Policy discourse, people's internal frames, and declared aircraft noise annoyance: An application of Q-methodology

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Aircraft noise annoyance is studied extensively, but often without an explicit theoretical framework. In this article, a social approach for noise annoyance is proposed. The idea that aircraft noise is meaningful to people within a socially produced discourse is assumed and tested. More particularly, it is expected that the noise policy discourse influences people's assessment of aircraft noise. To this end, Q-methodology is used, which, to the best of the authors' knowledge, has not been used for aircraft noise annoyance so far. Through factor analysis five distinct frames are revealed: "Long live aviation!," "aviation: an ecological threat," "aviation and the environment: a solvable problem," "aircraft noise: not a problem," and "aviation: a local problem." It is shown that the former three frames are clearly related to the policy discourse. Based on this observation it is argued that policy making is a possible mechanism through which the sound of aircraft is turned into annoyance. In addition, it is concluded that the experience of aircraft noise and, in particular, noise annoyance is part of coherent frames of mind, which consist of mutually reinforcing positions and include non-acoustical factors. © *2009 Acoustical Society of America.* [DOI: 10.1121/1.3139904]

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I. INTRODUCTION

Exposure to aircraft noise in residential areas is a prime focus of protests and policy in many countries. In Europe it is estimated that in 2006 2.2×10^6 people were exposed to annual aircraft noise exposure levels of Lden 55 dB(A) or more and 3.0×10^6 Europeans were exposed to night-time noise levels of Lnight 45 dB(A) or more (MPD, 2007). In addition, the population within the Lden 55 dB(A) is expected to increase to 2.3–2.4 in 2010 and to 2.6–2.7 in 2015 (MPD, 2007).

While aviation generally increased over the past decades, noise tolerance seems to decrease. Today less noise is necessary to have an equal portion of highly annoyed people (Guski, 2002, 2004; Bröer and Wirth, 2004; Van Kempen and Van Kamp, 2005; Schreckenberg and Meis, 2007). In an updated review of Van Kempen and Van Kamp (2005), Schreckenberg and Meis (2007) showed that exposure-response functions of the period 1990–2008 are different from those collected in the period 1965–1992 on which EU policy is based (Miedema and Oudshoorn, 2001; European Communities, 2002). The older "EU-curve" is found to structurally underestimate the negative community response observed presently.

Several explanations for this trend have been provided. One is the change in the structure of the noise load: The average noise load of single events has decreased, but the number of events has increased (Guski, 2004). This change is concealed by annual energy equivalent noise metrics, which are generally used to predict noise annoyance, and the new structure might be experienced as more annoying. Other explanations focus on changes in individual characteristics (e.g., noise sensitivity) or on changes in attitudes such as trust in the noise source authorities, which might have come about due to the advent of the risk averse society (Wirth and Bröer, 2004). Guski (2004) provided yet another reason in arguing that recent aircraft noise studies have been done in the context of step changes in noise exposure levels, which are known to cause so-called excess negative response on top of the response to be expected from exposure-response curves derived from steady-state situations.

In this study, however, we focus on a different explanation, one which has received little attention in previous research. This explanation focuses on the policy discourse at airports. A policy discourse is defined as the way policy actors socially and publicly define and handle problems. We hypothesize that public definitions of aircraft noise are internalized in frames, which people adopt to evaluate aircraft noise. For example, if the policy discourse identifies aircraft noise as an important problem, we expect that people will internalize this definition, and in doing so, become more annoyed by the noise. The explanation for the trend toward higher annoyance then lies in changes in the policy discourse.

In this article we propose a social explanation for declared noise annoyance. Based on previous work of Bröer (2006) the main hypothesis of the present study is that policy making is a possible mechanism through which the sound environment due to aircrafts is turned into noise annoyance. The main assumptions underlying this hypothesis are that (1) people make use of already existing frames to appraise an

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environmental stimulus such as aircraft noise (cf. Nijhof, 1995, 1998, 2003) and (2) one of the most influential sources of these frames is the policy discourse. More specifically, the hypothesis can be decomposed into two distinctive processes: an internalization process of the policy discourse in internal frames of people and, second, using this internal frame, an appraisal process of aircraft noise. It is assumed that the policy discourse (and subsequently also the internal frame) contains "feeling rules" (Hochschild, 1979): It legitimizes or delegitimizes concerns, complaints, or fears. This can be modeled like the following: The policy discourse treats aircraft noise as a problem and (de)legitimizes annoyance→cognition and feeling rules are internalized by people around the airport→people feel annoyed by aircraft noise.

We do not claim that these relationships are unidirectional. A policy discourse can develop within a field of multiple actors, including citizens. Furthermore, people's frames can depend on personal characteristics such as gender, age, or noise sensitivity. Their role, however, is not the focus of the present study.

Focusing on the criterion of association the present article will investigate the relationship between the policy discourse and the internal frames of people. To that effect the following approach is adopted. First, the policy discourse at one airport, namely, Amsterdam Schiphol (the largest airport in The Netherlands), is characterized. This particular airport is chosen for two reasons. First, the policy discourse at Amsterdam Schiphol explicitly defines aircraft noise annoyance as a problem, a necessary condition if the aim is to investigate whether this definition resonates with the internal frames of people. And second, sufficient previous research is already available to provide a satisfactory description of the policy discourse. Second, the different perspectives used to study aircraft noise annoyance will be reviewed. This review shows that to assess subjectivity, Q-methodology is well-suited. Third, we reveal the frames people adopt to evaluate aircraft noise and how these relate to the policy discourse and to the declared level of noise annoyance. The rationale behind the approach described here is that if (1) a resemblance is found between the internal frames and the policy discourse (at a single moment in time) and (2) noise annoyance response is found to be intrinsically related to the revealed internal frames, there will be sufficient evidence to support the hypothesis that there is a strong relation between the policy discourse and aircraft noise annoyance.

II. NOISE POLICY DISCOURSE AT AMSTERDAM SCHIPHOL

Hajer (1995) (p. 264) defined a discourse[1] as "an ensemble of ideas, concepts, and categories through which meaning is given to social and physical phenomena, and which is produced and reproduced through an identifiable set of practices." Hence, a policy discourse can be regarded as the way policy actors (socially) define and handle public problems. Useful elements to guide these definitions are policy concepts, story-lines, and metaphors. In addition, although multiple discourses surrounding an issue can be identified, only one of those is (usually) dominant. Hajer (2006) defined dominance using two criteria, namely, discourse structuration and discourse institutionalization. The former relates to the degree a particular discourse dominates a given social unit (e.g., a policy domain). It refers to the degree a discourse is shared among multiple actors, the so-called discourse-coalition.[2] The latter relates to the degree a discourse is institutionalized in policy processes and policy measures. When both conditions are satisfied a discourse is said to be dominant. The current description of the policy discourse will only focus on the dominant discourse. Although alternative discourses can be identified, this focus is justified by the argument that this discourse is most visible to residents around the airport.[3]

The present description of the policy discourse related to the issue of aircraft at Amsterdam Schiphol is based on several existing studies (Dierikx and Bouwens, 1997; Van Eeten, 1999, 2001; Abma, 2001; Wagenaar and Cook, 2003; Bröer, 2006). It is meant to identify the dominant policy discourse for noise annoyance in The Netherlands.

