的适用性。

3.3.4 与此同时，航空环保委员会替代燃料工作组专家还计划确定可能的特定地区政策运用案例研究，通过经济建模进行评估，并总结可能的经验教训，纳入最终指导。

## 4. 第二次航空与代用燃料会议的行动

### 4.1 请第二次航空与代用燃料会议：

- a) 要求各国提供成功的生物能源和可持续航空燃料政策实施案例研究的实例；可能对其他会员国和航空环保委员会当前工作有用的成果和可能的经验教训；和
- b) 鼓励各国检验第 3.3.1 段中提出的定性衡量标准作为“检查单”手段的适用性。

—————

**APPENDIX A**

**POLICY OPTION TYPE OF MEASURES**

<b>Types of Support</b>	<b>Measures</b>	<b>Description</b>
Volume-linked support	Import tariff	Duties levied on imported biofuels. Lowering import tariff will increase import volume, whereas increasing tariff will reduce import volume. Tariff affects domestic price elasticity and market distribution (boosting domestic producer).
	Target	Percentage or volume of renewable energy (or biofuels) consumption (for all sector/ for specific sector) set to be achieved at specific timeframe. The amount indicated as a target is used as reference only. It may be gradually increased over time.
	Mandate	Mandatory consumption of a fixed amount of specific biofuel type (e.g. 2nd generation biofuels). The amount indicated (either percentage or volumetric) in a mandate is binding.
	Blending obligation	Obligation for fossil fuel producer to blend xx% of biofuels content to convention fuel (e.g diesel) sold in the market. It is also possible for a country to apply an indicative blending obligation (more flexible in its application and less binding).
	Quota Mechanism	A cap or minimum level of biofuels that must be used in a specific sector (e.g. road transport).
Subsidy	Excise tax credit	Excise taxes are taxes paid when purchases are made on a specific good, such as fuel. Excise taxes are often included in the price of the product. As for biofuels, blenders benefitting from excise tax credit for each unit produced (in gallons).
	Input subsidy (e.g. feedstock)	Payment made to feedstock farmers aimed at incentivizing production. Subsidy may also be given in a form of fertilizer supplies, water supplies, etc.
	Output based subsidy	Payment made to producer based on how many gallons of biofuels they produced (also called as per gallon subsidy).
	GHG emission level based subsidy	Financial incentive given on a basis of GHG unit displaced
	Green vehicles subsidy	Tax credit for consumers purchasing eco-friendly vehicle (applicable to road transport)
Assistance for Establishment of Production	Capital grant	Subsidy given to biofuel-specific capital supporting a range of production facilities, re-fuelling or blending infrastructure, or purchase of alternative fuelled vehicles.
	Loan guarantees	A loan guaranteed by a third party in the event that the borrower defaults. The loan is often guaranteed by a government agency which will purchase the debt from the lending financial institution and take on responsibility for the loan. Loan guarantees are given mainly for production facilities.
	Crop insurance	Crop insurance contract is a commitment between insured farmers and their insurance providers. Under the contract, the insured farmer agrees to insure all the eligible acreage of a crop planted in a particular region. The insurance provider agrees to indemnify (that is, to protect) the insured farmer against losses that occur during the crop year.
Assistance for R&D	Tax credit for investment in technology	Tax credit given to total investment made in research and development technology. It is applicable to technological goods specified by the government (usually comes in a form of a list). Government may set the eligibility criteria for this, e.g. minimum and maximum costs for the projects, project timeline, etc.

## APPENDIX B

### QUALITATIVE METRICS AS A “CHECK-LIST” INSTRUMENT

#### Flexibility:

Characteristics of this style of policy will demonstrate scope for adjustment to different situations and priorities. Policies with higher flexibility may be able to evolve or adapt quickly. It is possible special authority may be assigned to monitor and evaluate the policy on an on-going basis

#### Certainty:

These characteristics relate to the time frame, legal conditions and/or political decisions. Greater policy certainty can be associated with more economic value being ascribed to a particular policy. In some cases policy certainty can be linked to the security level for investors. Lower certainty policies may have the inverse effect for investors and provide less incentive for capital investment.

