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Title: Are energy efficiency strategies in Air Transport a matter of social contestability?:

Summary:

Using the theoretic framework of Institutional Economics, we analyze a survey on energy efficiency that has been sent to 25 Air Transport stakeholders (Airlines, Airport and Manufacturer). The results of that survey show some variations in the implementation of the environmental strategies and especially in the energy efficiency strategies.

To explain this heterogeneity, we enounce several hypothesis developed by the institutional economics. The main hypothesis we are working on is based upon the social contestability model. It shows that heterogeneous implementation of energy efficiency can be induced by the fact that stakeholders have to face various degrees of critics upon their contribution to climate change.

INTRODUCTION

In many industrial activities, environmental concerns have been a stringent constraint to their development. Far away from these environmental considerations, Air Transport has always thought of itself as a “disembodied” activity. It is true, that policy makers have always seen in Air Transport many reasons to promote its growth: it is a broad field for experimenting new technological advances as a necessary industry boosting development of the entire economic structure of a State. For those reasons, Air Transport has grown without taking into account the environmental issues that surround it. Nowadays, the Air Transport Industry has to face its “forgotten responsibilities” and adapt its development strategies in order to fit within the framework of sustainable development. Any attempt to put the firms evolving in the air transport industry into a general sustainability framework allowing balancing and trading off responsibilities hits the lack of consensus and definition of air transport sustainability. As a matter of fact, during the 1990’s, several attempts have been made to define what is meant by “Environmentally Sustainable Transport”; most of them based on the broad definition of sustainable development introduced by the Brundtland Commission in 1987 (CMED, 1987). Unfortunately these works did not lead to a shared and commonly agreed formalized environmental framework that could have formed the basis for homogeneous policy among the Air Transport industry (see Annex 1). In this vacuum, following (Huetting, 1990¹), we state that Sustainable Development is essentially a matter of conflicting goals, and that environmental strategies have to adapt to social and economical contingencies.

This research paper analyzes the position of the Air Transport stakeholder regarding their growing environmental responsibilities. We will especially focus on the issue of energy efficiency², one of the most crucial for the future development of this mode of transportation. From the author point of view, the energy concerns that aviation will have to solve illustrate perfectly this need for strategy change and in the same time the numerous trade-off that stakeholders have to make. Our intention in this paper is not to be prescriptive, but to describe the environmental policies and especially the energy efficiency strategies (EES) that are put in place within the Air Transport industry.

¹ Huetting, R., 1990, “The Brundtland report : a matter of conflicting goals”, *Ecological Economics*, Vol.2, N°02, pp.109-117.

² From the author’s point of view, Energy Efficiency gathers two main energy related constraints (consumption of non renewable sources of energy and the growing contribution to Climate Change), and is one of the most critical for the future pathway of Air Transport.

Energy efficiency improvement in the air transport industry is fundamental for the future development of air transport. Whatever the forecast, growth in aviation implies growth in fuel consumption and gaseous emissions. This situation can be very critical. Nobody really knows how much time oil will be so easily extracted and everybody agreed to say that Kyoto protocol is only the first step to stabilize GHG concentrations in atmosphere. In many European countries, reduction objectives discussed were about a cut in emissions of 60 to 80 % their 1990 levels (a huge step compares to the 8 % reduction objective in the Kyoto protocol for the European zone). For that, the UK royal Commission concluded that *“aviation policy must not simply respond to current growth patterns. A primary aim of policy must be to seek to limit aviation’s contribution to global warming. This will require significant constraints on the growth of air traffic”*³. It will be necessary in the next decade to not only de-couple environmental degradation from continued economic growth, but to ensure that pressures on the environment are at a level compatible with environmentally sustainable development.

The first part of this paper consists in giving the results of a survey, interrogating the air transport stakeholder on their environmental strategies. We will show that if environmental strategies do exist, they are variously implemented and take into account different environmental externalities. In a second part, we are looking upon institutional hypothesis that can give some explanations on this heterogeneity. We especially focus on the model of social contestability that rely the implementation of environmental strategies as a trade off between economical and social contestability. It seems that if energy efficiency is better taken into account by airlines, it is not only because of its complementarities with economic competitiveness but also because their license to operate is dependant upon their ability to respond constructively to climate change issue.

³ Royal Commission on Environmental Pollution, 2001, “The Environmental Effects of Civil Aircraft in Flight”

PART I: RESULTS OF THE ENERGY EFFICIENCY SURVEY

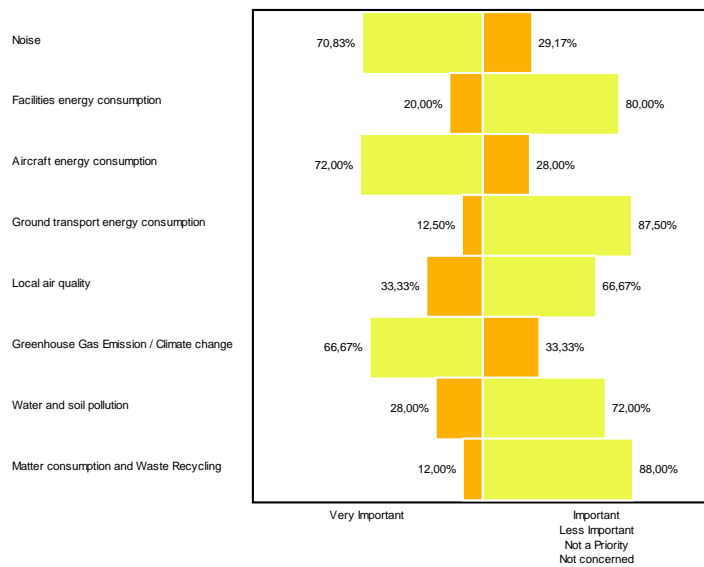
1) *The Global Environmental Policies in the air transport industry*

a. *Perception of the Environmental Issues in the air transport industry:*

Looking at the answer of our survey, we can distinguish four main environmental issues for the air transport industry. By order of importance, the concerns that are perceived as the more crucial for the future development of the industry are:

- Aircraft energy consumption;
- Noise;
- Greenhouse gases emissions;
- And Local air quality.

Question: According to you, which environmental concerns are the most strategic for the future development of your organisation? (i.e. which environmental concerns are the most likely to curb your future development



The perception of the degree of importance varies following the type of stakeholders that are being questioned:

Aircraft Energy Consumption is a major concern for airlines and manufacturers, airports seem to be little less concerned;

Noise treatment is perceived as a very important stake for both airport and airlines (especially Full Service Carrier). Greenhouse gases emissions are also an important environmental matter for airlines and manufacturers whereas local air quality seems to be more an airport concern.

This different perception following the type of respondent is quite logical as each category of stakeholder is firstly concerned by issues that are controllable by their organisation. In that, airlines do not consider water and soil pollution as an important stake for them (although they contribute to that pollution because of de-icing or oil dumping), whereas airports and manufacturers seem to be more deeply concerned (as their activities take place on the ground,

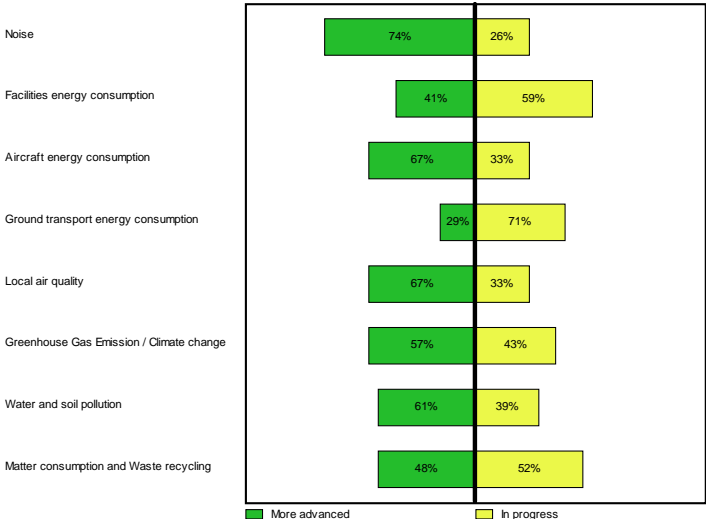
and in case of critics they would be the first to be denounced). Matter consumption and recycling is an important issue only for manufacturer, as this concern is a part of their quality management that enable enhanced industrial process⁴.

b. Environmental Policies implemented in the air transport industries.

The environmental concerns that is the more taken into account in their global environmental policies are :

- Noise (74%);
- Aircraft energy consumption (67%);
- Local air quality (67%);
- And Water and soil pollution (61%).

Question: On which environmental concerns are your environmental policy the more advanced (i.e. the environmental concerns that are the most taken into account, mobilizing many competencies, tools and equipments)?



We can note here a gap between the perception of the environmental concerns and their integration in a formal organizational policy. As a matter of fact, if noise or aircraft energy consumption are perceived as major environmental issues and effectively perceived as integrated among the firms, policies to deal with greenhouse gases emissions are effectively implemented only

for a little more than the half of the respondents (57%). On the contrary, environmental issues such as water and soil pollution that are not perceived as crucial for the future development of air transport industry are implemented in many firms (61%). This result could be explain by the existence of institutional rules for both noise and water and soil pollution, whereas it does not exist any common institutional framework for GHG emissions. This gap can be explained by many factors:

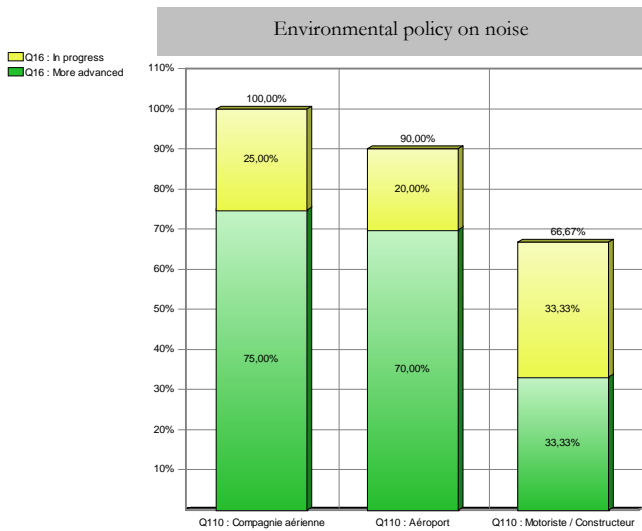
⁴ For instance, Airbus’ environmental approach covers the entire life cycle of an aircraft from concept to operation to decommissioning and recycling. Airbus implements this environmental strategy to enhance its industrial process but also to be certified by the environmental standards ISO 14001.

- the type of activities induce specific environmental strategies;
- the institutional framework that framed the externalities are heterogeneous;
- the size of the firm seems also to be a factor of heterogeneous environmental strategies.

We will also discuss this gap in part II, showing the role of social contestation in the integration of environmental issues in the policies of the firms.

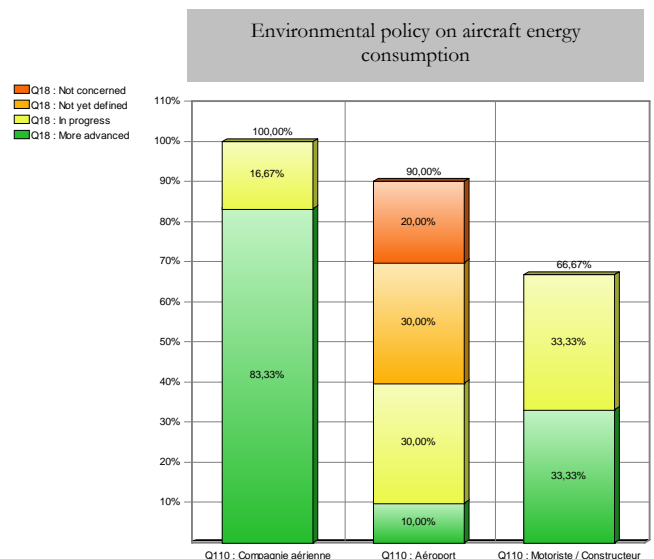
Factor 1: *The environmental policies vary following the type of stakeholder. As a matter of fact, each type of stakeholder have their own environmental externalities, therefore we can observe some heterogeneity in the implementation of the environmental policy.*

Question: On which environmental concerns is your environmental policy the more advanced (i.e. the environmental concern that are the most taken into account, mobilizing many competencies, tools and equipments) ?