Before aircraft became a problem of noise annoyance, aviation had been introduced to The Netherlands as an economic asset and as a part of national development since 1919. In policy documents Schiphol airport and aviation were placed in a historical perspective, relating them to the image of The Netherlands as a successful seafaring nation in the golden age. Based on this analogy the airport should be regarded as something to be trusted and accepted and the government should strive to develop an airport that plays a role on a global scale.

In the mid-1950s aircraft noise was first identified as a (potential) problem. In the following decades this problem was, in line with the physical expansion of the airport, treated as a spatial planning problem. The fundament of the noise policy was to fit the airport, with its noise footprints, in the residential environment surrounding the airport, such that the flight routes avoided living areas. Other (implicit) assumptions followed from this central planning perspective. First, human response to aircraft noise was expected to be uniform. The physical noise level therefore became the central outcome of interest for policy regulation. Second, since spatial planning was a matter of centralistic control, a major role was given to national governmental bodies and (acoustical) experts in the development of the airport, while residents surrounding the airport were assumed to be passive. Third, planning and noise policy focused on long term developments, which were expressed in statistics, maps (showing noise contours), and scenarios. And lastly, solutions proposed by policy makers and advisory commissions to solve the noise problem were spatial and technocratic in nature (e.g., repositioning runways or flight routes, improving aircraft engines, restrictive land-use policies, and relocation of the airport to the sea).

However, the planning discourse failed because flight operations and housing more and more overlapped. From the 1960s onwards, therefore, policy makers accepted noise pollution in residential areas. Citizens around Amsterdam Schiphol, however, following the discourse's own premise that aircraft noise is an important problem, did not settle in their role as passive receivers. In the period between 1965

and 1995 the history of Schiphol knows many citizens' protests. In these protests the disciplinary effect of the policy discourse can be observed. Although citizens oppose the policy they still express themselves in terms of the planning discourse by advocating for solutions such as the repositioning of runways and relocation of the airport. The unsolvable conflict caused by the planning discourse (i.e., "noise is an avoidable problem" versus "some noise needs to be accepted") as well as the (resulting) protests led to a deadlock. To escape it a new (international) story-line was introduced in the 1990s, called "ecological modernization" (Weale, 1992; Mol and Spaargaren, 1993; Hajer, 1995). The combination of this story-line with the existing discourse has led to the policy discourse that exists to the present day, which Bröer (2006) termed the "mainport and environmental discourse."

The basic assumption of this new story-line was that economy and environment could be developed at the same time; the attainment of both economical and ecological goals should be regarded as a positive-sum game. The promise of ecological modernization relied strongly on developments in science and technology and market-based policy instruments (e.g., environmental taxes). Related to Amsterdam Schiphol the economic benefits of aviation became known under the umbrella of the "mainport," which was considered a vital entity to The Netherlands if it were to play a role in the globalizing economy. Schiphol should be seen as an "engine of the economy." The ecological negative externalities, most notably noise, but also risk and pollution, became known under the umbrella of the "environment."[4] From 1990s the mainport and environment discourse was spread among citizens through extended participatory processes. Repeatedly, citizens were called upon to be alert, to be informed, and to express their interests. In 1995, the mainport and environment discourse was institutionalized, when the decision was made to construct Schiphol's fifth runway (mainport) and to implement noise contours (environment).

Although the principle of ecological modernization seems to have provided a viable new perspective, it can actually be seen as an explicit reformulation of the existing problem conceptualization (i.e., the planning discourse) in modern (neo-liberal) terms. Policy makers seek to accommodate growth of the airport while trying to avoid its negative effects on the environment via traditional planning instruments. The only difference is the explicit acknowledgment of both economical and environmental effects/values.

III. THREE PERSPECTIVES TO STUDY AIRCRAFT NOISE ANNOYANCE

In studying noise annoyance three perspectives and related research approaches can be distinguished: the acoustical aggregate model, the (non-)acoustical disaggregate approach, and the discourse approach. In the following these three perspectives will be briefly discussed and their suitability to our research aim indicated.

The acoustical aggregate model has focused on the most obvious determinant of noise annoyance: the physical level of noise exposure. The effects of this variable are presented as exposure-response relationships, e.g., the percentage of highly annoyed people, at a given level of noise exposure, calculated or measured with energy-based noise metrics such as Lden. Schultz (1978), who was the first to integrate the results of 11 community surveys, developed a general exposure-response relationship for transportation noise, which was updated by Fidell *et al.* (1991) and Miedema and Vos (1998). The physical level of noise exposure can reveal community response but cannot account for all individual variability in noise annoyance. Based on review of 39 surveys Job (1988) concluded that only 9–29% of the variation in negative reaction (i.e., noise annoyance) can be explained by noise exposure. Since the aim of the present study is to elucidate the different frames of people, this model, which focuses on community response, does not suit our purpose well. The disaggregate non-acoustical approach [also termed the individual or situational difference model (Lercher, 1996)], which developed in response to the limitations of the acoustical model, is more in line with our aim, but it still does not fully suffice.

Within this disaggregate non-acoustical modeling approach the effects of personal and situational variables on individual levels of noise annoyance are studied via survey research or experiments, controlling for the level of noise exposure. Several non-acoustical factors have been identified. Borsky (1961), McKennell (1963), and Leonard and Borsky (1973) showed that noise annoyance is associated with source evaluation, misfeasance in relation to the authorities, fear of an aircraft crash, and concern about health effects. Job (1988) found that the attitude to the noise source and sensitivity to the noise account for more variance in annoyance than noise exposure does. A meta-analysis of Fields (1993), based on 136 surveys, revealed that socio-economic and demographic variables (age, sex, social status, income, education, home ownership, dwelling type, length of residence, and personal benefit) had no influence on the level of noise annoyance. Instead, annoyance was related to the amount of insulation from sound at home, fear of danger from the noise source, noise prevention beliefs, general noise sensitivity, beliefs about the importance of the noise source, and annoyance with non-noise impacts of the noise source. Similar results were obtained by Miedema and Vos (1999). Overviews of relevant non-acoustical factors are given by Lercher (1996), Guski (1999), and Kroesen *et al.* (2008). The last mentioned authors identified 28 (potentially relevant) non-acoustical factors.

The disaggregate approach uncovered a wide range of factors empirically related to aircraft noise annoyance. In addition, it seems well-suited to investigate the causal structure, which underlies noise annoyance. Still, for our aim, it is unfit. In the first place, we are not interested in the statistical associations between variables, but in the frames people adopt to evaluate aircraft noise. (Linear) combinations of variables can be used to predict (or explain) annoyance response, but they are not suited to capture or qualify the frames we hope to reveal.

Second, the disaggregate approach recognizes that annoyance is partly based on subjectivity, but (implicitly) assumes that all people have the same understanding of non-acoustical factors such as trust in the source authorities or

noise sensitivity. Hence, the approach generally assumes an objective and unchanging frame of reference when different people respond to different questions. A concept such as noise annoyance, however, can be subject to a host of different definitions, each of which may be sensible within a specific social context. An *a priori* meaning of the concept introduces arbitrary subjectivity in the measurement process, which carries the risk of missing or misinterpreting meaning from the respondents own frame of reference.