#### Financial costs and benefits:

Policy effectiveness should consider costs and benefits (including social costs). Policies that rely on government financial support should be assessed on the benefits they deliver towards the stated policy objective or for the government.

#### Price sensitivity to externalities:

The sensitivity of a policy to externalities should be understood before implementation to ensure unintended impacts are not experienced. Price based policy can be less volatile if a floor and ceiling price is established. The higher the sensitivity to externalities, the more potential unintended consequences.

#### Ease of implementation:

Policy implementation can be affected by administrative, governance and procedural issues. The number of agencies involved in implementing or administering a policy can impact effectiveness. States should be conscious of the relationship within their State of local, regional and national jurisdictions.

#### Contribution to Sustainable Alternative Fuel deployment and GHG reduction:

Contribution to deployment will be higher if a policy is designed to ensure a specific quantity of biofuels are delivered into a system and if it is supported by a set of legal instruments. Contribution to deployment will be lower if no specific amount of deployment is targeted or mandated; and not supported by any legal basis. Policy that incentivises higher verified GHG achievement relative to the conventional fuels that is being replaced may be more effective. Similarly, policy that considers, respects and addresses social and economic consequences may deliver broader economic benefit relative to policies that focus singularly on environmental achievement.

#### Unintended consequences:

Effective policies need to address the risk that implementation of the policy could lead to unintended consequences. These consequences can be economic, environmental or social. The most effective policy will have mechanisms to recognise and mitigate the impact of unintended consequences.

#### Robustness of policy:

Effectiveness of a policy can be influenced by how robust the policy is. Robust policies are ones, that once implemented, have a regulating system to ensure that its objectives are achieved and appropriate procedures have been followed.

— — — — —

APPENDIX C

POLICY MEASURES LITERATURE REVIEW

No	Title	Author	Year of Publication	Journal Title/ Publisher
1	Development of renewable energy in Australia and China: A comparison of Policy and Status	Yaping Hua, Monica Oliphant, Eric Jing Hu	2015	Renewable Energy 85
2	Prospect of Biofuels as an Alternative Transport Fuel in Australia	A.K.Azad n, M.G.Rasul,M.M.K.Khan,SubhashC .Sharma,M.A.Hazrat	2014	Renewable and Sustainable Energy Reviews 43
3	Towards a Sustainable Strategy For Road Transportation in Australia: The Potential Contribution of Hydrogen	Paul Maniatopoulos, John Andrews, Bahman Shabani	2015	Renewable and Sustainable Energy Reviews 52
4	Assessing the impact of environmental innovation in the airline industry: An empirical study of emerging market economies	Wei Yan, Zhijian Cui, María José Álvarez Gil	2016	Environmental Innovation and Societal Transition
5	Aviation Biofuel From Renewable Resources: Routes,opportunities, and challenges	Thushara Kandaramath Hari, Zahira Yaakob, Narayanan N. Binitha	2014	Renewable and Sustainable Energy Reviews
6	Biomass Production for Sustainable Aviation Fuels: A regional case study in Queensland	Helen T.Murphy, Deborah A.O'Connell, R. John Raison, Andrew C.Warden, Trevor H. Booth, Alexander Herr, Andrew L. Braid, Debbie F. Crawford, Jennifer A.Hayward, Tom Jovanovic, John G. McIvor , Michael H. O'Connor, Michael L. Poole, Di Prestwidge, Nat Raisbeck-Brownf, Lucas Rye	2015	Renewable and Sustainable Energy Reviews 44
7	Lead markets in 2nd generation biofuels for aviation: A comparison of Germany, Brazil and the USA	Jonathan Köhler, Rainer Walz, Frank Marscheder-Weidemann, Benjamin Thedieck	2013	Environmental Innovation and Societal Transitions 10
8	A review on present situation and development of biofuels in China	Hao Chen, Meng-long Xu, Qi Guo, Lu Yang, Yong Ma	2015	Journal of the Energy Institute 89
9	Scenario analysis of CO2 emissions from China's civil aviation industry through 2030	Wenji Zhou, Tao Wang, Yadong Yu, Dingjiang Chen, Bing Zhu	2016	Applied Energy 175
10	An overview of biofuels policies and industrialization in the major biofuel producing countries	Yujie Su, Peidong Zhang, Yuqing Su	2015	Renewable and Sustainable Energy Reviews 50
11	Biofuel subsidies versus the gas tax: The carrot or the stick?	Diya B. Mazumder	2014	Energy Economics 44
12	Global Scenarios for Biofuels: Impacts and Implications	Mark W. Rosegrant, Tingju Zhu, Siwa Msangi and Timothy Sulser	2008	Review of Agricultural Economics 30
13	International trade in biofuels: an introduction to the special issue	Rainer Zah, Thomas F. Ruddy	2009	Journal of Cleaner Production 17
14	Second-best biofuel policies and the welfare effects of quantity mandates	Harvey Lapan,Gian Carlo Moschini	2011	Journal of Environmental

