Socio-acoustic survey data archives at INCE/J

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INTRODUCTION

While large numbers of social surveys on community response to noise, such as neighbourhood, road traffic, railway, and aircraft noises, have been carried out in Japan, the survey data has been left unused after their primary analyses. As a result, Japan Government faces many difficulties in reviewing noise policy and creating effective measures. To solve the problem, it must be important to provide infrastructure in which micro data, pairs of reactions and exposures associated with noise, are accumulated and maintained for promoting re-analysis. This means it is absolutely essential to construct data archive on socio-acoustic survey.

The application of the data archive provides for the research focusing on the different view point from the original. It is expected that studies regarding effects of non-acoustic factors (e.g. demographic factors, living environments, and vibration exposure) on reactions to noise and temporal social responses to noise are advanced. In addition, the accumulation of surveyed data under various circumstances makes it possible to present representative dose-response curves according to noise sources, in terms of annoyance, disturbances, and health effects. These findings contribute to the planning of effective noise policy based on public awareness.

The Institute of Noise Control Engineering/Japan (INCE/J) set up the Social Survey Data Archive Committee in 2009 for the purpose of developing an archive of social survey data on reactions to noise. By summarizing the results that have been achieved, the committee established the Socio-Acoustic Survey Data Archive (SASDA) in 2011. The archive is consisted of the micro data that the committee members deposited.

This paper summarizes the procedure operating (deposit, access, publication, maintenance) in the archive. Furthermore, by using the SASDA data, we made the secondary analyses of the reactions to noises. For one thing, we compared the dose-response relationships among road traffic, conventional railway, and Shinkansen railway noises. In addition, we examined whether non-acoustic factors affected community response to noise or not.

OUTLINES OF SASDA

The committee set rules and procedures for managing SASDA, referring those of the Social Science Japan Data Archive (SSJDA) established at the Institute of Social Science, University of Tokyo. The operational procedure flow chart is shown in Figure 1.