A study of King *et al.* (2004) is illustrative for the way a social or political context can cause differences in internal frames of reference. They measured the perceived level of political efficacy within a Mexican and Chinese sample with the following question: "How much say do you have in getting the government to address issues that interest you?" It turned out that 50% of the Mexicans, while living in a democratic country, reported to have no say, in contrast to 30% of the Chinese, while living in a non-democratic (communist) country, reported to have no say. According to King *et al.* (2004) the explanation lies in the fact that Chinese have lower standards for what counts as satisfying the level described by any given response category. Hence, although their "actual" level of political efficacy is lower, the difference in the frame of reference between Mexicans and Chinese is cause for the found opposite result. This exemplifies the need to have an understanding and operationalization of an issue, which is grounded in specificities of a field.

The aggregate model or disaggregate modeling approach provide valuable insights on their own terms. In addition, it has been shown possible to make inferences about the internal frames of people with traditional questionnaire techniques and statistical analysis (Raimbault *et al.*, 2003). Yet, we want to put forward now a different approach, which pays more attention to differences in frames of reference.

A step toward an alternative approach was taken by Bröer (2006, 2007a, 2007b). His main thrust was to understand aircraft noise annoyance from subjects' own frame of reference. Instead of testing an already existing theory, his aim was to develop a new theory, which is grounded in the meaning people attribute to sound (Glaser and Strauss, 1967; Blumer, 1969; Charmaz, 2006). In line with the present study he assumed that sound is meaningful within a coherent frame, a concept which is connected to discursive psychology (Billig, 1987; Potter and Wetherell, 1987; Edwards and Potter, 1992). Here, a frame is defined as a discourse that operates at the individual level a coherent set of beliefs and attitudes that people use to observe and give meaning to reality. In general, frames guide the extraction of relevant cues from ongoing flows of events and act as filters through which we (selectively) observe the world, attribute meaning to it, and act on it (Goffman, 1974; Rein and Schön, 1993; Schön and Rein, 1994; Weick, 1995). Bröer (2006) argued that phenomena labeled "non-acoustical factors" can be part of such a frame. Furthermore, Bröer (2006) assumed that people learn or internalize frames socially and hypothesized that the frames' subjects develop to give meaning to the experience of aircraft noise are influenced by the policy discourse related to the issue of aircraft noise at an airport.

If the policy discourse influences people's attitude to aircraft noise, one would find different kinds of noise annoyance in different political settings. Therefore Bröer (2006) studied the policy discourses and people's frames of aircraft noise at two European airports: Amsterdam Airport Schiphol in The Netherlands and Zurich Kloten in Switzerland. He found that at similar sound levels the aircraft noise was indeed experienced differently *between* the two cases and that those differences can be traced back to different noise policies. Different attitudes toward noise *within* a case were related to the dominant policy discourse too: Typically people strongly adopted part of the dominant policy discourse and rejected or downplayed other parts. In general, people were found to evaluate noise policy when they heard aircraft sound and to have internalized the language and the logic of the policy. Based on these results Bröer (2006) concluded that noise annoyance is shaped by the policy discourse.

This third perspective is most closely related to our formulated aim. However, Bröer (2006) worked with an interpretative approach, which begs the questions if the frames he found can be objectified. Therefore, in contrast to Bröer's (2006) qualitative methodology, we use Q-methodology. In line with Bröer's (2006) approach this method assumes that subjectivity is anchored in self-reference. However, in contrast to Bröer's (2006) approach, the Q-method *can* be used to render internal frames of people manifest in an objective way (Brown, 1980; McKeown and Thomas, 1988).

The three perspectives are summarized in Fig. 1 and Table I. The present study will be in line with the discourse model and will further investigate the hypothesis that the policy discourse surrounding a particular airport becomes internalized in the frames people adopt to evaluate the meaning of aircraft noise. Yet, in contrast to Bröer's (2006) qualitative methodology, we use Q-methodology to render the internal frames of people visible. Lastly, we acknowledge the influence of personal determinants (e.g., age, gender, and noise sensitivity) and the physical level of aircraft noise exposure on people's frames, but these influences are not assessed.

IV. Q-METHOD

The basic idea of Q-methodology (Brown, 1980) is that people rank-order statements derived from everyday communication and that these rank-orderings (i.e., so-called Q-sorts), instead of traits related to the individual, are correlated and factor analyzed. When two Q-sorts are shown to correlate, the persons who constructed them are said to share a similar frame. By factor-analyzing a correlation matrix of $n \times n$ persons/Q-sorts, shared frames can be extracted. Underlying this procedure is the premise that subjectivity is anchored in self-reference. Subjects are encouraged to actively construct their opinion on the topic at hand. In addition, by letting the subjects rank-order the statements (on a single scale), they are evaluating and interpreting them in relation to each other. If, like in our study, subjects sort 48 statements, this involves, at least implicitly $\left(\frac{1}{2}\right)(48)(48-1) = 1128$ judgments. This procedure is based on the assumption that meaning is relational: A specific statement cannot be seen in isolation but derives meaning from its relation to

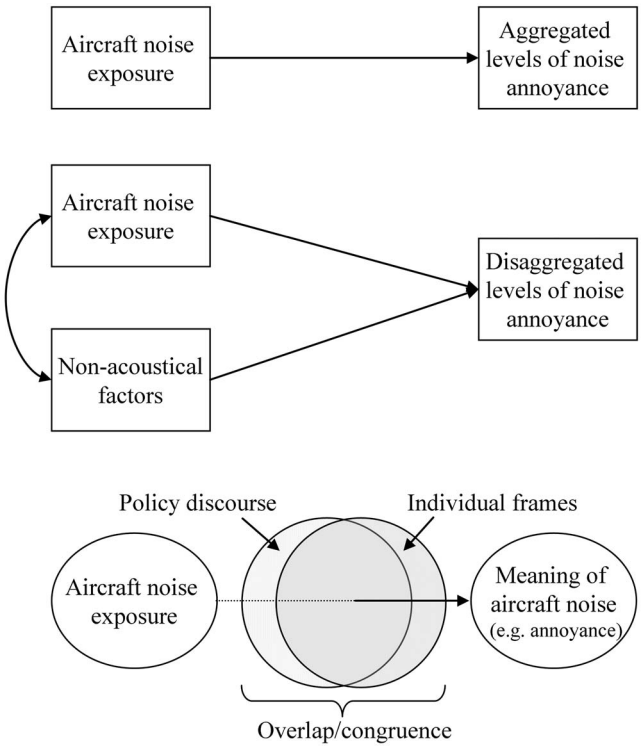

FIG. 1. Model structures of the three perspectives. The aggregate acoustical model (top figure), the disaggregate approach (middle figure), and the discourse approach (lower figure). The discourse approach assumes that meaning is provided to aircraft noise through an individual frame, which is schematized here as a filter. Second, it assumes that the individual frames are congruent with the policy discourse. We schematized the entities in the discourse approach as ovals to indicate their nature as *fixed qualities*. In contrast to the other two approaches were the entities (rectangles) relate to *variable quantities*.

other statements (a position common in Gestalt psychology, philosophy of language, discourse analysis, and large parts of interpretive social science). For example, when two people strongly agree with the statement "I am annoyed by aircraft noise," survey research treats those expressions as part of the same category. In a relational perspective, the statement might refer to disturbance or to unfair treatment and can therefore constitute two (or even more) different kinds of annoyance. Since the aim of the present study is to explore the different frames in which people are (not) annoyed by aircraft noise, Q-methodology seems well-suited for this task. Below we describe the way Q-method is applied to our case.