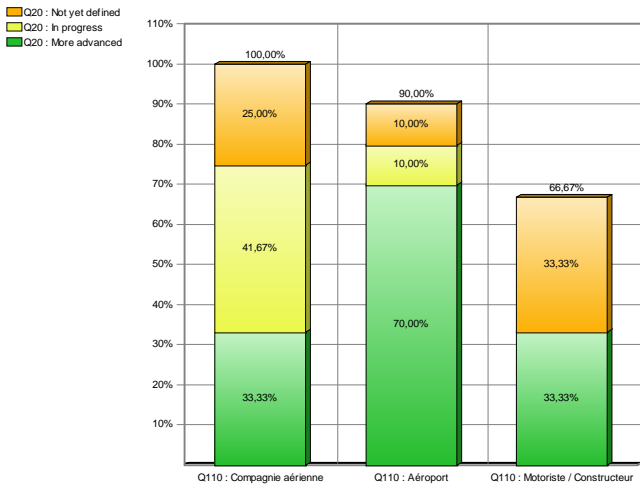


Noise is the environmental concern that is the more homogeneously implemented in the environmental strategy of the firms. Airlines (75%) and Airports (70%) state that noise policies are well implemented.

Aircraft Energy Consumption is well integrated in Airlines environmental policies, but very few airports declare that they have a well advanced strategy to deal with aircraft energy consumption (whereas they have several means to reduce the ground consumption of aircraft using auxiliary power unit or reducing taxiing phase)



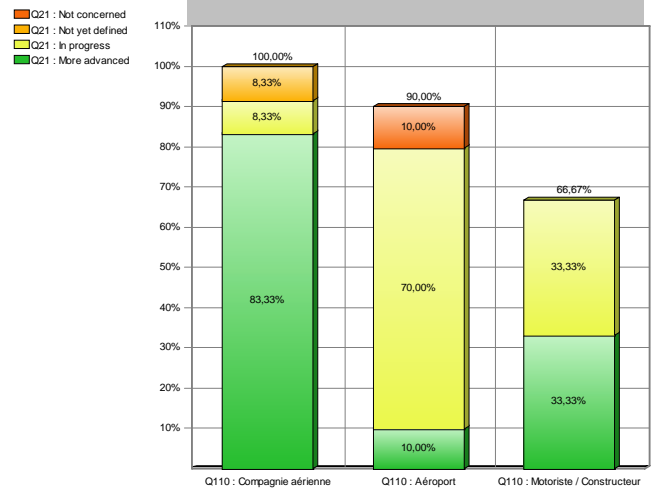
Environmental policy on local air quality



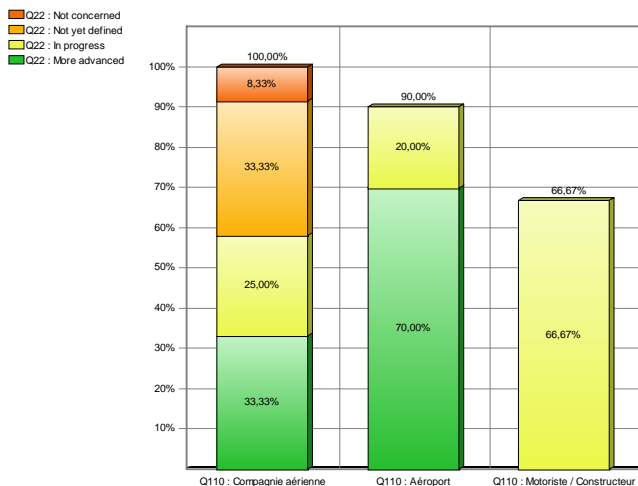
Local Air Quality is firstly taken into account by Airports (70%), on the contrary airlines have not yet integrate that environmental concerns in their strategies. A quarter of the airline respondent has not yet defined a strategy on that subject. It is about the same for **water and soil pollution** where 70% airports think their strategy is advanced on that concerns, whereas only 33% of airlines think so.

Greenhouse gases emissions show the greatest disparity between airlines (83.3% state that an environmental policy is advanced on that subject) and airports (only 10% state that this policy is advanced). This answer is cohesive with another answer of airports where they state that one of the major barrier to the implementation of an effective EES is the lack of responsibilities from the airports on this issue.

Environmental policy on GHG

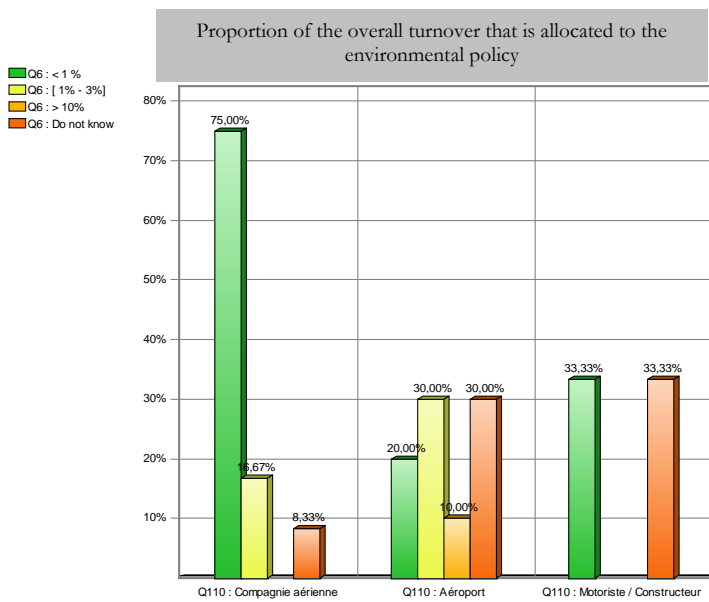


Environmental policy on Water and soil Pollution



Water and soil pollution is well integrated in the environmental strategies of airports, in progress among the manufacturer and implemented heterogeneously in the airline category.

Airports seem also to invest more in the environmental field than the others stakeholders. Their



environmental budget is larger than other stakeholder: 30 % state that they invest 1 to 3% of their overall turnover and 10% state that they invest more than 10%.

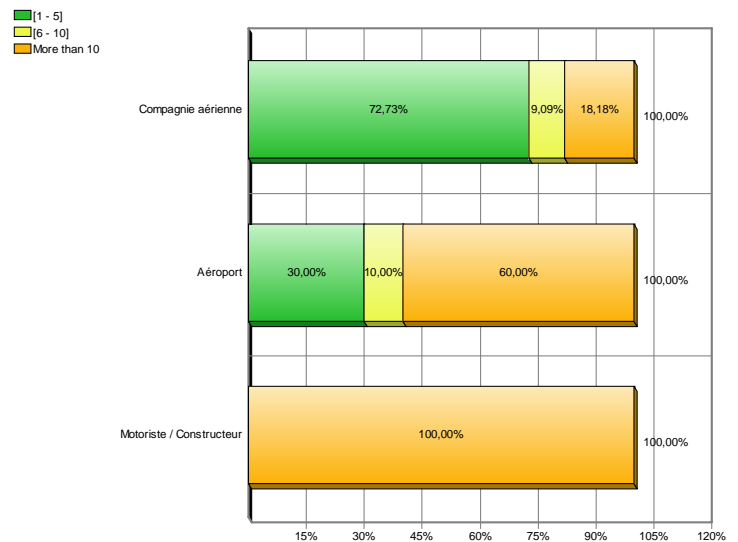
On the contrary 75% of the airlines invest less than 1% of their turnover to environmental purpose.

We can note that information about the environmental budget is not clear as many respondents do not know the amount

dedicated to the environmental strategy. This could be explain by the fact that investment that contribute to the environmental strategy are often part of other services (for instance, the acquisition of new aircraft or the use of lighter cargo containers contribute to the enhancement of the environmental efficiency but is not determined by the environmental department; the acquisition of ground power unit by the airport to minimise the use of auxiliary power unit or the construction of new taxiways to reduce taxi times are not directly related to the environmental strategy, etc...).

The size of the environmental department

varies also depending on the type of stakeholder: Airports seem to have larger department than airlines. 60% of the airports have department with more than 10 people. 72% of the airlines have department with less than 5 people.

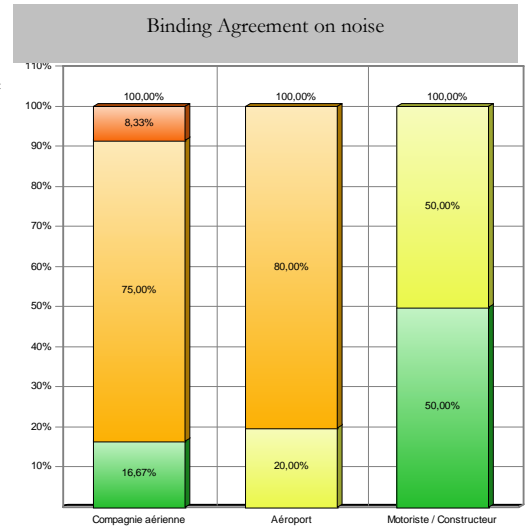
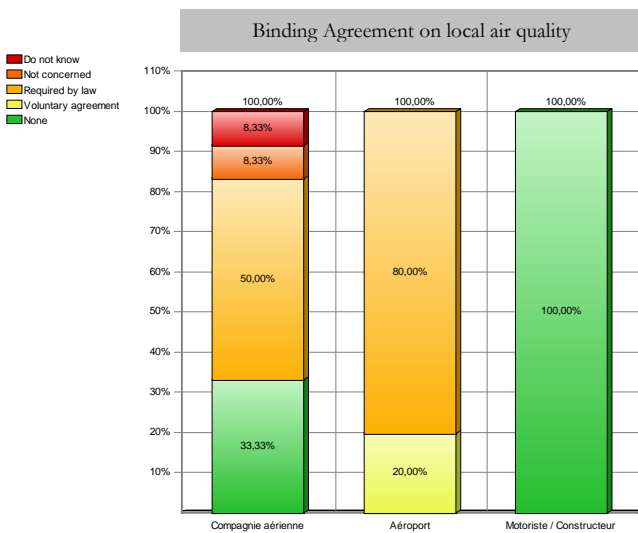


But we shall precise that most of the environmental strategies rest upon a network of environmental manager that are not duly counted as part of the environment department. As a matter of fact, many of the environmental managers occupy this function with another one such as quality manager or health and safety manager. Thus it is difficult to evaluate the exact proportion of persons that are working to the implementation of the environmental policies among firms.

Factor 2: The stringency of institutional rules drives the implementation of environmental policies. Domains of binding agreements differ greatly following the type of environmental concerns that are covered by law.

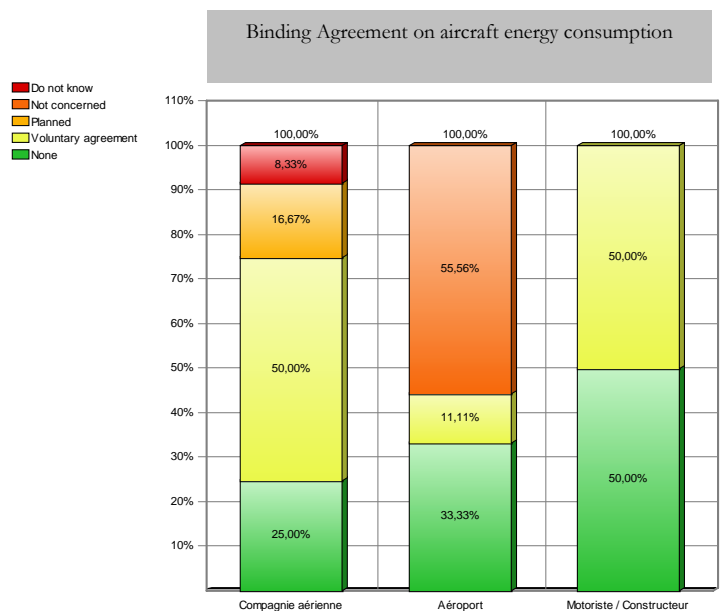
Question: Which environmental concerns are covered by a binding agreement with stakeholders?