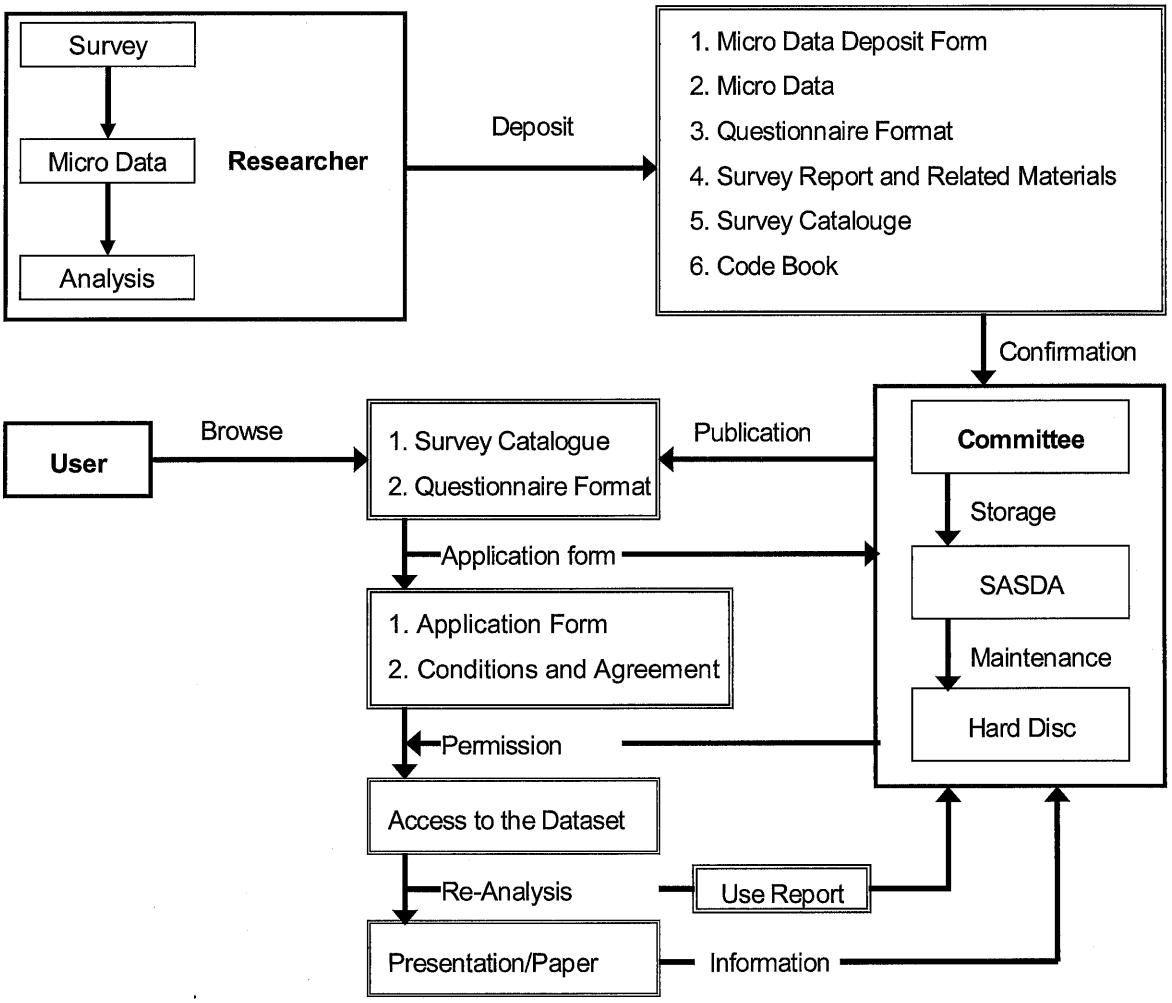

Figure 1: Operational procedure flow chart

Deposit

At present, the archived data are largely deposited by the committee members. To increase micro data, we have to encourage other organizations and researchers to make their own data available to the public.

When researchers deposit their surveyed data to SASDA, they are required for the submission of the following materials: micro data deposit form, micro data, questionnaire form, code book, survey report (or paper regarding the research), and survey catalogue.

It is noted that materials (photograph and map related to survey) which could contribute to disclosing personal information are prohibited to the archive. Since the materials yield valuable clues of detail information on social surveys, the storage in a

safe place plays an important role for SADA in preventing the materials from disappearing. Although it is important to archive photographs and maps relevant to survey, SASDA takes priority in protecting personal information and has a policy not to receive the materials.

However, the storage of information about the distance from noise sources to respondent's dwellings is allowed in the archive, unless information on survey sites is not disclosed. Information on the distance can be a moderator exploring factors affecting reactions to noise. Moreover, detail measurements (each noise level from passing trains, hourly noise level, etc) have the potential to be useful information to review noise metric. Thus, the committee encourages researchers to deposit the detail measurements if possible.

Publication

The survey catalogue and questionnaire out of the deposited materials (only in Japanese) are published on the INCE/J homepage. Furthermore, relevant forms are available for download. Six items included in a survey catalogue are shown in Figure 2. Accordingly, applicants who wish to analyze datasets can browse survey catalogues on the website and obtain information on deposited researches.

A. Survey purpose

B. Outline of survey
1) Survey period
2) Survey site location (Local government of research sites)
3) Survey method (Face to face, Self-administered, Telephone, etc)
4) Outline of survey site (Site selection, Site size, Number of sites, etc)
5) Research institute
6) Outline of questionnaire (Title, number of question items, Number of pages)
7) Key questions (Exact wording of primary questionnaire items and answer alternatives)

C. Respondent
1) Conditions for respondents
2) Extraction of respondents from their own families
3) Number of distribution and respondents

D. Estimaiton of exposures
Items for road traffic, railway and environment noises are indicate below.
1) Noise metrics
2) Estimation method for noise exposure
3) Noise source
4) Measurement institute
5) Noise measured quantity
6) Measuring points
7) Measurement procedure
8) Calculation of noise metrics at the measuring points
9) Estimation of noise mertics to respondents

E. Special instructions
1) Non-acoustical effect (measurement of vibration, low-frequency noise, air-pollution,etc)
2) Presence or absence of detailed measurements

F. Conference presentations and papers
Paper with or without peer review

Figure 2: Outline of survey catalogue

Access

The methods of data access permit show by a run of the item.

- Members of INCE/J or ASJ (Acoustic Society of Japan) are allowed access to datasets at the archive.
- In addition, depositors of SASDA are also allowed access to the datasets.
- Graduates or undergraduates whom the above qualified persons instruct are available for access.
- When users wish to analyze a particular set of archived data, they are obliged to submit the Data Application Form to the committee.
- Users shall restrict their use of the data to secondary analysis for research purposes only.
- Users shall agree that the depositors of the data and SASDA bear no responsibility for any disadvantage they might encounter as a result of using the datasets supplied by SASDA.
- Data access permit is required with the depositor's permission.
- All inquiries regarding the surveys are made, in principle, through the SASDA, and not directly to depositors.
- Data access permit period is one year. If users are unable to complete the data analysis within the one year permit period, they may apply for an extension of the permit, by submitting a new application form to SASDA.
- Upon termination of the data access permit period, users shall erase the datasets.
- The cost of access to the dataset is free of charge.
- When publishing the results of the secondary analysis of SASDA datasets, users shall acknowledge the data source.
- Users shall also submit to SASDA the Data Use Report Form.
- Users shall comply with all other requirements specified by SASDA.