A. Defining the Q-sample

First, one has to define the "concourse:" the whole of statements of opinion, related to a certain topic that can be found among members of a social group (Stephenson, 1978; Brown, 1980). In this case the concourse encompasses all expressions by residents living in the vicinity of Schiphol Airport related to the topic of aircraft noise. Based on previous research of Bröer (2006) statements were theoretically sampled (Glaser and Strauss, 1967; Charmaz, 2006) from four diverse sources: thematically structured interviews with residents living in Amsterdam Osdorp related to the topic of aircraft noise ($n=47$), complaints to the Commission Regional Dialogue Schiphol ($n=130$), letters to the editor from residents around Schiphol published in three national newspapers ($n=71$), and statements from residents during public inquiry procedures ($n=18$). This provided us with 240 different statements about aircraft noise.

To select a Q-sample from these statements we used academic literature to identify four key themes: (1) perceptions of aircraft noise (covering statements related to hearing aircraft, being disturbed by aircraft, fear, noise annoyance, etc.), (2) non-acoustical factors (covering statements related to trust in noise source authorities, perceived control, expectations, etc.), (3) policy story-lines (covering statements related to economic benefits, ecological costs of aviation, complaining, etc.), and (4) "autonomous noise annoyance definitions," which are not covered in one of the first three and are rather unusual (covering statements such as "people have the right for silence"). To arrive at a representative sample, statements within each category were selected until all (sub)categories were covered. The final Q-set consisted of 48 statements and can be found in Table II (Sec. V). The final sample is *naturalistic* in the sense that the statements were derived from participants' own communications about aircraft noise and *structured* in the sense that theoretical (sub)themes were used to categorize the concourse, which ensured coverage of all relevant issues related to aircraft noise in the final sample (McKeown and Thomas, 1988).

B. Participants and procedures

We presented the selection of statements to residents of part of Amsterdam Osdorp, in The Netherlands. This was also the area were the initial interviews were held. All respondents were exposed to the same aircraft noise. The av-

TABLE I. Three perspectives to study the effect of aircraft noise on humans.

Acoustical aggregate model (top figure in Fig. 1)	(Non-)acoustical disaggregate approach (middle figure in Fig. 1)	Discourse approach (bottom figure in Fig. 1)
Main objective: (given the noise level) to predict aggregated levels of noise annoyance (i.e., community response).	Main objective: to predict/explain variation in individual levels of noise annoyance.	Main objective: to study the link between policy discourses and the internal frames, which people adopt to qualify aircraft noise (non-acoustical factors can be part of the internal frames).
Limitations: (1) Large portions of variance in (community) reaction remain unexplained and (2) unable to reveal internal frames.	Limitations: (1) Difficult to reveal internal frames and (2) implicit assumption of an objective frame of reference.	Limitation: difficult to generalize the results to a larger population.

TABLE II. Factor arrays of the five rotated factors.

No.	Statement	A	B	C	D	E
1	It is convenient to live near Schiphol.	3	−1	1	−1	−1
2	Schiphol should be allowed to stay: Long live aviation!	4	−1	0	2	0
3	I regularly hear aircraft.	3	4	3	−2	5
4	I fear that aircraft noise will increase.	−1	2	1	−4	5
5	I have the feeling that aircraft noise is forced on me.	−2	4	−3	−3	−4
6	The sound of aircraft belongs to this day and age.	3	−2	0	2	1
7	If you cannot stand aircraft noise, you should go and live somewhere else.	1	−3	0	−3	−4
8	It is acceptable that people are disturbed by aircraft noise in their dwelling.	0	−5	−4	−2	−3
9	It is acceptable that people have to interrupt a conversation due to aircraft noise.	−2	−5	−2	0	−1
10	I am annoyed by aircraft noise.	−5	2	−1	−4	2
11	Air traffic is a hazard for public health.	−2	1	1	0	3
12	The growth of Schiphol goes at the expense of the quality of life of many citizens.	−1	5	−3	−1	2
13	I cannot control the noise and this makes me feel angry and powerless.	−4	0	−2	−3	−3
14	If you do not pay attention to it (i.e., the noise) then you will not be bothered by it.	3	−4	1	0	−3
15	I can do something against the noise.	1	−2	−1	−2	−5
16	If I could I would move to a quiet neighborhood.	−4	−1	−4	−1	4
17	I am afraid that one day an aircraft will crash nearby.	−2	−1	−5	1	−3
18	As citizen you are powerless against Schiphol.	−3	1	0	3	−2
19	It does not help to complain about aircraft noise.	−1	0	−1	3	0
20	There is sufficient consideration for residents around Schiphol.	2	−4	−2	3	0
21	Citizens should collectively move up against aircraft noise.	−1	0	−3	−4	2
22	If people complain about aircraft noise they mainly serve their self-interest. They do not realize how important Schiphol is to The Netherlands.	1	−3	−2	5	2
23	There is too much attention for a small group of complainants around Schiphol.	0	−3	1	2	0
24	You cannot solve the "annoyance" problem. Schiphol has been around for a long time and this is something we have to deal with.	2	−1	−1	3	0
25	Flying is too cheap.	−4	0	−3	−1	−5
26	More technology will be developed that will reduce the noise.	4	1	3	0	3
27	Schiphol acts as a free-state making its own rules and regulations.	−1	1	−5	0	−4
28	I believe that Schiphol always gets his way.	−3	3	0	0	2
29	Schiphol does enough to reduce the noise.	0	−4	−2	−1	−2
30	The government does enough to reduce the noise.	0	−3	−1	−5	−2
31	The government does not live up to their promise to reduce the noise.	−1	1	−4	3	1
32	It is a good thing that the environmental movement and local action groups stand up for residents living around Schiphol.	1	3	2	−1	3
33	They always expand the airport first, and then raise the norms for the allowed levels of noise.	0	2	0	2	1
34	Schiphol is an engine of the economy.	5	0	5	1	0
35	We should be proud of our national airport.	4	0	2	1	−2
36	Aviation is important for the employment.	5	3	5	1	1
37	Noise annoyance from aircraft is an important problem.	0	4	2	−3	−1
38	Aviation is a threat to the environment.	0	5	2	1	1
39	The government should strive for reducing noise annoyance.	2	2	3	0	4
40	The government should strive for growth of Schiphol.	1	−2	−1	−5	−1
41	Economic interests are more important than reducing the level of noise annoyance.	1	−2	2	−2	0
42	Schiphol is big enough and should not be allowed to grow any further.	−3	1	3	4	−1
43	The double-sided aim (more growth but not more annoyance) of the government has failed. In the end the choice is always made to accommodate growth.	2	2	1	4	0
44	People have the right for silence.	0	3	4	2	4
45	Aircraft noise is "meaningless" (Dutch: zinloos) noise.	−3	−1	0	0	−1
46	I think it is a good idea to have an "aircraft-free-Sunday" every now and then.	−2	−2	4	0	3
47	Schiphol should be relocated to the sea.	−5	0	4	−2	−2
48	Further away from Schiphol aircraft noise is not really a problem.	2	0	0	5	1

erage noise level in this neighborhood, calculated over the period of 1 year, is approximately Lden 53 dB(A) (Bröer, 2007a). It is located approximately 5 km from the center of Amsterdam Schiphol. For the Q-method, 40–60 subjects are sufficient (Watts and Stenner, 2005). Respondents are chosen strategically: based on criteria derived from theory. In this case we included people who are highly, moderately, and not annoyed.