No	Title	Author	Year of Publication	Journal Title/ Publisher
	and subsidies			Economics and Management 63
15	The Taxation of Fuel Economy	James M. Sallee	2011	Tax Policy and the Economy 25
16	Biofuel futures in road transport – A modeling analysis for Sweden	Martin Börjesson, Erik O. Ahlgren, Robert Lundmark, Dimitris Athanassiadis	2014	Transportation Research Part D 32
17	Biofuels in Brazilian Aviation: Current scenario and prospects	Paulo André Cremonez, Michael Feroldi, Amanda Vianade Araújo b, Maykon Negreiros Borges, Thompson Weiser Meier, Armin Feiden, Joel Gustavo Teleken	2014	Renewable and Sustainable Energy Reviews 43
18	Biofuels: Opportunities and Challenges in India	Mambully Chandrasekharan Gopinathan and Rajasekaran Sudhakaran	2009	In Vitro Cellular & Developmental Biology Plant
19	Economy-wide impacts of biofuels in Argentina	Govinda R. Timilsina, Omar O. Chisari, Carlos A. Romero	2013	Energy Policy 55
20	Jet biofuels in Brazil: Sustainability challenges	Marcia A.F.D. Moraes, Andre M. Nassar, Paula Moura, Rodrigo L.V. Leal, L.A.B. Cortez	2014	Renewable and Sustainable Energy Reviews 40
21	Promoting Biofuels Use in Spain: A cost-benefit analysis	Marta Santamaría, Diego Azqueta	2015	Renewable and Sustainable Energy Reviews 50
22	Comparison of fixed versus variable biofuels incentives	Wallace E. Tyner, Farzad Taheripour, David Perkis	2010	Energy Policy 38
23	Targets and Mandates: Lessons Learned from EU and US Biofuels Policy Mechanisms	Jadwiga Ziolkowska, William H. Meyers, Seth Meyer, and Julian Binfield	2011	Agrobiotechnology Management and Economics
24	Biofuels in aviation: Fuel demand and CO2 emissions evolution in Europe toward 2030	Marina Kousoulidou, Laura Lonza	2016	Transportation Research Part D 46
25	Study of the current incentive rules and mechanisms to promote biofuel use in the EU and their possible application to the civil aviation sector	Hazariah M. Noh, Arturo Benito, Gustavo Alonso	2016	Transport Research Part D 46
26	Distributional Implications of U.S. Ethanol Policy	Bruce A. Babcock	2008	Review of Agricultural Economics, Vol. 30
27	Second generation biofuels and bioinvasions: An evaluation of invasive risks and policy responses in the United States and Canada	A.L. Smith, N. Klenk, S. Wood, N. Hewitt, I. Henriques, N. Yana, D.R. Bazely	2013	Renewable and Sustainable Energy Reviews 27
28	The Impact of advanced biofuels on aviation emissions and operations in the U.S.	Niven Winchester, Robert Malina, Mark D. Staples, Steven R.H. Barrett	2015	Energy Economics 49
29	US biofuels subsidies and CO2 emissions: An empirical test for a weak and a strong green paradox	R. Quentin Grafton, Tom Kompas, Ngo Van Long, Hang To	2013	Energy Policy 68
30	Climate-neutrality versus carbon-neutrality for aviation biofuel policy	Philip Krammer, Lynnette Dray, Marcus O. Köhler	2013	Transportation Research Part D 23
31	Stepping Up but Back : How EU	Evanthie Michalena and Jeremy M.	2016	Renewable and