Maintenance

To protect the disappearance and leaks of archived data, all the micro data are stored at four external hard disk drives (data mirroring). Each set of two drives is maintained at separate places. Furthermore, the committee has the latest virus protection software installed on its computers for increasing security. However, during the task, archiving datasets and writing datasets to which an applicant permits access into a media (CD-R), the committee shall work off-line without loose ends to protect the leaks on the Internet.

Archived datasets

The list of deposited datasets is indicated in Table 1. Diverse institutes have cooperated the archive. The number of archived researches is 23 and collected micro data amounted to about 20,000. Since the committee has collected micro data which are mainly stored as electric files, researches since the 1990s have been mainly collected. By noise sources, SASDA holds sufficient researches on road traffic and railway noises. On the contrary, very few researches on aircraft noise and combined are available for secondary analysis. In addition, no survey on health impact of noise is archived.

Table 1: List of SASDA

ID	Noise	Survey Period	Survey Area	Research Institute
S1	Personal Exposure Noise	1975−1978	Nagoya City, etc.	Nagoya Univ.
S2	Environmental Noise	1982−1994	Nagoya City	Nagoya Univ. Daido Univ.
S3	Conventinal Railway Noise	1994−1995	Fukuoka Pref. Kumamoto Pref.	Kumamoto Univ.
S4	Road Traffic Noise (Highway Road)	1994−1995	Kumamoto Pref.	Kumamoto Univ.
S5	Shinkansen Railway Noise	1995−1996	Kanagawa Pref.	Yokohama Nat. Univ. Kanagawa Pref. Govt.
S6	Road Traffic Noise	1996	Kumamoto City	Kumamoto Univ.
S7	Conventional Railway Noise	1997	Kanagawa Pref.	Yokohama Nat. Univ. Kanagawa Pref. Govt.
S8	Road traffic Noise	1997−1998	Sapporo City	Hokkai-Gakuen Univ.
S9	Road Traffic Noise	1997−1998	Bangkok City	Kumamoto Univ. Suranaree Univ. of Tech.
S10	Road Traffic Noise	1998	Kanagawa Pref.	Yokohama Nat. Univ. Kanagawa Pref. Govt.
S11	Road Traffic Noise	1999−2000	Kanagawa Pref.	Yokohama Nat. Univ. Kanagawa Pref. Govt.
S12	Road Traffic Noise	2000−2002	Chiba City, etc.	Ministry of the Environment INCE/J
S13	Conventional Railway Noise	2001	Sapporo City, etc	Hokkai-Gakuen Univ.
S14	Shinkansen Railway Noise	2001−2003	Kanagawa Pref.	Yokohama Nat. Univ. Kanagawa Pref. Govt.
S15	Conventional Railway Noise	2002	Osaka City	Osaka City
S16	Conventional Railway Noise	2002	Fukuoka Pref.	Kumamoto Univ.
S17	Shinkansen Railway Noise	2003	Fukuoka Pref.	Kumamoto Univ.
S18	Road Traffic Noise	2003−2004	Tomakomai City	Hokkai-Gakuen Univ.
S19	Conventional Railway Noise	2003−2004	Chiba City, etc.	Ministry of the Environment INCE/J
S20	Combined Noise	2004−2006	Kanagawa Pref.	Yokohama Nat. Univ. Kanagawa Pref. Govt.
S21	Shinkansen Railway Noise	2005	Nagoya City	Aichi Inst. Tech., etc.
S22	Aircraft Noise	2006	Kumamoto Pref.	Kumamoto Univ.
S23	Conventional Railway Noise	2007	Osaka City	Osaka City Univ.

SECONDARY ANALYSIS

Using 17 datasets archived at SASDA, we tried to make secondary analysis. Table 2 indicates information on noise exposures, distance from noise source to respondent's dwelling, and responses (annoyance and traffic access) of the analyzed datasets. Whereas all the surveys estimated 24-hour L_{Aeq}, about half of the surveys provided L_{dn}. Thus, this study uses 24-hour L_{Aeq} as noise exposure metric.

As shown in Table 2, annoyance is evaluated from 4-point to 7-point scales. Moreover, the wording of question and answer alternatives with respect to annoyance differed among the surveys. However, a majority of recent researches measures annoyance by ICBEN verbal scale. For the distance, not all dataset included the information. In contrast, evaluation of traffic access was obtained for all the surveys.