The data were collected at people's homes, by students under the close supervision of both authors in the period March–April 2008. We asked respondents to rank-order the 48 statements according to the following: "To which extent

do you agree/disagree with the following statements?" The scale ranged from −5 (most disagree) to +5 (most agree). In total 43 respondents completed the Q-sorting task and participated in a short interview afterwards. The interview asked for reasons behind respondents' rankings, additional topics, and noise annoyance, measured with the first item of the standardized noise annoyance scale developed by Fields *et al.* (2001).

C. Analysis

To identify similarly patterned Q-sorts, a correlation matrix of $n \times n$ Q-sorts (n=43 subjects) was calculated and factor analyzed using the method of centroid factor analysis (Brown, 1980). The PQMETHOD software (Schmolck, 2002) was used for this purpose. Based on Brown's (1980) recommendation seven factors were initially extracted. Next, the varimax rotation method was used to approximate simple structure. In line with standard Q-methodological practice only factors with two or more significant loadings[5] and an eigenvalue greater than 1 were considered acceptable. After rotation it was found that two factors did not satisfy these criteria. These were therefore disregarded from further analyses.

Next, factor exemplars to compute the composite factor arrays are identified. These are participants' Q-sorts that significantly and solely load on a factor and can therefore be considered as representative for the thought pattern present in the factor on which they load. Via the formula $2.58(1/\sqrt{N})$ and with N=48 (i.e., the number of statements) it can be calculated that loadings greater than ±0.37 are significant at the 0.01 level. However, following the approach described by Watts and Stenner (2005), the confounding of participants (i.e., the number of participants that load on two or more factors) is minimized by raising this level to ±0.40. At this level 37 participants load solely on one factor, 3 participants load on two factors, and 3 participants load on none of the factor. Hence, 86% of the data are used in the final analysis of the factors.

Lastly, the factor exemplars are merged into factor arrays, which represent "idealized" Q-sorts of hypothetical persons loading 100% on the factors.

V. RESULTS

A. Frames of residents around Schiphol

In the following the factors will be interpreted based on the computed factor arrays (Table II). For each factor, we indicate its relation to the noise policy discourse. Central to the first three factors is their relation to the mainport and environment policy discourse. In line with our theoretical argument, the factors are called frames below.

1. Frame A: Long live aviation! (the economic stance)

This frame is shared by 14 subjects and can account for 17% of the total variance of the correlation matrix.[6] In line with the policy discourse it strongly emphasizes the economic benefits of Schiphol airport (34: 5; read: statement 34, score 5) and of aviation in general (36: 5). According to this account we should be proud of our national airport (35: 4) and be cheerful about it (2: 4). Schiphol should grow (42: −3) and certainly not be relocated to the sea (47: −5). In this frame, one is optimistic about the future: Technology will reduce aircraft noise (26: 4) and aircraft noise is not expected to increase (4: −1).

While this frame strongly subscribes to the economic argument of the noise policy, it plays down the ecological arguments: Aviation is not considered a threat to the environment (38: 0) and noise annoyance is not considered a major problem (37: 0). Subjects tend to disagree with statements that aircraft noise is a hazard to public health (11: −2) and are indifferent about the statement that growth of Schiphol reduces the quality of life (12: −1).

In line with playing down the ecological arguments, complaining about noise is not supported: Subjects are indifferent about the statement that those who complain about noise are selfish and do not see the bigger picture (22: 1). They believe that residents around the airport receive sufficient consideration (20: 2) and they have no intention to engage in a collective action to address the noise problem (21: −1).

Given the support for economic reasoning, subjects are indifferent about the efforts of the government and Schiphol to reduce the noise (30: 0 and 31: 0). The relationship with the noise source authorities is mildly positive to neutral. Subjects do not believe Schiphol always gets its way (28: −3) and are indifferent about the statement that this actor makes its own rules and regulations (27: −1). This indifference can also be observed in relation to the statement that the government does not live up to its promise to reduce the noise (31: −1).

In this frame, the aim of the government to combine economic growth and ecology has failed (43: 2), but this does not go together with an overall negative attitude toward authorities.

Subjects subscribing to this frame do not consider themselves to be annoyed by the aircraft noise (10: −5), although they do regularly hear aircraft (3: 3). In addition, they have no intention of moving to a quieter place (16: −4).

Lastly, the frame acknowledges that we live in modern times: The sound of aircraft belongs to this day and age (6: 3) and aviation is just something we need to deal with (24: 2). This is typical for a "go with the flow" attitude toward modernity.

Altogether, frame A has a clear structure: It strongly favors economic arguments and plays down everything related to ecology.

2. Frame B: Aviation: An ecological threat (the environmental stance)

This frame is shared by 15 subjects and can explain 18% of the total variance. In contrast to frame A, this frame emphasizes that aviation is an environmental threat (38: 5), that growth of Schiphol goes at the expense of the quality of life of many citizens (12: 5), that disturbance by noise is completely unacceptable (8: 5, 9: 5), and that aircraft noise annoyance is an important problem (37: 4), which cannot be

ignored (14: −4). In line with the policy discourse, this account subscribes to the conceptualization of aviation as an important environmental problem.

While the frame stresses "ecology" it is less supportive of "economy." Subjects neither confirm nor disconfirm that Schiphol is an engine of the economy (34: 0). Aviation, however, is considered to be important for employment (36: 3). Compared to frame A, there is a strong support for one half of the policy discourse, but less criticism toward the other half.

Like subjects in frame A, subjects in frame B agree with the statement that the double-sided aim has failed and that in the end the government always chooses to accommodate growth (43: 2). But, different from frame A, in frame B this is combined with an elaborate negative attitude toward authorities. One believes that there is insufficient consideration for residents around Schiphol (20: −4) and that the government and Schiphol are not putting in enough effort to reduce the noise (29: −4 and 30: −3). Subjects believe Schiphol always gets its way (28: 3) and that the noise norms are purposively manipulated following expansion of the airport (33: 2). Consequently and in contrast to all other frames, subjects feel that aircraft noise is forced on them (5: 4), that something which is net undesirable (38: 5 versus 34: 0 and 36: 3) is unwillingly/forcefully and unasked (20: −4) being imposed on them. Policy has failed in the sense that noise annoyance is out of control. It is only in this frame that subjects do not think that aviation belongs to this day and age (6: −2). Instead, it is a runaway train, which threatens citizens and the environment.