Noise is the environmental issue that is the most covered by institutional constraints. That rules could explain why Noise management is homogeneously taken into account by airlines and airports. Airports and Airlines must both adapt to this institutional framework by adopting a binding agreement on that issue.

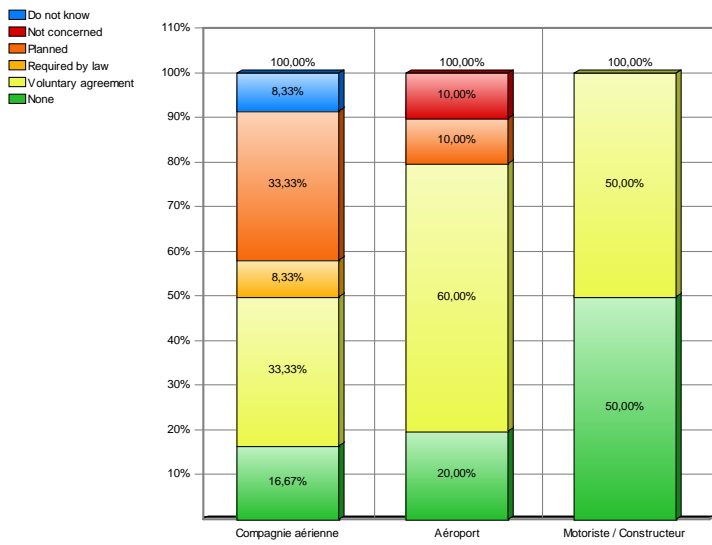


Institutional rules on **local air quality** exist for 80% of the airports and for 50% of the airlines. As for the noise issue, influences of institutional rules on the adoption of an environmental strategy on that subject seem to be strong.

Aircraft Energy Consumption is not included in any institutional policy. Thus airlines that have signed binding agreements do it on a voluntary basis. Majority of Airports state that they are not concerned by this issue. Manufacturers who have a specific agreement on that subject do it also on a voluntary basis.

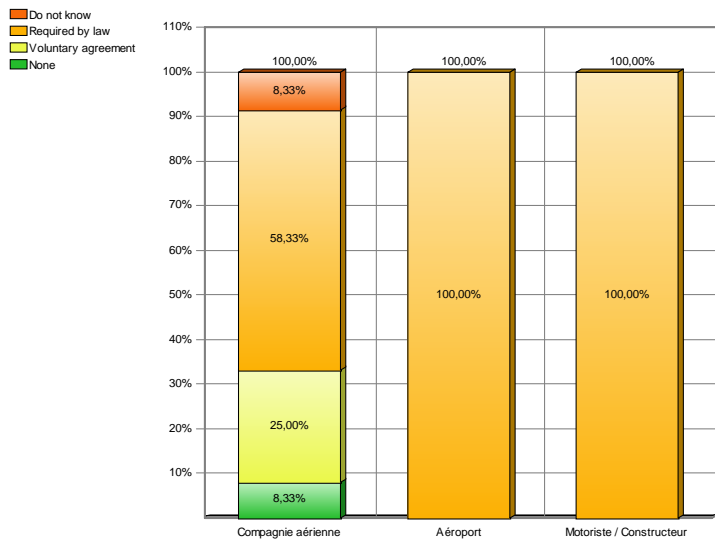


Binding Agreement on GHG



Greenhouse gases emissions agreements are exceptionally required by law (only 8.33% of the airlines). Binding agreements on that issue are most of the time implemented on a voluntary basis. We can note on that issue that only 33% of the airlines have a binding agreement whereas 80% of them have stated that this issue was well implemented in their environmental strategy.

Water and soil pollution binding agreements are required by the law for both airports and manufacturer, and for more than the half of the airlines. This could explain why this issue, even if it is not perceived as crucial for the future development of air transport, is well integrated in the environmental policy of the firms.



Factor 3: The size of the firms can also be an explanatory variable of the heterogeneity of the environmental strategy. The more traffic you have, the more elaborated will be your environmental strategy.

For instance, FSC have all a global environmental reporting system covering all major environmental issues of the air transport industry, whereas LCC and Regional Carrier have a more restrictive environmental reporting system covering only two or three environmental issues. Environmental certification, internal and external auditing are also implemented in all the FSC whereas only few Regional Carrier have obtained a certification and are subject to auditing (when they are subject to an auditing, it is an internal one). The size and the budget of the environmental department of the FSC are also bigger than the LCC or Regional Carrier. The first state that they have more than 10 people working in that unit, the others states that their department have less than 5 persons. The overall budget allocated to develop and implement the environmental policy is for 75% of the air carriers inferior to 1% of the overall turnover. Thus, environmental budget shall be higher in the major airlines than in the smaller ones.

We can observe the same relation between size and environmental strategy among the airport. The more traffic the airport will have and the more elaborated its environmental strategy will be. Domains of environmental reporting are more numerous for big airports; certification and auditing are more generalized also. We can also note a specificity of German airport that often have a double environmental certification (EMAS and ISO 14001), whereas other airports have only ISO 14001 certification. The only major hub that is part of our survey also has ISO 9000 certification (quality management certification).

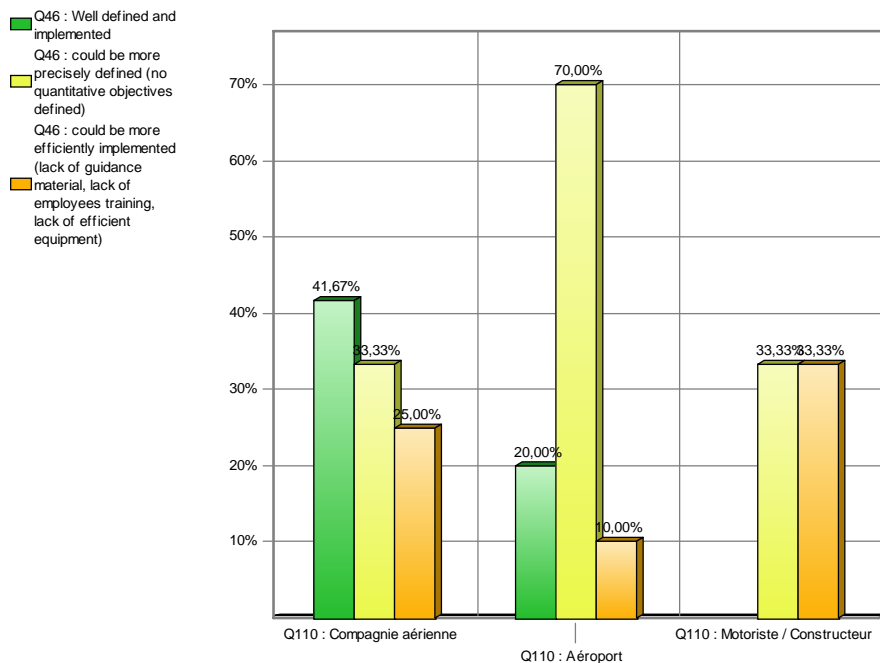
2) The Energy Efficiency Strategy (EES) in the Air transport Industry

Energy Efficiency Strategies are variously implemented among the air transport stakeholder. This heterogeneity is remarkable inside each category of actor and between the different categories of actors.

a. Perception on the EES implementation

Among all categories, airlines are the stakeholders that perceive their EES as the more robustly implemented (see graph below). 42 % of the airlines think that their EES are well established and implemented, 33 % think that it could be more precisely defined by determining some quantified objectives and 25% think that their EES suffer from a lack of guidance, efficient equipment or training. There is no relation between size of the airline and the satisfaction regarding the organization's EES as we find some FSC and some Regional Carrier in each category (except the last one). Airports' EES are perceived in a large majority as insufficiently defined, and only 20% see their policy on that subject as well defined.

Question: Would you say that the energy efficiency policy in your organisation is ...

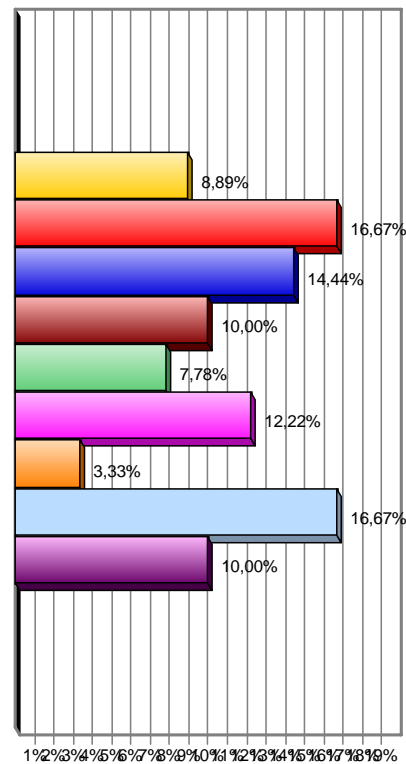


Note: This question could have induced a bias as two respondents belonging to the same airlines answer differently, one thinks its EES was well defined and the other answer that it could be more precisely defined. That also shows that environmental issue and especially EES are subject to subjective interpretation depending on the level of requirement that each individual consider as sufficient or not.

The **main drivers** for energy efficiency are:

- International (e.g. EU) standards and legislation - energy
- International (e.g. EU) standards and legislation - emissions
- National or local energy standards and legislation - energy
- National or local energy standards and legislation - emissions
- Preparation for anticipated or potential constraints on future policy
- Environmental improvements as a Support of strategic business aim (e.g. growth)
- Providing low cost services to customers (ie competitiveness)
- Cost reduction objectives
- Care for society, Corporate Responsibility

According to you, what are the MAIN drivers for your energy efficiency policy? (4 answers max.)

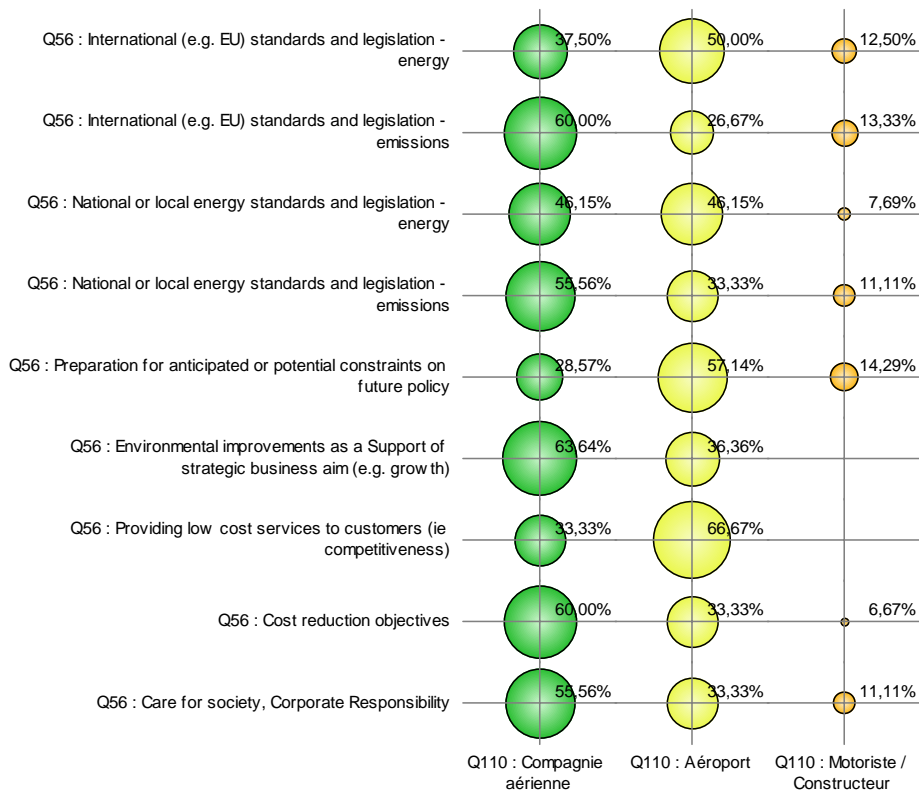


The answers on that question show two distinct drivers for energy efficiency improvement:

- the need of regulation on emission and energy;
- The contribution of EES to the growth of the firm (quality competitiveness) and to cost reduction objectives (cost competitiveness).