Table 2: Information on the analyzed datasets

Survey ID	L_{Aeq}	L_{dn}	Distance	Annoyance	Traffic access
A	1	1	0	4-point	2-point
B	1	1	0	4-point, 5-point, 6-point, 7-point	5-point
C	1	1	0	4-point	5-point
D	1	0	1	5-point	4-point
E	1	1	0	4-point	5-point
F	1	0	1	5-point	4-point
G	1	1	1	4-point	5-point
H	1	0	1	5-point	4-point
I	1	0	0	5-point	5-point
J	1	1	1	4-point, 5-point	5-point
K	1	0	1	5-point	5-point
L	1	1	1	5-point	5-point
M	1	0	1	5-point	5-point
N	1	1	0	5-point	5-point
P	1	0	1	5-point	5-point
0	1	1	1	5-point	5-point
Q	1	0	1	5-point	5-point

0: not including, 1: including

To uniform the scale for annoyance, % highly annoyed (%HA) is defined as shown in Figure 3. For 4-point and 5-point scales, %HA is defined as the ratio of the top category answer.

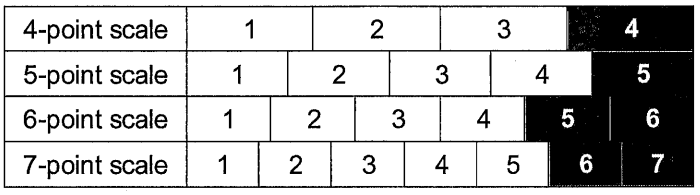

Figure 3: Definition of % highly annoyed

Figure 4 compares dose-response curves for annoyance among noise sources (road traffic, conventional railway, Shinkansen Railway, and environment noises). The curves are determined using nominal logistic regression analysis. This figure indicates the annoyance due to noise from the Shinkansen is most severe as the previous studies reported (Tamura 1994; Yokoshima & Tamura 2003; Yano et al. 2005). On the other hand, %HA for conventional railway noise is higher than that for road traffic noise. In Euro-American surveys it has been frequently shown that railway noise is less annoying than road traffic noise (Miedema & Voss 1998). In contrast, recent studies carried out in Japan have not clarified railway bonus as the same result shown in this figure (Morihara et al. 2004).

Figure 5 compares dose-response curves for annoyance according to the distance from the noise source to dwelling (≤50 m and >50 m), using logistic regression analysis. This analysis ignores the difference in annoyance among the sources. This figure indicates people who are closer to the noise source are more annoyed. The difference can be explained synergetic effect of ground vibration on noise annoyance. In

addition, dwelling adjacency to noise sources may be contributed to the difference in railway bonus between in Europe and Japan.

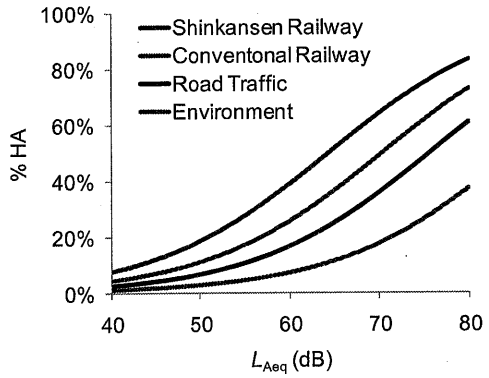

Figure 4: Comparison of dose-response curves among noise sources

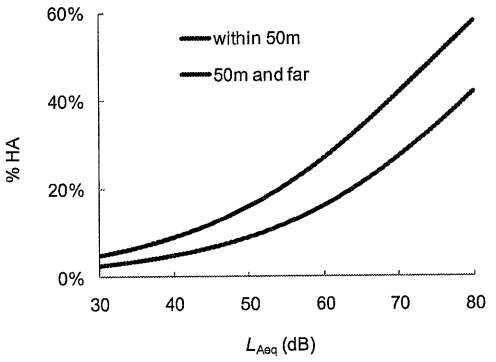

Figure 5: Comparison of dose-response curves according to the distance

Figure 6 compares dose-response curves for annoyance between the groups by the evaluation to traffic access. Likewise for Figure 5, all the data integrated regardless of the noise sources are analyzed. 4-point and 5-point scales of the evaluation are converted into 2-point scales: convenience and inconvenience. The curve of convenience indicates higher annoyance than that of inconvenience. This suggests that the convenience of traffic access reduces the annoyance. It is probably difficult that such an analysis is made using data obtained from a social survey, because the evaluation of traffic access frequently becomes one-sided.

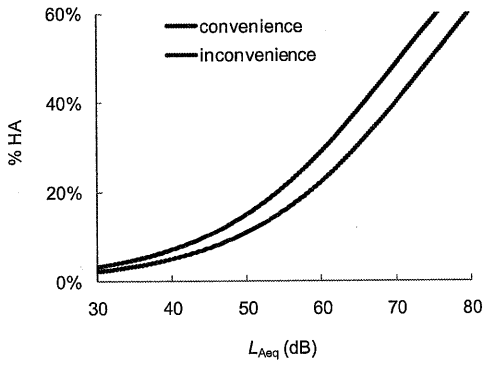

Figure 6: Comparison of dose-response curves by the evaluation of traffic access

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