Within the account people support complaining (22: −3 and 23: −3) and environmental movements (32: 3). This support is stronger than in all other frames. This is of course in line with the ecological stance. It might also be interpreted as a way to counter the criticism often raised against complainants in The Netherlands.

Subjects within this frame consider themselves moderately annoyed by aircraft noise (10: 2) and claim they regularly hear aircraft (3: 4).

Altogether, frame B has a clear structure: It strongly favors ecology, puts less emphasis on economy, is strikingly critical about noise policy, and portrays noise as an uncontrolled ecological threat.

3. Frame C: Aviation and the environment: A solvable problem (the technocratic stance)

This frame is shared by three subjects and can explain 5% of the total variance. This particular frame closely resembles the policy discourse with regard to Schiphol. It underlines the benefits of aviation for the economy (34: 5) and employment (36: 5), but also mildly agrees with the statements that aviation is a threat to the environment (38: 2) and that noise annoyance is an important problem (37: 2). Environmental pressure groups are viewed positively (32: 2).

Complaining, in this frame, is necessary and useful in general (19: −1, 22: −2), but subjects are indifferent about the statement that there is too much attention for a small group of serial complainers (23: 1).

This frame accurately reproduces the dominant policy and supports the government's policy stronger than any other frame. Subjects strongly disagree with the statement that the government does not live up to its promise to reduce the noise (31: −4) and with the statement that Schiphol acts as a "free-state" (27: −5). Subjects do not feel powerless (13: −2) and do not have the idea that the sound is forced on them (5: −3). Still, subjects weakly disagree with the statements that the government and Schiphol do enough to reduce the noise (29: −2 and 30: −1, respectively). So even in this frame achievement of the double-sided aim of the government is not supported (43: 1).

It seems as if in this frame, subjects have internalized the dominant policy, but feel disappointed with the results. Subjects strongly agree with statements that Schiphol should be relocated to the sea (47: 4) and that it would be a good idea to have an "aircraft-free-Sunday" every now and then (46: 4). The first measure has been debated since the 1960s; the second one is in no way part of the dominant policy discourse.

In addition, subjects have faith in technology to reduce noise (26: 3) as well as in technology in general. This latter remark is supported by the fact that subjects within the frame are least fearful of a nearby aircraft crash (17: −5). It is plausible that the acknowledged failure of the double-sided aim does not lie in subjects' belief that this is a wrong aim to strive for but probably lies in subjects' belief that wrong or too few solutions are being implemented.

Lastly, although subjects do regularly hear aircraft (3: 3), they are not particularly annoyed by aircraft noise (10: −1). They do, however, find it unacceptable that people are disturbed by aircraft noise in their dwelling (8: −4) or that people have to interrupt a conversation due to the noise (9: −2).

The structure of this frame closely resembles the dominant policy. In this frame, a "technological fix" is the prime solution for the still existing tension between economy and ecology.

4. Frame D: Noise is not a problem (the anti-government stance)

This frame is shared by two subjects and can explain 4% of the total variance. This account neither strongly concurs with the policy discourse's propagation of aviation as an important driver of the economy (35: 1 and 36: 1), nor with its propagation of aviation as an important environmental threat (38: 1). Moreover, subjects even disagree with the statement that noise annoyance is an important problem (37: −3). The denial of aircraft noise as an important problem also becomes apparent from other statements: Subjects are not annoyed by aircraft noise (10: −4), they do not believe that the government should strive for reducing noise annoyance (39: 0), nor do they fear that aircraft noise will increase (4: −4), and they strongly agree with the statement that farther away from Schiphol aircraft noise is not really a problem (48: 5). In addition, subjects in this frame do not regularly hear aircraft (3: −2) in contrast to the other frames in which subjects agree to this statement.

The attitude that aircraft noise is not a problem is consistent with the strong non-complaining attitude present in this frame. Subjects strongly agree with the statement that people who complain about aircraft noise only serve their self-interest and wrongfully neglect the importance of Schiphol to The Netherlands (22: 5). In addition, they do not believe that citizens should move up collectively against the noise (21: −4) and agree with the statement that there is sufficient consideration for residents around Schiphol (20: 3).

Still, subjects believe that the government does not do enough to reduce the noise (30: −5), that the double-sided aim of the government has failed (43: 4), and that the government does not live up to its promise to reduce the noise (31: 3). Since subjects in this frame do not subscribe to the ecological or the economic arguments, their dissatisfaction is derived from a different argument. In this frame, subjects most strongly state that government should not strive for growth of the airport (40: −5) and that Schiphol is big enough and should not be allowed to grow any further (42: 4). Subjects probably fear the growth of the airport for which they blame politicians, not the industry. They do not believe Schiphol always gets its way (28: 0) or that it acts as a free-state (27: 0).

As mentioned earlier, subjects adhering to this frame do not find themselves annoyed by aircraft noise (10: −4), nor do they regularly hear aircraft (3: −2). As in frame A, subjects in frame D are rather indifferent about the acceptability of being disturbed by aircraft noise (8: −2 and 9: 0).

This frame is structured around the idea that the physical growth of the airport is insufficiently controlled by politicians, but this problem is not connected to either environmental or economic arguments. It might relate to a conservative anti-government frame in which the airport as such is big enough.

5. Frame E: Aviation, a local problem (the a-political stance)

This frame is shared by three subjects and can explain 5% of the total variance. Subjects in frame E are, similar to those in frame D, not very concerned with the positive economic effects (34: 0 and 36: 1) or the negative environmental effects (38: −1 and 39: 1) of the airport. Instead the consistent theme in this frame is that subjects evaluate the statements in terms of the direct consequences they hold to their personal situations. Therefore, subjects do not take a strong position in the wider public controversy related to the economy-ecology conflict, but instead react with strong agreement to the statements such as "I fear aircraft noise will increase" (4: 5) and "Air traffic is a hazard for public health" (11: 3).

The most striking feature of frame E is the subjects' desire to move to a quieter neighborhood (16: 4). In addition, subjects strongly disagree with the statement "I can do something about the noise" (15: −5). Only in this frame, people do not think that one should be proud of the airport (34: −2).

Subjects strongly believe that the government should strive for noise reduction (39: 4) and deny that noise annoyance is an important problem at the same time. They weakly believe that the government and Schiphol are not putting in enough effort to reduce noise (30: −2 and 31: −2) and that Schiphol always gets its way (28: 2). They support an "aircraft-free-Sunday" (46: 3), but relocation of the airport is not considered a good idea (47: −2). Although such a measure would of course result in direct positive effects (i.e., no more aircraft noise) it also has its direct disadvantages, for it would probably raise the price for air travel. This goes against subjects' desire to travel by air, which can be inferred from subjects' strong disagreement with the statement that flying is too cheap (25: −5).

Similar to subjects in frame B, subjects within this frame consider themselves to be moderately annoyed by aircraft noise (10: 2) and subjects regularly hear aircraft (3: 5). Lastly, they find it unacceptable to be disturbed by aircraft noise (7: −4 and 8: −3).