But if we look to the answers depending on each category of stakeholder, we can enlight some differences between airlines and airports. Those are quite interesting as they reveal heterogeneous preferences among the stakeholders (see table below).

If airlines see primarily their EES as a support for economical growth (63.64%) and a way to fulfil their costs reduction objectives (60%), airports see their EES as a mean to provide low cost services to customer (66.67%) and a way to anticipate future constraint on their development (57.14%).

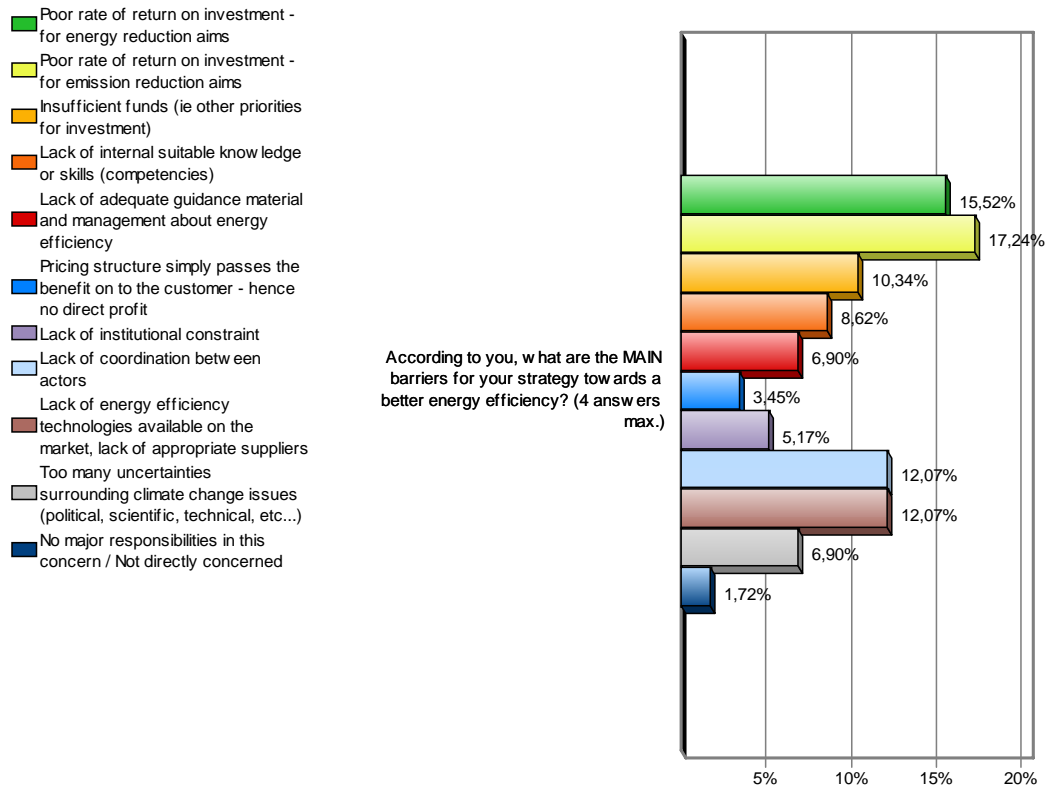


Both airlines and airports recognise the positive driver that stringent institutional regulation could be, but the airlines prefer the implementation of international (60%) or national (55.56) standards on emissions whereas airports answer that international (56%) and national (46.15%) standards on energy are more useful to their EES. We can explain these differences by the specificity of their activity. Indeed airlines consider their environmental externalities principally as a matter of flight emissions, whereas airports that manage firstly ground operation are concerned by the energy consumption of their buildings. Both prefer the implementation of regulation on a world wide basis rather than national or local scale. This is clearly motivated (especially for airlines) by the fear of competitive distortion that could occur between European firms and the rest of the world (the first bearing excessive cost to adapt their equipment to a new stringent institutional rule).

The EES are related to corporate social and environmental responsibility for 56% of the airlines and only 33% of the airports. This point is important as it shows that perception of environmental responsibilities varies following the type of activities. Indeed, airlines are directly denounced by environmentalist for their contribution to climate change whereas airports are more criticised on their local environmental impact (noise, water and soil pollution and local air

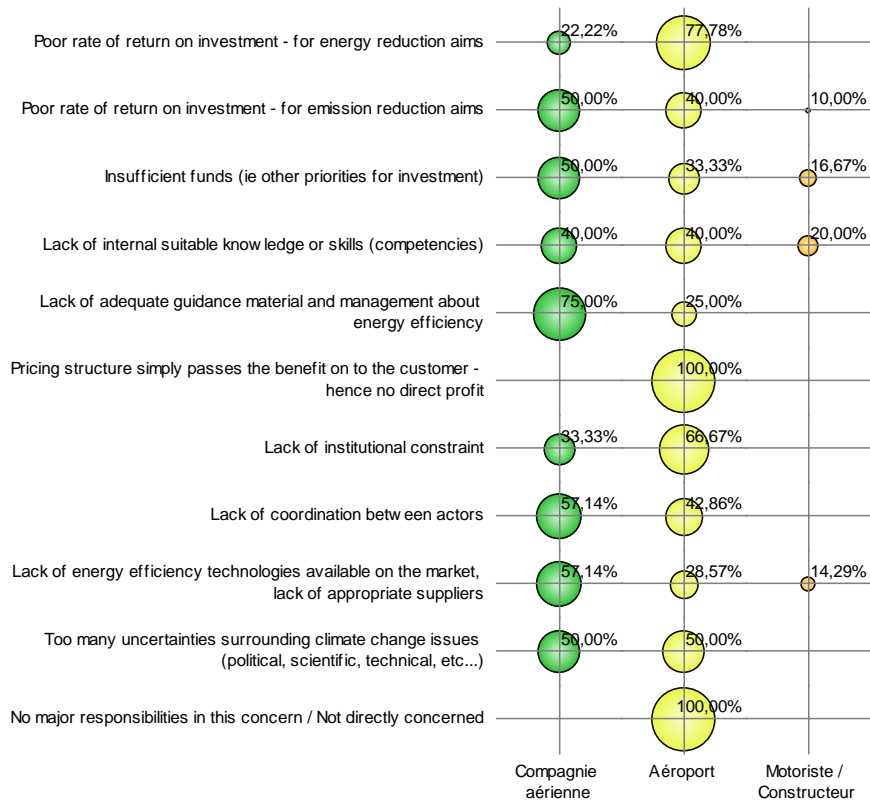
quality). This point is in line with our main hypothesis on social contestability as a driver to implement environmental policies and especially EES

The **main barriers** for the implementation of their EES are:



The difficulty for implementing an EES in the air transport industry would come from the little financial gain from being efficient, the lack of a coordinated policy and finally the lack of technologies available. But the answers are not the same depending upon the stakeholder that answer the survey (see table below). For airlines, the three main barriers are the lack of adequate guidance material and management about energy efficiency, the lack of coordination between actors and the lack of energy efficiency technologies available on the market. For airports, the main barriers are the pricing structure that passes the benefits on to the customer and the poor rate of return on investment for energy reduction aim; therefore they have no incitation to invest on that purpose⁵. The fact that they are not directly concerned by the impact of aviation on climate change is also a barrier to the implementation of their EES.

⁵Airport service partners pay the airport operator for energy in a wide range of ways; some is metered and this is a barrier to the airport making more efficient use of energy as they lose income. Conversely, if the energy is prorata's or included in the rent, this support the airport investing but prevent the tenant. Some areas like the main concourses are jointly occupied and it may be difficult to apportion costs and benefits to make a business case for investment.



There are convergence between airlines and airports on the uncertainties surrounding climate change issues. These uncertainties are barriers that discourage them from investing as they cannot evaluate the benefit to do the necessary investment in their EES. Airports and Airlines also have the same position on the lack of internal suitable competencies on that subject.

There are divergence of opinion between airport operators and airlines on the role played by regulation: the first think that it is a barrier to implementation of EES because regulation could be an incentive to investment, but the other do not find that lack of regulation is a real explanation. Another divergence is about the existence of guidance material, management tools and technologies available on the market. As the airport operators seem to have sufficient information and technologies for implementing their EES, the airlines think on the contrary that there are deficiencies of equipment and information on that matter.

b. Collaborations on Energy Efficiency

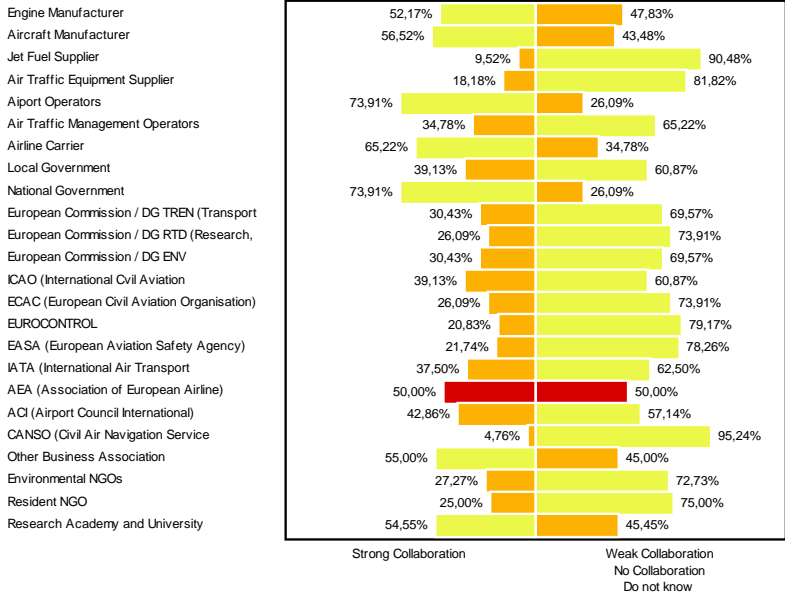
We wanted to know what kind of network was developed to implement the EES. As a matter of fact, enhancing the energy efficiency of the air transport industry requires collaboration between stakeholders. For instance, the acquisition of more efficient aircraft will allow reducing energy consumption only if the other stakeholders (airport, air navigation service provider) optimize also

their processes. In that sense, a study from EUROCONTROL (Carlier and alii, 2007) show that ground regulation and optimized air traffic flow management can bring substantial benefit in lowering energy consumption (see the estimations of the environmental impacts of delays in the table below).

Type of delay	Fuel (tonnes/year)	NOx (tonnes/year)	HC (tonnes/year)	CO (tonnes/year)
Ground delays	25 597	342	98	676
Airborne delays	148 429	1 087	185	2 093

Source: Carlier and alii, 2007, "Environmental impact of air traffic flow management delays"

The stakeholders of the air transport industry that are engaged in collaboration on energy efficiency are mainly the airport operators, the manufacturers, the airlines, the national governments, the business associations (such as AEA or ACI) and the research academy.