No	Title	Author	Year of Publication	Journal Title/ Publisher
	policy reform fails to meet the needs of RE actors	Hills		Sustainable Energy Reviews
32	Biofuel Development in China and Its Potential Impact	Tian Fuqiang	Not specified	International Commission on Irrigation and Drainage
33	Biofuels - At What Cost? Government support for ethanol and biodiesel in China		2008	IISD Paper
34	The effects of China's biofuel policies on agricultural and ethanol markets	Shuyang Si, James A. Chalfant, C.-Y. Cynthia Lin Lawell, and Fujin Yi	2015	University of California Davis Faculty Paper
35	Biofuel Economics in a Setting of Multiple Objectives & Unintended Consequences	William K. Jaeger and Thorsten M. Egelkraut	2011	Renewable and Sustainable Energy Reviews. 15(9)
36	Analysis of Biofuels Policy in the Nordic Countries	Dorothy Sutherland Olsen, Antje Klitkou and Annele Eerola & VTT colleagues		TOP NEST
37	Aviation Biofuel Production in Sweden	Ben Fethers	2014	IIIEE
38	Biofuels in Canada: Tracking progress in tackling greenhouse gas emissions from transportation fuels	Jeremy Moorhouse and Michael Wolinetz	2016	Clean Energy Canada
39	Cellulosic biofuels market uncertainties and government policy	Wallace E Tyner	2010	Future Science
40	Biofuels, Policy Options, and Their Implications: Analyses Using Partial and General Equilibrium Approaches	Farzad Taheripour and Wallace E. Tyner	2008	Journal of Agricultural and Food Industrial Organization
41	Policy Options for Integrated Energy and Agricultural Markets	Wallace E. Tyner and Farzad Taheripour	2008	Purdue University Paper
42	Renewable Fuel Standard: Potential Economic and Environmental Effects of U.S. Biofuel Policy		2011	The National Academy of Sciences
43	The Integration of Energy and Agricultural Markets	Wallace E. Tyner	2009	International Association of Agricultural Economists
44	The US Ethanol and Biofuels Boom: Its Origins, Current Status, and Future Prospects	Wallace E. Tyner	2008	BioScience
45	Transatlantic Platform For Action On The Global Environment	Catherine Bowyer, Malcolm Fergusson, Christine Erickson, Melanie Nakagawa	2008	IIEP and NRDC
46	Growing Complexities: A Cross-Sector Review of U.S. Biofuels Policies and Their Interactions	Joshua A. Blonz, Shalini P. Vajjhala, and Elena Safirova	2008	Resource for the Future
47	Options to increase EU biofuels volumes beyond the current blending limits	Bettina Kampman, Ruud Verbeek, Anouk van Grinsven, Pim van Mensch, Harry Croezen, Artur Patuleia	2013	TNO Innovation