The line of reasoning in this frame is difficult to interpret. It does not resemble the dominant policy and seems inherently contradictory. What seems to stand out is a fear of personal damage, a desire to move away from the neighborhood, and no identification with the airport. This might be seen as an a-political stance. The ecology-economy conflict is turned into a local and personal problem, which can be solved with a local solution, i.e., moving to a quieter place.

B. The relation between the policy discourse and internal frames

We expected that the ways people approach aircraft noise (described in Sec. V A) are related to the way this noise is approached in policy discourse (Sec. II). Based on the results it can be concluded that the first three frames are clearly related to the policy discourse. Frame A follows the economic argument, and frames B and C follow both the economic and environmental arguments. Moreover, none of the frames denies the economic or environmental trains of thought. Frame A, the economic frame, does not acknowledge the environmental problems posed by aviation, but also does not deny them. Statements related to environmental concerns receive a neutral score, not a negative one. Frame B, the environmental frame, moderately agrees with part of the economic reasoning (i.e., employment). Lastly, frame C also sides with both arguments, but, in contrast to frame B, emphasizes the economic values. In addition, since the first three frames account for the major part of the total portion of explained variance (cumulative 40% of the total 49%), it can be concluded that the lines of reasoning expressed within the policy discourse interact with most of the participants' beliefs. Hence, the way the problem is framed in the policy discourse becomes internalized in the internal frames of people.

C. Noise annoyance response within the frames

Next, the noise annoyance response within each frame is assessed. This is done through examination of the position of statement 10, "I am annoyed by aircraft noise," in the factor arrays (see Table II). In addition, this information is supplemented with results from the standardized noise annoyance question posed in the short interview conducted after the

TABLE III. Position of statement 10 and the descriptive statistics of the standardized noise annoyance item.

Frame	Position s10	Noise annoyance (0–10) Mean	Min	Max	Median	SD	*N*
A—Long live aviation!	−5	1.43	0	5	1	1.45	14
B—Aviation: an ecological threat	2	6.00	3	10	7	2.37	15
C—Aviation and the environment: a solvable problem	−1	4.00	3	5	4	1.00	3
D—Aircraft noise: not a problem	−4	2.50	2	3	2.5	0.71	2
E—Aviation: a local problem	2	6.33	4	10	5	3.21	3

Q-sorting exercise. The Q-methodological and traditional survey results are both reported to cross-validate the observations.[7] From Table III it can be deduced that the position of statement 10 for the different frames is overall consistent with the mean scores of the standardized noise annoyance item.

Differences greater than 2–3 between statement scores can be treated as significant (Brown, 1980). Based on this rule-of-thumb it is concluded that several annoyance scores vary significantly across frames. More specifically, the following comparisons are significant: frames A and D versus the other frames, frames B and E versus the other frames, and frame C versus the other frames.

Within frames A and D annoyance is strongly denied. For frame A the denial of aircraft noise as annoying is consistent with the belief that aviation has only economic benefits and is not associated with environmental costs. Frame D even explicitly denies aircraft noise as a problem. On the contrary, for frames B and E, annoyance is (moderately) justified. Frame B prioritizes ecological concerns over the economic benefits. Aircraft noise is regarded as a serious problem. Frame E does not relate to the environment-economy dichotomy. However, here, the local conflict justifies a negative response to noise. It is important to note, however, that frames B and E do not legitimize an extreme annoyance response. After all, benefits of aviation (being national or individual) *are* acknowledged, so one cannot totally oppose aviation/Schiphol. Lastly, frame C strongly supports economic benefits but also acknowledges environmental values. This goes together with an average noise annoyance score, which deviates significantly from the annoyance scores in the other frames.

Overall, it can be concluded that annoyance response is intrinsically related to the frames and that the frames legitimize or delegitimize different degrees of annoyance response. The variance in annoyance response (i.e., after controlling for the level of noise exposure by keeping its level constant) aligns well with the variation in frames. The present approach therefore provides an adequate means of understanding this variation.

VI. DISCUSSION

Lastly, we would like to reflect on the results of our analysis and focus our attention on two issues: the observed variation in frames and the noise annoyance response within the frames.

The first issue relates to the finding that people's frames and the policy discourse indeed overlap. With respect to this observation it can be questioned why we did not find one frame that fully resembles the policy discourse. In the following an argumentation will be provided why this finding would have been unlikely.

It could be speculated that a frame fully reflective of the policy discourse would position both economical and environmental arguments on the right side of the scale; after all, both are considered very important in the policy discourse. In line with the policy discourse, subjects would trust central planning authorities. However, such a frame was not found. Instead, subjects across all frames (mildly) agree with the statement that the government has failed to achieve the double-sided aim (statement 43: to let the airport grow and restrict environmental impacts at the same time). This critical evaluation can be explained by an inherent contradiction present within the policy discourse because, on the one side, the policy discourse relies strongly on technological advances, which are said to "fix" the problem, but, on the other side, these technological advances contribute to the growth of aviation. Hence, the situation remains that some aircraft noise will have to be accepted. The policy does not provide a clear solution to the economy-ecology conflict. Therefore, an inconsistency can be perceived within the policy discourse because it reproduces the contradiction it claims to solve.

Subsequently, in line with Festinger's (1957) theory of cognitive dissonance, which postulates that inconsistency among beliefs will cause an uncomfortable psychological tension, it can be argued that people are forced to resolve this inconsistency. It can be observed that each frame related to the policy discourse (i.e., frames A–C) has a distinct way of doing this. Frame A simply resolves the inconsistency by playing down the environmental arguments. For frame B, which prioritizes environment over economy, but indeed subscribes to both arguments, the inconsistency is resolved by "adding" other cognitions and feelings: a negative attitude toward the authorities, distrust that they will successfully handle the noise problem and feelings of a lack of control. The government makes a promise (less noise) but does not keep it (aviation and Schiphol keep growing), and is therefore not to be trusted. The well-established "non-acoustical factors" such as trust and control serve the purpose of resolving the perceived dissonance. Lastly, frame C, which prioritizes economy over environment, but also subscribes to both arguments, resolves the inconsistency via two ways. Like frame B it "adds" cognitions that the authorities fail to do

their job, but distinctively, it also places high hopes on possible future solutions, most notably, the relocation of the airport to the sea.[8]

Altogether, it can be argued that subjects experience an inconsistency within the policy discourse. The different ways to resolve the perceived dissonance lead to different frames. As can be observed from the lines of reasoning expressed in the frames, each has developed its own distinctive way of doing this. In addition, established "non-acoustical factors" such as trust and control are internalized as part of the frames and hence as part of an argumentative relation with policy makers. In fact, they can hardly be treated as isolated variables, but should be approached as part of specific discourses.