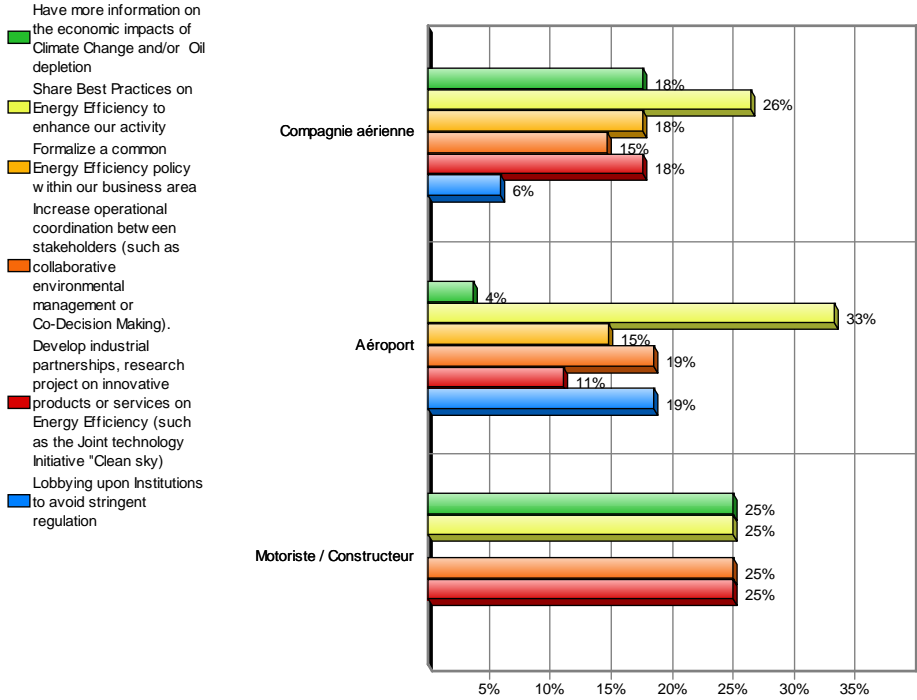
The collaboration on energy efficiency is based upon a restrained network, where the strongest ties are between:

- airlines, airport operators, aircraft and engine manufacturers;
- each stakeholder with its respective business association (AEA for airlines, ACI for airport, IATA for Airlines and Airport, aircraft and engine manufacturer with other business association as ACAE);

Surprisingly, the European institutions (DG TREN, DG RTD, DG ENV) and sectoral institutions (such as ICAO, EUROCONTROL or EASA) are not strongly implicated (or perceived as implicated) in energy efficiency collaboration.

The collaborations on energy efficiency have various purposes. The main objectives of the partnership are:

- Best Practice sharing, especially for the airport operators;
- Formalizing a common energy efficiency policy, especially for airlines;
- Increasing operational coordination, especially for airports operators.

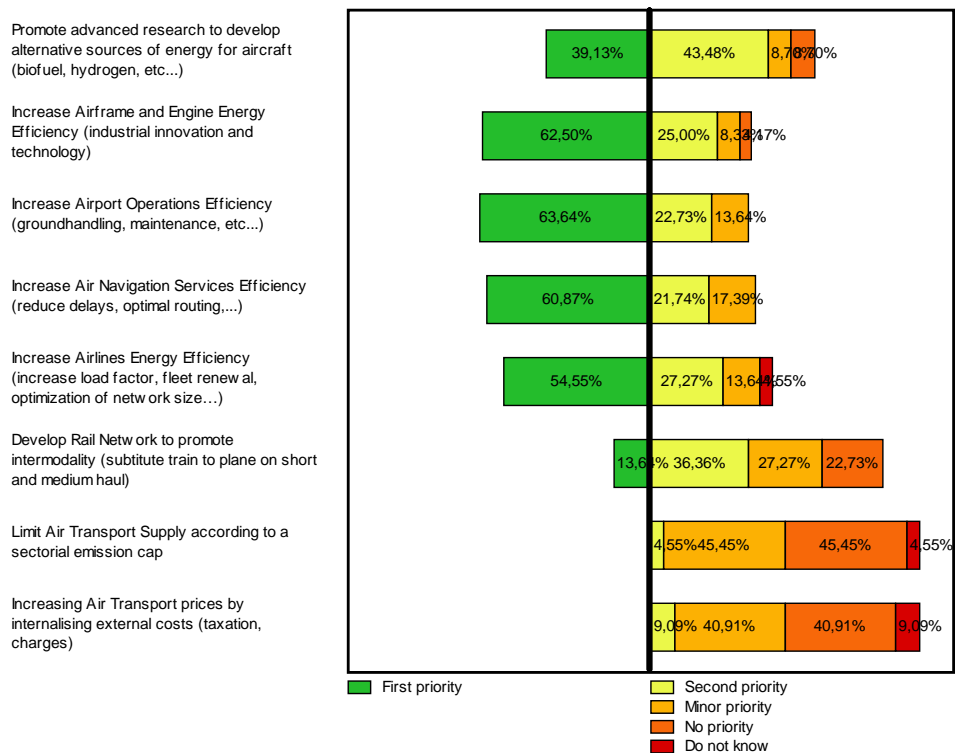


We can note some differences in the objectives:

- Airlines and aircraft manufacturer are looking upon a better information on Climate Change Impacts, that is absolutely not the case for airports;
- Airports see their cooperation as a mean to avoid stringent regulation, that is not the case for airlines and aircraft manufacturer.

c. Institutional Policies to enhance the Energy Efficiency of the air transport industry

Question: Enhancing the energy efficiency of Air Transport need to establish priorities between different environmental policies available. Could you prioritize those policies?



Air Transport stakeholders choose as best choice for the environmental policies the enhancement of the airport operations efficiency. That answers is quite surprising as the airport operators do not consider that they have a substantial role in the mitigation of Climate Change. Other best choices are the enhancement of air navigation services efficiency and enhancement of airframe and engine efficiency. Surprisingly, the increasing of the airlines efficiency is only the fourth best choice, and the research of alternative source of energy are only the fifth best choice.

If we look to the answers depending on the type of stakeholders, we find that each stakeholder

First priority	Airports	Airlines	Manufacturer
1 st Choice	Airport operations (90%)	Airline operations (75%)	Airframe and Engine (100%)
2 nd Choice	Air Navigation (50%)	Air Navigation (66.67%)	Not significant
3 rd Choice	Airframe and Engine (40%)	Airframe and Engine (66.67%)	Not significant

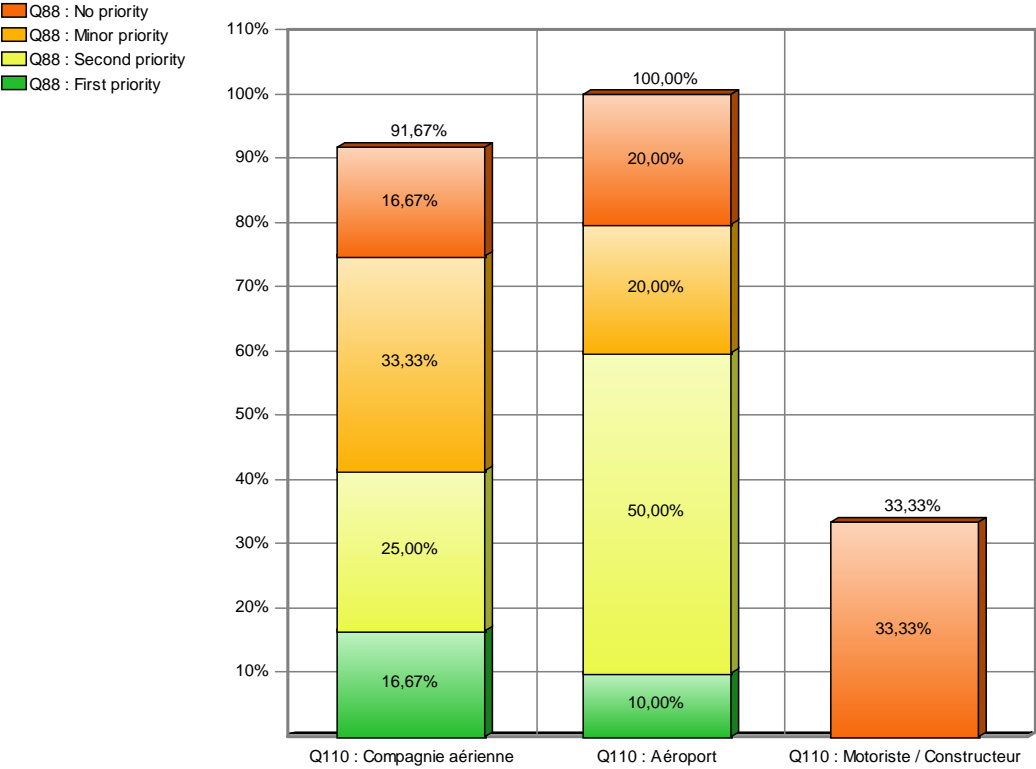
chooses as first priority the policy that directly concerns their business:

airport choose at 90% the increasing in airport operations efficiency, 75% of the airlines choose as first choice the increasing of airlines energy efficiency by increasing load factor, optimizing

their networks or renewing of their fleet, and 100% of the manufacturer choose as first priority the development of industrial technology to enhance the airframe and engine energy efficiency.

Policies that would induce a reduction or a stabilization in the traffic growth are commonly rejected: The implementation of a sectorial cap to limit air transport supply is not a priority for almost 50% of the respondent and the increasing of air transport pricing according to their social cost is rejected for 41% (but 20% of the airports choose it as a first priority). The development of intermodality is the choice that is the most subject to discussion, especially for the airlines category (see graph below) whereas airports choose this policy as a second choice.

Development of Rail Network to promote intermodality (substitute train to plane on short and medium haul)



PART II: INSTITUTIONAL ANALYSIS OF EES IMPLEMENTATION

1) Implementation of Energy Efficiency as a matter of investment in controversial situation.

Our research focuses on the various means that are mobilized by the economic agents of the Air Transport Industry in order to mitigate their contribution to climate change. We decide to analyze the Energy Efficiency Strategy (EES) as the policy that encompasses all the organizational rules, equipments, technology, measure instruments that is implemented in order to reduce or limit the energy consumption and as a consequence the greenhouse gases emissions related to Air Transport development. We are thus studying EES as a matter of investment decision under various uncertainties. As a matter of fact, following the Knightian distinction between risk and uncertainty⁶, dealing with Climate Change involves at least two major uncertainties:

- a. *The contribution of aviation to a global environmental issue (Climate change) is still the object of debate, and the institutional rules to deal with Climate Change are still in negotiation. Therefore, implementing an EES in a controversial situation is difficult because it is not homogeneously perceived as necessary. Moreover, the type of investment needed to implement the EES is uncertain.*

EES is a policy that is implemented as a way to reduce aviation's impact on the global atmosphere. But the Climate change issue is framed by scientific, economical and political uncertainties. Using Godard and alii (2002), we can precise what are the difficulties to mobilize the economic agents when the environmental issue that must be solved is taking place in a controversial situation:

The perception of the issue by the economic agents is not direct but framed by a scientific, an administrative or a political construction. Moreover, the scientific knowledge that determines the issue is not stabilized but in constant progress (the evaluation of the impacts of greenhouse gases emitted is not known with certainty, see for instance the uncertainty about contrails impacts on the environment).

The representation of each category of stakeholder is asymmetric: as institutional or economic agents have financial, cognitive and relational means to influence the social choice; other stakeholders are not well represented. Nature or future generation are symbolic of this type of silent stakeholder, their interest can only be mediated by other group of stakeholder (research

⁶ Knight, F., 1921, *Risk, Uncertainty and Profit*, Boston, MA: Hart, Schaffner & Marx; Houghton Mifflin Company, 1921. A risk refers to a known probability distribution, whereas uncertainty refers to an unknown probability distribution.

academy or NGOs). In that situation, it is very difficult to know their specific preferences and their voice can hardly be taken into account in the social choice.

One last characteristic is to be enounced: the controversial situation engages **a risk of irreversibility**. This point is quite fundamental as the risk of irreversibility need a change in our risk management. Authors like Hans Jonas (from a philosophical an ethical point of view) or Ulrich Beck (from a political point of view) underline the need to implement precaution principle to avoid irreversibilities rather than traditional prevention or mitigation concept. In the air transport industry, we can state that noise is an issue that is treated in a relatively stabilized environment, whereas climate change issues are obviously defined as a controversial situation (see table below).