No	Title	Author	Year of Publication	Journal Title/ Publisher
48	Biofuels—At What Cost? A review of costs and benefits of Spain's biofuel policies	Chris Charles, Alicia Natalia Zamudio, Tom Moerenhout	2013	IISD
49	Inventory of Biofuel Policy Measures and their Impact on the Market	Luc Pelkmans, Leen Govaerts, Kris Kessels	2008	ELOBIO
50	Cautionary Tales for Biofuel Policy Reformer	Ivetta Gerasimchuk, Richard Bridle, Chris Charles and Tom Moerenhout	2012	IISD
51	State and federal subsidies to biofuels: magnitude and options for redirection	Doug Koplouw	2009	International Journal of Biotechnology
52	Marginal abatement costs for greenhouse gas emission reduction in transport compared with other sectors	Richard Smokers, Ab de Buck, Margaret van Valkengoed	2009	CE Delft
53	Regional differences in China's CO <sub>2</sub> abatement cost	Xiaoping He	2015	Energy Policy Journal 80
54	Integrated assessment of energy efficiency technologies and CO <sub>2</sub> abatement cost curves in China's road passenger car sector	Bin-Bin Peng, Ying Fan, Jin-Hua Xu	2016	Energy Conversion and Management 109
55	The Cost of Abating CO <sub>2</sub> Emissions by Renewable Energy Incentives	Claudio Marcantonini and A. Denny Ellerman	2013	European University Institute
56	A Marginal Abatement Cost Curve Model For The UK Aviation Sector	Mike Holland, Mike Mann, Malcolm Ralph, Bethan Owen, David Lee, Gareth Horton, Neil Dickson, Sujith Kollamthodi	2009	EMRC and AEA
57	Sectoral Emission Reduction Potentials and Economic Costs for Climate Change	Bart Wesselink, Yvonne Deng	2009	Ecofys
58	Government policies and drivers of world biofuels, sustainability criteria, certification proposals and their limitations	Timothy D. Searchinger	2009	Biofuels: Environmental consequences and interactions with changing land use
59	Are technology myths stalling aviation climate policy?	Paul Peeters, James Higham, Diana Kutzner, Scott Cohen, Stefan Gössling	2016	Transportation Research Part D: Transport and Environment
60	Assumptions in the European Union biofuels policy: frictions with experiences in Germany, Brazil and Mozambique	Jennifer Franco, Les Levidow, David Fig, Lucia Goldfarb, Mireille Hönicke, Maria Lusía Mendonça	2010	The Journal of peasant studies
61	Globiom, the basis for biofuel policy post-2020	Jos Dings	2016	Transport & Environment
62	The land use change impact of biofuels consumed in the EU Quantification of area and greenhouse gas impacts	Hugo Valin, Daan Peters, Maarten van den Berg, Stefan Frank, Petr Havlik, Nicklas Forsell, Carlo Hamelinck, Johannes Pirker, Aline Mosnier, Juraj Balkovic, Erwin	20105	Transport & Environment

No	Title	Author	Year of Publication	Journal Title/ Publisher
		Schmid, Martina Dürauer and Fulvio di Fulvio		
63	The EU system for the certification of sustainable biofuels	European Court of Auditors	2016	European Court of Auditors
64	Three routes forward for biofuels: Incremental, leapfrog, and transitional	Geoff M. Morrison, Julie Witcover, Nathan C. Parker, Lew Fulton	2016	Energy Policy
65	Finding effective pathways to sustainable mobility: bridging the science-policy gap	Scott A. Cohen, James Higham, Stefan Gössling, Paul Peeters	2016	Journal of Sustainable Tourism
66	Eco-skies, the global rush for aviation biofuel	Lukas Ross, Anuradha Mittal, Frederic Mousseau	2013	The Oakland Institute
67	Agrofuels in planes, heating the climate at a higher level	Evert Hassink, Christopher Whelehan, Iris Maher	2012	Friends of the Earth Netherlands
68	Biokerosene : take-off in the wrong direction	Geert Ritsema, Claudia Theile, Arief Zayyin, Fitri Anya, Helen Burley, Agnes de Rooij	2012	Friends of the Earth Netherlands
69	Flying in the face of the facts	Friends of the Earth Europe	2011	Friends of the Earth Europe
70	Study of the current incentive rules and mechanisms to promote biofuel use in the EU and their possible application to the civil aviation sector	Hazariah M. Noh, Arturo Benito, Gustavo Alonso	2016	Transport & Environment
71	Climate-neutrality versus carbon-neutrality for aviation biofuel policy	Philip Krammer, Lynnette, Marcus O. Köhler	2013	Transportation Research Part D: Transport and Environment