A second issue on which we want to focus relates to the noise annoyance response within the frames. In the present study it is assumed that the position of aircraft noise annoyance follows from the lines of reasoning present within the frames. However, it can be argued that the varying levels of disturbance, which people experience, dictates the adoption of specific policy arguments. A person who regularly feels disturbed by aircraft noise (e.g., who is interrupted in a conversation or awakened during sleep) might be selective in the adoption of the arguments that are congruent with this state. We hold the (preliminary) belief that people "construct" their experience of aircraft noise on the basis of the disturbances they experience as well as under influence of socially sanctioned arguments provided by the policy discourse. It can be argued that it is unlikely that people will become annoyed by the noise if they are not disturbed by it in any way and that, the other way around, people who have to interrupt a conversation due to the noise might not classify this as particularly annoying if the policy discourse would not legitimate such concerns. To substantiate this point further, it can be observed that in frame D, a person claims not to hear aircraft with any regularity (see statement 3 in Table II). This particular frame selectively ignores aircraft noise as relevant. This observation is consistent with a literature review of Stallen (2008), which suggests that (even) the perceived loudness of a stimulus is not determined by its physical characteristics alone but also by its (social) context, an insight which already existed in relation to noise annoyance (Maris *et al.*, 2007a, 2007b).

VII. CONCLUSION

In this study the hypothesis is investigated that policy making is a possible mechanism through which the sound environment due to aircraft is turned into annoyance. To this effect, the policy discourse is described and the internal frames of people are revealed via Q-methodology. The factor analysis revealed five frames, which residents around Amsterdam Schiphol adopt to evaluate aircraft noise. We showed that the three main frames are related to the policy discourse. Based on these results it is concluded that the policy discourse is a source of arguments, which plays a role in structuring the frames of people. Second, it is shown that the experience of aircraft noise, and, in particular, noise annoyance, is intrinsically related to whole and consistent frames: the meaning of sound depends on a large set of mutually reinforcing positions. Non-acoustical factors should be regarded as part of these specific comprehensive frames and serve the purpose of making these frames internally consistent. Lastly, it can be concluded that our approach has been effective in explaining the variation in annoyance response controlled for the level of noise exposure. The analysis has provided a better understanding of the (negative) experience of aircraft noise.

Finally, we can relate our findings to our point of departure, namely, the observable trend that presently people are more annoyed than several decades ago at equal (annual equivalent energy) noise levels. Our analysis suggests that this trend can be explained by the fact that today's policy discourses explicitly recognize aircraft noise as an important problem. This definition becomes internalized by people affected by aircraft noise and structures the experience of noise as negative.

To investigate our hypothesis further, the following directions for further research can be formulated. First, our research focused on the relationship between the policy discourse and individual frames at one moment in time without considering which of the two takes causal precedence. Bröer's (2006, 2007b) research provides data, which point at least to a historic precedence of policy arguments before people's frames. But the issue of causality remains. One might argue that annoyance is part of a field in which multiple actors (including policy makers, stakeholders, and citizens) together construct annoyance policy and frames. Further research should focus on this process. Particularly, one should focus on the micro-processes in which people develop perceptions of aircraft sound. By studying this process insights could be gained as to whether these coherent frames are built around experienced disturbances due to aircraft noise (which subsequently dictate the adoption of specific policy arguments) or around the arguments put forward by the policy discourse (which facilitates the formation of negative feelings and increases the proneness of being disturbed) or whether it is, in fact, a co-evolutionary process in which both processes mutually reinforce each other.

The second possible focus of future research is the distribution of the frames over the population. A mixed-method approach, combining Q-methodology with traditional survey methods, would have to be followed to gain information about the exact distribution. Within such a mixed-method model the effects of the physical level of aircraft noise exposure (which presently is not part of our model) could also be investigated. For example, it could be hypothesized that the distribution of different frames is different for varying levels of noise exposure.

A third direction is to study the policy discourse and individual frames at other airports. In this study the relationship between the policy discourse and the individual frames are studied for one airport only. To find further support for our hypothesis that the policy discourse shapes individual frames this relationship should be studied at multiple airports where different problem definitions exist. Airports where no well-defined noise policies exist would be even more interesting cases. In such instances one might find little negative

response to aircraft noise, find that those who are annoyed might need to go at great length to develop comprehensive frames that rationalize their negative experiences (since no pre-existing frames are available), find that other institutions provide people with a framework to interpret noise, or find that a much larger variety of individual frames exist (since no common frame is available). In short, research focused on such cases can yield interesting results.

Lastly, we would like to relate our findings to the policy practice. The analysis shows that the conceptualization of aircraft noise as an important problem by policy makers disciplines the way aircraft noise is evaluated. Should policy makers therefore stop treating aircraft noise as a problem? We do not believe so. In the first place, as we have seen in our analysis, there are frames that do no relate to the policy discourse and in which annoyance response to aircraft noise is still present. In addition, next to the disciplinary effect of the policy discourse on community response, we believe that the policy discourse also serves the function of channeling response. As mentioned in the previous paragraph, without this common discourse that people can fall back on in qualifying the sound of aircraft, it can be speculated that the variety of frames would probably be much larger and maybe more extreme. We believe that denial of aircraft noise as a problem should therefore not be regarded as a successful strategy.

However, the way policy deals with aircraft noise after acknowledging it as a problem is another issue. At Amsterdam Schiphol the mainport and environmental discourse is based on the premise that technological development is able to uncouple the divergent goals. Yet, in all of the revealed frames, whether pro-economy, pro-environment, or its combination, it is believed that achievement of the double-sided aim (growth *and* reduction in annoyance) has failed. If we relate this observation to Dryzek's (2001) (p. 652) notion of discursive legitimacy, which he defined as "the degree that collective outcomes are responsive to the balance of competing discourse in the public sphere," it can be concluded that the policy discourse's main premise is inconsistent with the frames shared among the public. This inconsistency undermines the legitimacy (and credibility) of the noise policy. Along this line of reasoning it would be better to let go the idea of a technological fix and explicitly choose for either economy or ecology.

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[1]There are several variants of discourse analysis, even within social psychology. What matters most to this study is the fact that "language in use" structures what can and cannot be said and thought in a specific situation. Discourse is different from "discussion" in the sense that it points to a pattern of the discussion.

[2]Hajer (1995) indicated that the term discourse-coalition differs from Sabatier's (1988) advocacy-coalition, which is a coalition of actors that share similar normative beliefs and/or interests. The essence of the term discourse-coalition is that actors with different and even competing goals (who by definition do not form an advocacy-coalition) can still be united under the flag of a discourse (in the sense that they share similar ways of thinking and acting).

[3]For the purpose of readability the term "dominant policy discourse" is therefore, in the remainder of this paper, equated and replaced with "policy discourse."

[4]Therefore, the remainder of this paper will treat the terms ecological and environmental interchangeably.

[5]Unlike in traditional applications of factor analysis the aim is not to account for as much variance as possible, instead its primary aim lies in finding unique shared viewpoints. At minimum, such a shared viewpoint can be identified based on two subjects.

[6]This value is calculated via the following formula: 100× (factor eigenvalue/number of subjects) (Brown, 1980).

[7]We acknowledge that the sample is too small to provide reliable estimates for the means and standard deviations. These figures are regarded as indicative.

[8]Here, a nice analogy between frame C and a particular smoker can be drawn. A smoker, who feels an inconsistency between smoking behavior and the cognition that smoking is bad for health, can neutralize this inconsistency by resolving to stop smoking in the (near) future. This postpones the feeling of being inconsistent.

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