	Stabilized situation	Controversial situation
Type of environmental externality	Noise	Climate Change
Type of treatment Mode	Mitigation measures (minimize the impact of noise)	Prevention Measure (minimize emission)
Stakeholder engaged in the social choice	Local externality Clearly delimited (noise exposure zone defined by administrative institution). The residents represent their interest forming a specific association.	Global externality (atmosphere is a Common good) Each Human being is engaged but in various degrees. There is no representation for the future generation (even if NGOs can be admitted as partial representative) Environmental impacts vary following the geographical area. Stakeholders have also asymmetric means of representation and adaptation.
Measure of the externality	Instruments of noise exposure do exist. Levels of exposure are defined at a global level and at local level.	Instrument of emissions calculation do exists but are still under elaboration. No level of emission is defined for carbon dioxide (but they do exist for Nox)
Social Cost	Difficult to evaluate (use of stated or revealed preferences)	Impossible to evaluate
Mitigation means	Do exist	Unknown
Degree of irreversibility	None	Strong
Degree of scientific uncertainty	Weak (the uncertainty is upon the non acoustic factor of noise annoyance)	Strong Each greenhouse gases have different radiative forcing impacts, with a level of uncertainty. Altitude of emissions can also have an effect on the radiative forcing.

b. In the absence of adapted institutional constraints, the contribution of EES to the competitiveness of the firm is not known. This uncertainty on the contribution of EES to the firm’s profit is also a cause of variation among the air transport industry

One main economical problem in dealing with Environmentally Sustainable System lies in the fact that pollution such as gaseous emissions is considered as a case where “the invisible hand” does not work. That is to say the individual interests of agents (i.e. the profit maximising by

firms) diverge with the general interest. The reason for such a market failure is that environmental impacts of Air Transport are characterized with an externality feature. As a matter of fact, externalities arise where the activities of some firms or individuals affect the welfare of others, without the former considering these effects in their decisions. For classical economic sciences, environmental concerns such as contribution to mitigation of climate change will therefore be considered as externalities issues. Typically, common good (such as clean air) and the lack of well-defined property rights is the underlying cause of the externality problem, because it prevents the existence of a market for external effects. For a standard economic analysis, companies should view environmental impacts as external costs to be borne by society as a whole. To ensure consideration of these impacts, public authorities should intervene by bringing in regulations, providing incentives or attributing new rights of use and ownership. Indeed, even if company directors have a civic conscience, the logic of the competitive market poses a dilemma: to assume those external costs would mean weakening the economic situation of their company compared to less beneficent competitors, who would then be in a position to seize a larger market share and possibly even chase the socially responsible producer from the market. In other words, in a market economy, competition acts like a regulating mechanism, dissuading companies from shouldering their external costs.

A Neoclassical explanation will put forward that industries differ greatly in the magnitudes of research and development because of the differences in the growth of productivity. Research and development activity is more powerful when directed toward the technologies of certain industries than toward the technologies of others; therefore, the disparities in rates of technical progress reflect some kind of innate differences in ability to advance efficiently the different kinds of technologies which *R&D* allocation decisions rationally reflect. This hypothesis cannot explain the fact that we find in the same category of stakeholder (such as airline or airport) different level of implementation. Investments needed to reduce fuel consumption and/or greenhouse gases emissions require to mobilize assets (technology and equipment) and human resources without any certainty on the return on investment that could be achieved. It is widely accepted that economic agents are not indifferent to uncertainty and will not, in general, value assets with uncertain returns at their expected values. While the investment is certain from a social point of view, there is considerable risk from a private point of view. (Arrow and alii, 1970). The returns on such investment are not certain and depend greatly on the coordination between each category of stakeholder. We can therefore underline one major barrier to the diffusion and implementation of EES: without any information on the contribution of such investment to competitiveness (because the net profit is not known and is dependant upon the

other stakeholders' investment decisions), the economic agents solely will not be incited to realize its own investments in implementing and EES.

2) The various contributions of institutional economics to explain the dynamic of EES implementation among the air transport industry

Following North (1990, 1994), Institutions are “*the rules of the game in a society or more formally (...) the humanly devised constraints that structure human interaction*”. They are made up of formal constraints (rules, laws), informal constraints (norms of behaviour, conventions) and their enforcement characteristics. Therefore studying the implementation of EES in an institutional economics framework leads us to wonder how formal institutions contribute to the implementation of an EES and in what extent voluntary measures of firms to reduce their energy externalities can be analyzed as a production of institutional standards by the firms. In other word, we are wondering if formal institutions are the driving factor of the EES in the air transport industry, or, on the contrary, in the absence of coercive pressure from institutions, how can we explain the elaboration of new conventions or norms of behaviour primarily produced by economic agents?

As our survey shows, most of the respondent firms has implemented an EES but with various intensity and various degree of cohesiveness (some EES are part of a cohesive environmental policy and some other strategy cannot be included in a global environmental policy). There are many institutional hypothesis that could allow us to answer that question, and contribute to explain variations (or on the contrary homogenization) of organizational forms in the energy efficiency field.

- a. Evolutionary Model: *The variation among firms comes from their different level of research and development activities and their specific capabilities to learn by doing, homogenization come from the economic selection mechanism and from imitation.*

In the evolutionary perspective of Nelson and Winter (1975), the diffusion of an innovative process come from the *definition of "worth" or profit* that is operative for the firms in the sector, but also from the *manner in which consumer and regulatory preferences and rules influence what is profitable*⁷, and the *imitation processes that are involved*. In the longer run two classes of dynamic mechanisms are at work. At the firm level, rule change may occur through processes of deliberate problem solving (e.g., research and development), perhaps involving some imitation of the observed success of

⁷ Industries differ significantly in the extent to which patent rights and other protections internalize the returns to inventions that flow out of firm R&D spending, and in the extent to which government subsidization permits the undertaking of high-valued research and development projects where externalities are important.

other firms. Or it may "just happen," as particular capabilities in the firm improve through use (learning by doing), deteriorate through disuse, or are adapted to changed input characteristics. At the level of a market or a whole economy, aggregate outcomes change as a consequence of the economic selection mechanism — the change in the weighting of different rules that comes about through the expansion of firms with profitable rules and the contraction of firms with unprofitable ones. The selection mechanism operates at any particular time only on the set of rules actually employed at that time by functioning firms, but this set is modified over time both by the search activities of firms in business and by the appearance of new firms (Nelson and Winter, 1976). North (1990) states from his point of view that economic change is a *function of the rate of learning*, but the direction of that change is a *function of the expected payoffs to acquiring different kinds of knowledge*.

- b. *Isomorphism Model: The variations among firms are explained by the lack of coercive pressure from formal and informal institution. The homogeneity comes from mimetic pressure, which is driven by uncertainties.*

Powell and Di Maggio (1984) do not try to explain heterogeneity among firms but their progressive homogenization. As a matter of fact, they observed that in the initial stage of their life cycle, organizational fields display considerable diversity in approach and form; but once a field becomes well established they observe an inexorable push toward homogenization. They call isomorphism that "*constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions*". They identify three mechanisms through which institutional isomorphic change occurs: *Coercive pressure* stemming from political influence and the problem of legitimacy; *mimetic drivers* to change resulting from standard responses to uncertainty and finally *normative pressure* that come from professionalization of an industry.

Coercive Isomorphism results from both formal and informal pressure exerted on organizations by other organizations upon which they are dependent and by cultural expectations in the society within which organizations function. This coercive isomorphism would explain why there are variation in environmental strategies between noise mitigation and energy externalities mitigation. As a matter of fact, noise is already framed by many institutional rules that are implemented on a local or on a global basis (ICAO standards) and that could explain why the stakeholders have all integrated noise mitigation in their environmental strategies. Energy efficiency is at this time essentially implemented on a voluntary basis; and as King and alii (2000) have shown in their studies on the chemical industry's responsible care program, opportunism strategy has the potential to overcome the isomorphic effect of informal pressure of even powerful self-

regulatory institutions and suggest that effective industry self regulation is difficult to maintain without explicit standards and sanctions.

The various degrees of implementation of EES are the results of a lack of coercive pressures on climate change issues. Therefore opportunism overcome self regulation and limits the diffusion of energy efficiency best practices.

Mimetic Processes is driven by uncertainties. When organizational technologies are poorly understood, when goals are ambiguous, or when the environment creates symbolic uncertainty, organization may model themselves on other organization. Firms tend to model themselves after similar organizations in their field that they perceive to be more legitimate or successful. The ubiquity of certain kind of strategy can be credited to mimetic processes rather than any concrete evidence that the adopted model enhance efficiency. This hypothesis is validated by the fact that in absence of coercive pressure, air transport stakeholders invest, even with various degrees, in EES.

As strong uncertainties exists on the way institutions will force the air transport industry to contribute to the climate change mitigation, firms implement strategies in order to avoid the risk of being late comparing to their main competitors and to anticipate potential stringent regulation.

Normative pressure is the third source of isomorphic change. It stems primarily from professionalization that is the collective struggle of members of an occupation to define the conditions and methods of their work. Two aspects of professionalization are important sources of isomorphism: the resting of formal education and of legitimation in a cognitive base produces by university specialist; the second is the growth and elaboration of professional networks that span organizations and across which new model diffuse rapidly.

This hypothesis would lead to explain EES by the fact that environmental or sustainable department are more and more concerned by that subject. As a matter of fact, after having formalized a common balanced approach on noise, energy externalities are a new ground of experimentation for their expertise.

- c. Porter Model: *The variation among firms comes from the lack of institutional standards. Homogeneity is explained by the contribution of energy efficiency investment to the competitiveness of the firms.*

Porter and Van der Linde (1995) start their demonstration underlining the fact that the relationship between environmental goals and industrial competitiveness has normally been thought of as involving a trade off between social benefits (society's desire) and private costs.

Therefore, environmental improvements in industry have to face economical objection: *“One side pushes for tougher standards; the other side tries to beat the standards back.”*

But this conventional wisdom is not necessarily true as the debate between environment-competitiveness has been framed incorrectly. As a matter of fact the inevitable struggle between ecology and the economy grows out of a static view of environmental regulation, in which technology, products, processes and customer needs are all fixed. For the authors’ point of view, the new paradigm of international competitiveness is a dynamic one, based on innovation:

“Competitiveness at the industry level arises from superior productivity, either in terms of lower costs than rivals or the ability to offer products with superior value that justify a premium price” (Porter, Van der Linde, 1995, p.97)

The two authors argue that properly designed environmental standards can trigger innovation that may offset the costs of complying with them. In that framework there are complementarities between tightened environmental standards and firms’ competitiveness:

“Firms can benefit from properly crafted environmental regulations that are more stringent than those faced by their competitors in other countries. By stimulating innovation, strict environmental regulations can actually enhance competitiveness.” (Porter, Van der Linde, 1995, p.97)

Complementarities between Environmental Regulation and Competitiveness

- 1 Regulations signal companies about likely resource inefficiencies and potential technological improvements;
2. Regulation focused on information gathering can achieve benefits by raising corporate awareness;
3. Regulation reduces the uncertainty that investments to address the environment will be valuable;
4. Regulation creates pressure that motivates innovation by overcoming organizational inertia and mitigate agency problems;
5. Regulation avoid the risk of free rider strategy

This hypothesis fits to the Schumpeterian analysis of economic growth and contradicts neoclassical orthodoxy that considers firms as profit maximising agent. Firms (and entrepreneurs) may seek profit, and may innovate or imitate to achieve higher profit. However, the emphasis on careful calculation over well-defined choice sets is absent. It is a dynamic selection environment, not an equilibrium one. The essential forces of growth are innovation and selection, with augmentation of capital stocks more or less tied to these processes (Nelson and Winter, 1974).

The Porter hypothesis states that there are some complementarities between institutional standards and the environmental decisions of the firms. *Therefore, heterogeneity in the implementation of EES comes from the heterogeneity of institutional rules that frame the environmental externality, thus lowering the potential competitive gain to implement an EES.* As a matter of fact, energy efficiency improvements take place in controversial situations that engaged “common goods” (protection of the atmosphere and preservation of local air quality), where scientific uncertainties surround the definition of the problem (information is incomplete, asymmetrically distributed) and where firms show strong organizational inertia (or even some free rider strategies). Standards would have a positive contribution to the implementation of EES by reducing those many uncertainties. Thus, investment in energy efficiency is lowered because of a lack of energy efficiency standards.

3) *Contestable Management Model: the variation among firms come from a trade-off between economic and social contestability*

Godard and alii (2004) propose to explore another line of analysis, taking as a starting point the concept of contestability (Baumol et al.,1982;Godard,1993). This concept studies what happens when a producer is exposed to a social contestation threat: the contestation of his business, his products, the techniques he uses, his management style or perhaps what the firm represents in terms of the field of activity (for instance, weapons manufacturing) or size (for instance a large multinational corporation). Realisation of this kind of threat can take various forms: legal (i.e. court action) or economic (defection of a supplier for instance, by performing poorly, or of consumers by shifting from one seller to another). Worse, a collective action may take the form of prompting social protest using modern means of communication to besmirch the company’s legitimacy, lobbying public authorities so that they implement a moratorium or other prohibitive measures, or perhaps even requesting a total boycott on the part of consumers.

Taking the theory of contestable markets as their main inspiration, and the regulatory effect of a threat of potential competition, the authors highlighted the implications of phenomena of social protest grounded in environmental and safety matters. According to their model of Contestable Management, a firm’s contestability is characterised by its exposure to two types of threat: *economic contestation from competitors and contestation of its social licence to produce* based on environmental or health-related risks to the community (or “collective risks”) attributed to the firm’s products or processes.

The link between the theory of contestable markets and the Contestable Management model is first established on the basis of the characteristics of the productive assets used. The authors

propose the notion of *time horizon of economic engagement* (the time taken to see a return on investment into the productive asset in normal conditions) to characterize an operator and its assets which is the pivotal idea determining the sensitivity to the threats of contestation. Premature withdrawal from the activity before reaching that horizon would result in a net loss, preventing easy recourse to an exit strategy from the market in the event of severe contestation: choosing such a strategy would result in high unrecoverable costs. In this context, the objective characteristics of the assets (degree of specificity, amount of investment, scale of production required to break even) determine the horizon of engagement, which coincides with the horizon of sensitivity to a threat of social contestation.

The Contestable Management model takes into consideration a second characteristic of the productive assets, which is *moral obsolescence*. Technical obsolescence is a critical determinant which, over time, reduces the residual market value of a productive asset and renders a portion of the investment costs irrecoverable (Hommel, 2001, p.91). With the notion of moral obsolescence, the Contestable Management model takes into account the economic effect of the agents' beliefs regarding the effective horizon of engagement of a productive asset, when those beliefs concern the legitimacy of a process or an asset. Moral obsolescence may be strong when a firm's processes or products are discovered to have negative impacts on health or the environment. The degree of social contestability of an established firm on a market expresses the measure of that firm's exposure to a risk of moral obsolescence resulting from contestation of the legitimacy of its economic activities because of potential risks to the community.

From the strategic standpoint, the two forms of contestability identified are not independent: when an established operator on a market seeks to reduce his exposure to a threat from potential competitors, he may do so by acquiring specific assets or assets requesting to spread amortization over a significant level of production that would be difficult or even impossible to access for a newcomer tempted by a "hit-and-run" strategy. Such assets are by definition less easily recoverable than standard assets, which fact in itself increases that operator's exposure to a threat of social contestation for environmental or safety reasons.

The graph below illustrates the relationship between the two forms of contestability for a firm

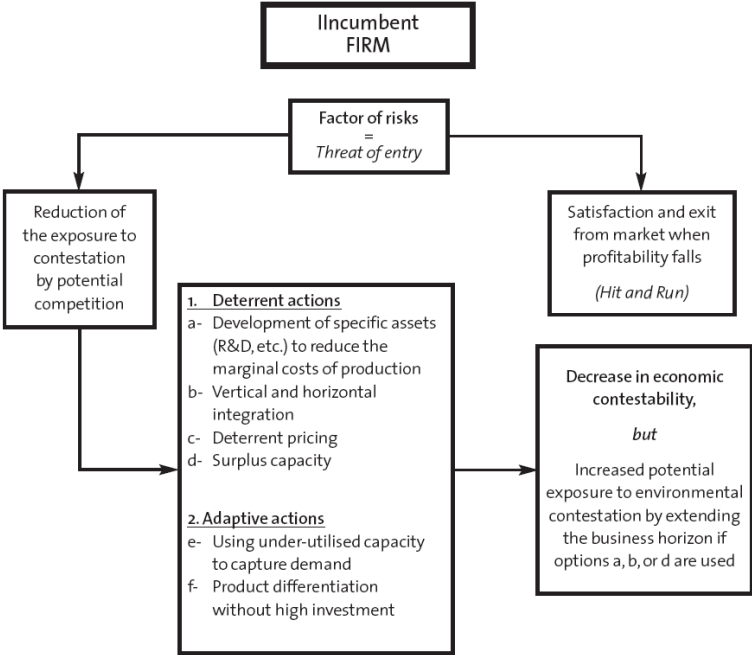


Diagram 1:
 Raised level of economic contestability and strategies to reduce threats of entry, with an effect on social contestability (Hommel, 2001, p.160)

well established on a market. Here a firm attempt to reduce its exposure to threat of entry on a highly contestable market. Actions aimed at reducing that economic contestability may increase its exposure to a threat of social contestability when those actions imply extending the horizon of engagement and increasing the irrecoverable short and medium-term costs.

This type of firms characterizes airlines as they evolve in competitive environment. In that kind of model, there is clearly a contradiction between environmental stakes and economic stakes of airlines.

Since deregulation, competitive intensity in the European market has grown substantially and airlines had to make specific investment in order to limit the threat of entry. In that sense, customer loyalty program, ticket distribution system, hub and spoke network (that need to invest in airport infrastructure), increased frequencies (shuttle system), barrier to entry in market by product proliferation strategy increase asset specificities and the time horizon of economic engagement is getting longer. These competitive strategies induce that airline have less invested in environmental policies than airports. But at the same time, they increase the risk of social contestability because all this measures contribute to the growth of air transport, thus increasing the total amount of greenhouse gases emitted in the atmosphere. We can add also that airlines that evolve in the more competitive environment (that means low cost carrier and regional carrier) invest the less in environmental strategies.

We have also noticed in our survey that airlines seem to be more concerned by energy efficiency than other category of stakeholder (especially airports), this could be explain in two ways:

- First, energy efficiency strategies can have a direct economic impact for airlines. Thus we found some complementarities between the reduction of energy consumption and pollutant emissions and the competitive strategy of the firms. Being efficient can have double dividend: reducing the cost and reducing the externalities.
- But these strategies are also constrained by the generalization of critics. Airline are more and more criticised by civil society, environmentalist group, and even some institutions about their contribution to climate change. This Generalizing social contestation is broad-based in terms of the frame of references and opponents involved. It is based not on nuisances in the immediate vicinity but on risks to the community (or “collective risks”) affecting a much larger set of persons. This kind of protest is typically fomented by players who neither belong to the branch nor live in the vicinity of the facilities concerned. These players form a coalition in order to coordinate their efforts and focus the undivided attention of the public authority and have it involved in their battle. Protests against airlines is just starting as we are still in preliminary work to identify and build knowledge on the alleged risks, but protests can generalized rapidly. These critics denounce airlines’ social license to operate as they estimate that the investment in the reduction of energy externalities are not sufficient, thus the moral obsolescence of this activities are increasing and force airlines to react by adaptation of their business model.

This next graph illustrates the opposite case, where an established firm on a market whose extent

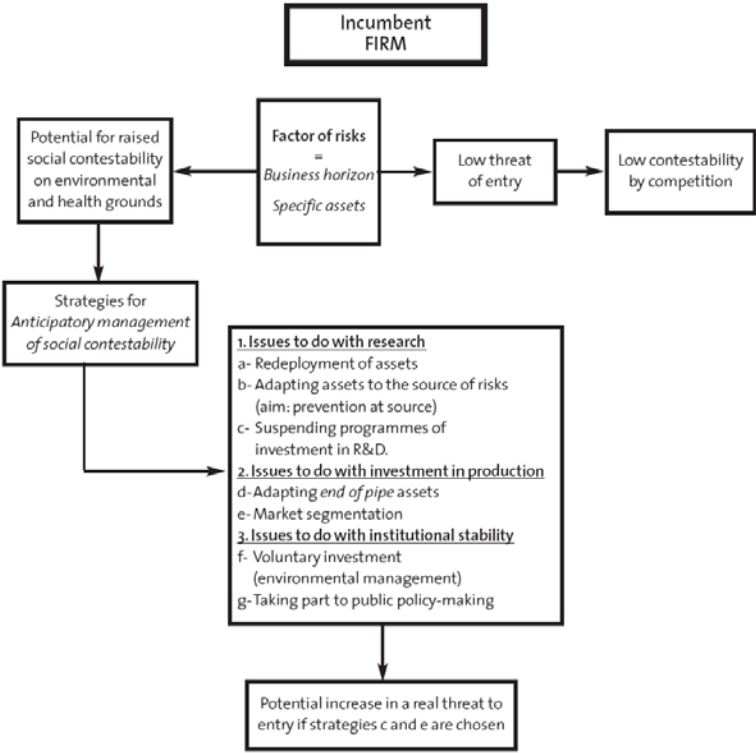


Diagram 2:
Reducing the level of environmental contestability in a market with a low level of economic contestability (Hommel and Godard, 2001, p.14)

of economic contestability by potential competitors is low. Among the various strategies the firm could use to reduce its exposure to protest on environmental issues, some have the direct effect of increasing the credibility of threats from potential newcomers, since they aim to reduce the horizon of engagement and increase flexibility: reducing the extent of environmental contestability would result in increasing the extent of economic contestability.

This is characteristic of airport business, where the economic contestability is quite low as they benefit from a natural monopoly, but they have to face high social contestability. As a matter of fact, their time horizon of economic engagement is long (because they have high irrecoverable cost and their assets are very specific). Unlike airlines that can easily change their market or sell their asset and move on to another activity, airports are embedded to their territory; therefore they have always known local challenging vigilance and NIMBY protests. Those critics aroused by nuisances or negative externalities generated on a local basis. Unlike the contestation about airlines' contribution to climate change that is still under elaboration and take place on a global scale, airports have known for long latent or active opposition to their activity mainly because of noise, but more and more about the water and soil pollution, and the degradation of local air quality.

That is why we found in our survey that investment in environmental strategy is higher in the airport business than in the airline activity. The protest of the resident and the existence of institutional rules are two strong drivers that explain the implementation of environmental

strategies. If they do not comply with those contingencies, their license to operate would have been contested. As they cannot adopt an exit strategy from the market in the event of severe contestation, they have to adapt to their territories constraints and implement environmental strategy.

Table: Type of activity and type of contestability in the air transport industry

	Airport	FSC	Low Cost and Regional carrier
Economic contestability	Low	Medium	High
Time horizon of economic engagement	Natural monopoly Long term High specificity of their assets	Dominant carrier Medium term specificity of their assets and irrecoverable costs (such as communication and loyalty program)	New entrant Short to medium term Possible “hit and run” strategies
Risk of Social contestation	High	Medium Brand visible by the opinion	Low
Type of contestation	Local vigilance NIMBY protest Noise and local air quality	Generalizing social contestation on Climate Change Issue Not many critics as other transport modes pollute more	
Degrees of environmental investment	High More developed on noise and local air quality	Medium More developed on noise and energy efficiency	Low Only developed where there are known complementarities with competitive purpose (for instance renewing of fleet)

CONCLUSION

We have shown through our survey that air transport stakeholders implement their environmental strategies variously. If the EES are uncertain in their results, they are nevertheless implemented in many firms as a way to reduce uncertainty surrounding their activity and especially their social legitimacy. Some are more concerned by local externalities (noise, local air quality and water and soil pollution) such as airport, whereas others strategies (such as airlines') are directed toward more global concerns (Climate Change).

This heterogeneity can be explained by numerous institutional hypotheses. We found that the social contestability model developed by Godard and Hommel can give precious answers to the variations of Energy Efficiency Strategies among firms.

As a matter of fact, the airlines seem to invest less in their environmental strategies than airport because they are more constrained by economic contestability, whereas airport must produce some compromise with their social stakeholder in order to protect their social license to operate. Therefore, airports have more elaborated environmental strategies than airlines do.

Moreover, if airlines are more concerned by the energy efficiency issues, it is for three major reasons:

- there exists some complementarities between economic competition and reduction of energy consumption, despite the lack of institutional rules. In that scope, EES is a way to increase the cost competitiveness of their activities.
- there is a risk of a generalized social criticism upon the environmental impact of airlines activities (whereas airports are more criticized for local environmental issues). To avoid the intensification of these risks, airlines must adapt their economical strategies, thus showing that they are still legitimate to operate;
- finally, the informal coercive pressure can also be a factor of adoption of EES. In that sense, being efficient is perceived as a performance indicator and a way to enhance quality of their products. This environmental differentiation is also a way to reduce the economic contestability of their activities (this factor is particularly true for Full Service Carrier that are more engaged in quality competition than other airlines –Regional Carrier or Low Fare Carrier).

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Annex 1 :

Enhancement of Air Transport sustainability and rational conflicts

On the one hand we have the Stockholm Environment Institute which is environmentally oriented; on the other hand we have got IATA, which is the “voice” of the Air Transport industry. This simple comparison show different point of conflicts that oppose two classical views about Environmentally Sustainable Air Transport.

Stockholm Environment Institute	IATA
End the tax free status of aviation fuel	<p>“The aviation is already over taxed (as alcohol or tobacco sometimes). Even if it is true that since the 1944 Chicago convention (art 24), international fuel is exempted from taxation.”</p> <p>Moreover, fuel taxes are a “particularly inefficient way to address environmental emissions” because they reduce the industry’s ability to invest in cleaner technology.</p>
Introduce an environmental charge for flying that is equal to the environmental damage caused by flying	<p>Through large and continuous investment in the development of new technologies, the aviation industry has been able to make very significant fuel and emissions reductions.”</p> <p>A fuel charge would be inefficient because it would “merely add a financial burden without improving environmental performance”</p>
Introduce WHO guidelines on noise limitation and ban night time flights	<p>“Through large and continuous investment in the development of new noise technologies, the aviation industry has been able to make very significant noise reductions.”</p> <p>“Proposal for a complete ban on night flights ignore the economic realities of the world we live in.”</p> <p>“Finally it is remarkable that night flights restrictions exclusively affect Air Transport as regulators apparently don’t dare impose night restrictions on other transport modes”.</p>
Increasing the use of public transport for access to airports to at least 50 % of all trips (Zurich airport “bubble concept”)	<p>“Effective environmental policy is to set targets and limits where necessary but to provide the flexibility for economic actors to choose the <i>most cost efficient ways</i> to meet their obligations.”</p>
<i>Transfer short (less than 400 miles) trips from air to train. This will mechanically reduce the number of flights by 45 %.</i>	<p>“To take the plane or the train should be a passenger’s choice and not dictated by governments”</p>
Encourage businesses to use <i>electronic media</i>	<p>“don’t’ expect airlines to advise their business travellers not to fly”</p>

Annex 2

Questionnaire sent to Air Transport Stakeholder

The questionnaire has been sent to 80 Air Transport Stakeholders, we obtained 25 answers.

The repartition of the stakeholder are as follow:

Type of stakeholder	Number of answers
Full Service Carrier	4
Regional Airlines	7
Charter Airlines	1
Low Fare Carrier	1
<i>Total Airlines</i>	<i>13</i>
Major Hub	1
Secondary Hub or Regional Airport	8
<i>Total Airport</i>	<i>9</i>
Manufacturer	3
<i>Total Answers</i>	<i>25</i>

(A) Preliminary Informations (Not to be diffused, only used for research purpose)

1 - Name of the respondent:

2 - Name of your Organization / firm:

3 - Function in the Organization / Firm:

4 - Which unit(s) is (are) in charge of defining the Environmental Strategy of your organisation?

5 - How many people are working in that unit?
 [0-5] [6-10] [11-15] [more than 16]
 Autre à préciser

(B) Perception of the Environmental Concerns in Air Transport

According to you, which environmental concerns are the most problematic for the future development of your business?

	Very Important	Important	Less Important	Not a Priority
6 - Noise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 - Facilities energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 - Aircraft energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9 - Ground transport energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 - Local air quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11 - Water and soil pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 - Matter consumption and Recycling Waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

According to you, which geographical scale is the most efficient to mitigate those environmental impacts?

	Global Scale	Regional Scale	National Scale	Local Scale
13 - Noise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14 - Facilities energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15 - Aircraft energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16 - Ground transport energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17 - Local air quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18 - Water and soil pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19 - Matter consumption and Recycling Waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(C) Environmental Strategy and Management tools in your organisation

20 - Could you please evaluate the proportion of the overall budget that is allocated especially for your environmental strategy?
 [<2%] [2%-5%] [>5%] Do not know

Has an environmental policy been defined in the following domains?

	Yes	No	Do not Know
21 - Noise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22 - Facilities energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23 - Aircraft energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24 - Ground transport energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25 - Local air quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26 - Water and soil pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27 - Matter consumption and Recycling Waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

28 - If Yes, please could you give an example of recent projects that have been launched to address the environmental concerns:

Is there an environmental reporting system for the environmental concerns listed below?

	Yes	No	Do not Know
29 - Noise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30 - Facilities energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31 - Aircraft energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32 - Ground transport energy consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33 - Local air quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34 - Water and soil pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35 - Matter consumption and Recycling Waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Among the following environmental management tools, which of them are used in your organisation?

36 - Environmental guideline, your organization ...
 Does not use an environmental guideline
 Uses an environmental guideline without yet quantitative objectives defined
 Uses an environmental guideline with quantitative objectives defined to address various environmental concerns
 You do not know

37 - Environmental certification, your organization...

- do not use any certification
- uses ISO 9000
- uses ISO 14001
- uses EMAS
- uses another certification system
- You do not know

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38 - Environmental auditing, your organization ...

- does not have any environmental auditing
- has implemented an Internal auditing
- has implemented an External auditing
- You do not know

39 - Multi-stakeholder Environmental agreement, your organization...

- has not signed any environmental agreement
- has signed a voluntary agreement with other stakeholders
- has signed a legally binding agreement
- You do not know

40 - Could you please indicate the names and the objectives of those agreements (examples: Global Reporting Initiative, Global Compact, OCDE Guidelines, etc...)

.....

.....

.....

.....

.....

41 - What kind of Internal Environmental Communication tools does your organization use?

- Environment is not a subject of internal communication
- Intranet
- Internal communication paper
- Internal committees/working group on the subject
- Specific training for employees
- Environmental criteria for jobs valuation
- others tools (please specify below)
- You do not know

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42 - What kind of External Environmental Communication tools does your organization use?

- Environment is not a subject of external communication
- Internet
- Sustainability Report or Environmental Report to communicate on the subject
- Environmental sponsorship
- Environmental advertising
- Consultative committees with resident on environmental concerns
- Working group with external stakeholder on environmental concerns
- Labellization by an Ethical Investment index (please answer question 43)
- Others External Communication Tools (please specify below)
- You do not know

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43 - If you are labeled by an ethical investment index, please specify which one:

- FTSE4Good
- Dow Jones Sustainability Index
- ASPI
- ESI
- You do not know

(D) The Energy Efficiency Strategy within your organisation

44 - Your organisation has well defined its strategy toward a better Energy efficiency

- Totally agree
- Partially agree
- Partially disagree
- Totally disagree

45 - Energy consumption and Greenhouse gases emissions must be treated as the same environmental concern:

- Totally agree
- Partially agree
- Partially disagree
- Totally disagree

46 - Energy consumption and local air quality must be treated as the same environmental concern:

- Totally agree
- Partially agree
- Partially disagree
- Totally disagree

47 - According to you, what are the MAIN drivers for your policy on Energy Efficiency? (Please tick the top 4)

- International (e.g. EU) standards and legislation - energy
- International (e.g. EU) standards and legislation - emissions
- National or local energy standards and legislation - energy
- National or local energy standards and legislation - emissions
- Providing low cost services to customers (ie competitiveness)
- Environmental improvements in Support of strategic business aim (e.g. growth)
- Preparation for anticipated or potential constraints on future policy
- Cost reduction
- Care for society
- Dealing with hostile external pressures
- Other, please specify

Other, please specify

48 - According to you, what are the MAIN barrier(s) for your policy on Energy Efficiency?

- Poor rate of return on investment - for energy reduction aims
- Poor rate of return on investment - for emission reduction aims
- Insufficient available funds (ie other priorities for investment)
- Lack of suitable knowledge or skills
- Lack of adequate guidance material
- Lack of adequate management information about energy or emissions
- Pricing structure simply passes the benefit on to the customer - hence no direct profit
- Lack of institutional constraint;
- Lack of coordination between actors;
- Alternative Technology/Energy does not exist;
- Too many scientific uncertainties on impact of greenhouse gases emissions;
- No responsibilities in this concern / Not directly concerned;
- Other, please specify

Other, please specify

In the list below, could you tick the actors with whom your organisation is involved in common projects / works on Energy Efficiency (reduce consumption and emission):

	A	B	C	D
49 - Engine Manufacturer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50 - Aircraft Manufacturer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51 - Kerosene Supplier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52 - Air Traffic Equipment Supplier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53 - Airport Operator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54 - Air Traffic Control and Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55 - Airline Carrier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56 - Local Government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57 - National Government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58 - European Commission / DG ENV (Environment)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59 - European Commission / DG TREN (Transport and Energy)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60 - European Commission / DG RTD (Research, Technology and development)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61 - European Parliament	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62 - ICAO (International Civil Aviation Organization)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63 - ECAC (European Civil Aviation Conference)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64 - EUROCONTROL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
65 - EASA (European Aviation Safety Agency)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66 - IATA (International Air Transport Association)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
67 - AEA (Association of European Airlines)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68 - ACI (Airport Council International) / ACI-Europe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
69 - CANSO (Civil Air Navigation Services Organisation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70 - Other Business Associations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
71 - Environmental NGO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
72 - Resident NGO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
73 - Research Academy and University	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- A - Strong Partnership / common project on Energy Efficiency
- B - Weak Partnership / only operational and/or local project
- C - No Partnership
- D - Do not know

74 - What are the main purpose(s) of such partnership (tick the top 3)?

- Have more information on the economic impacts of Climate Change and/or Oil depletion
- Share Best Practices on Energy Efficiency to enhance our activity
- Formalize a common Energy Efficiency policy within our business area
- Increase operational coordination between stakeholders (such as collaborative environmental management or Co-Decision Making).
- Develop industrial partnerships, research project on innovative products or services on Energy Efficiency (such as the Joint technology Initiative "Clean sky")
- Lobbying upon Institutions to avoid stringent regulation
- Other, please specify

Which Environmental Policies is the most effective to increase Energy Efficiency of the Air Transport Network?

	A	B	C	D
75 - Develop an alternative energy for aircraft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
76 - Increase airframe and engine Energy Efficiency (industrial innovation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
77 - Increase airport operations Energy Efficiency (groundhandling , maintenance)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
78 - Increase air navigation Energy Efficiency (reduce delays, optimal routing,...)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
79 - Increase airlines Energy Efficiency (increase load factor, fleet renewal, optimization of network size...)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
80 - Develop Air-Rail intermodality to promote substitution on short haul	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
81 - Reduce Air Transport Supply according to a sectorial emission cap	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
82 - Reduce Air Transport Demand by increasing prices (internalising external costs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A - Most effective
B - Effective
C - Not really effective
D - Less effective

83 - In the list below, choose the economic instrument(s) that is the most appropriate to increase energy efficiency of the air transport network (please tick the top 4):

- Technical norms on Engine consumption
- Technical norms on Engine emission
- Quotas on Noise level
- Quotas on Emissions level
- Traffic Cap (European scale)
- Traffic Cap (national or local scale)
- Value Added Taxes on Air Transport Activity
- Kerosene Taxes
- Global social cost Taxes (external costs)
- Airport Charges (Landing and Take Off cycle)
- Route Charges (length of flight)
- Global Pollution Emission Charges (GHG, CO2)
- Local Pollution Emission Charges (Other gases such as NOx, CO or HC)
- Open Emission Trading Scheme / Global scale
- Open Emission Trading Scheme / European scale
- Sectorial Emission Trading Scheme / Global scale
- Sectorial Emission Trading Scheme / European scale
- Sectorial Voluntary Agreement
- Other please specify

Other, please specify: