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SOCIAL OBSTACLES TO WASTE MANAGEMENT: THE SOLID WASTE PROBLEM IN THE PERCEPTION OF DIFFERENT SOCIAL ACTORS

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ABSTRACT

Seven hundred and forty-two people (experts and opinion leaders) were asked about their assessments and preferences concerning waste management, especially about different strategies for source reduction in Germany. The data were collected by a social survey in 1992. The respondents belong to six different social actor groups. Multivariate methods (discriminant analysis and correspondence analysis) were primarily used to analyze the data. The results exhibit a widespread but systematic dispersion of opinions among the different social actors. These differences are already visible with regard to features of "the" solid waste crisis. The different perspectives of the situation are partially connected with certain proposed strategies for avoiding waste. These social definitions of the situation and proposed strategies illustrate some social obstacles to waste management in Germany.

INTRODUCTION

In the course of the last years the handling of waste materials has lost some of its former "naturalness." For example it has recently become very difficult for an ordinary customer to behave in the right and responsible way: Should he or she use plastic or paper bags? Is it ecologically responsible to use disposable diapers? Does it make sense to separate plastics in order to recycle them? There are diverse answers to these questions and the range of pertinent advice indicates that waste management is becoming increasingly a political issue in several modern societies [1].

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In a wider context, some authors argue that former Club of Rome forecasts are essentially wrong: the shortages in the future will not be those of natural resources, but we will rather experience shortages of possibilities to handle the ultimate output of our way of life. They forecast a scarcely manageable "world of waste" [2]. From this point of view, it is clear that political decisions about waste management are important, at least for the future of the economy, and it seems that this opinion has gained growing relevance in the political discussions in western countries. Waste management, disposal, and treatment of waste are becoming increasingly political questions in the same way that other decisions about technology have become controversial [3].

The most prominent example in this context is the ceaseless discussion concerning nuclear power [4]. Within this discussion risk arguments have been of special interest [5]. Also the public debate on waste management seems *on the surface* to be primarily a controversy about the risks of technological options. In the case of waste management, for instance, the safety of plants, the effects of combustion on health, the pros and cons of recycling strategies, and the risks of different plant sites are matters of public controversy. In this article, a closer look at underlying assumptions and interpretations shall be given.

The present situation in several modern societies is often apostrophized as "garbage crisis" [6] or "solid waste crisis" which has until now received only little attention of the social sciences [7, 8]. In this article we will use the analytical possibilities of empirical social research, in order to describe social obstacles to waste management in detail. Therefore, the notion of "crisis" will be picked up. Empirical "maps" of that which is seen as a *waste problem* will be given, and relations will be drawn to proposed solutions that are discussed in terms of *source reduction*. Data about the German situation and multivariate methods (discriminant analysis and correspondence analyses) are principally used.

DATA

In 1992 a social survey was conducted in three regions of Baden-Wuerttemberg, a state in southwest Germany. The survey took place in the "counties" of Main-Tauber-Kreis, Mannheim, and Boeblingen. The differences between the "counties" primarily consists in the differentiation between rural and urban regions, both of which exist in southwestern Germany.

The aim of the research project was to gather data about assessments, opinions, and political preferences of different social groups concerning the actual public debate on the solid waste crisis and different strategies of waste management. In what follows, these groups will be denoted as social and political "actors."

The responses to different suggested strategies for avoiding waste were of special interest (proposals for source reduction). Several questions in the questionnaire also differentiate between "normal" municipal waste and hazardous wastes. In this article, the hazardous waste items are not explicitly taken into

account. The whole project was funded by a grant of the state ministry of environment [9].

The respondents stem from six different groups of actors:

1. teachers who are responsible at their schools for the compliance with environmental guidelines and rules (this group of actors is denoted by *school*);
2. people working in companies and who are responsible for the waste management in the organization (*business*);
3. journalists of different media (newspapers, local broadcasting stations) within the regions in question (*media*);
4. politicians who are respectively parliament members in the three "counties" (*politicians*);
5. people in public administration who are concerned with waste management, for example collection or disposal of solid wastes (*administration*);
6. members of environmental citizens' initiatives (local action groups of *environmentalists*). These groups cover a broad range of topics including for instance campaigns against waste incineration, but also initiatives in favor of general wildlife protection.

The data set thus compiles recent answers of relevant actors participating in the ongoing public debate. The number of respondents is 742 which represents an overall responding rate of 51.2 percent. The frequencies of the six actor groups are depicted in Table 1.

The following analyses were confined to two aspects:

1. The perception of the present situation. What is to be seen as *features* of the waste problem by the respondents? The items are measured on a nominal level on the basis of fourteen statements (Table 2).

Table 1. Distribution of the Six Actor Groups (Number of Respondents = 742)

Group	Percent
School	25.1
Companies, business	39.4
Media	5.5
Politics	15.2
Administration	9.7
Action groups of environmentalists	5.1

Table 2. Features of the Present Situation, the Waste Problem in the Perception of the Respondents ($n = 742$)

Statement		Percent
f1.	Growing amount of waste	68.1
f2.	Increase of hazardous and harmful substances	21.3
f3.	Bottle necks of waste management (for example, no further disposal sites)	40.7
f4.	No acceptance of waste management plants or sites by the public	42.3
f5.	Everywhere but "not in my backyard" syndrome (NIMBY)	50.8
f6.	Lacking motivation of the population to avoid waste	47.2
f7.	Too long planning time for waste management plants	30.7
f8.	Insufficient information of the population	27.6
f9.	The present consumption of goods	57.3
f10.	The recent way of producing goods	51.3
f11.	Too many civil rights for people who are against administrative plannings	19.8
f12.	Deficits of governmental politics	41.0
f13.	High risks connected with waste management	22.4
f14.	Environmental hazards (for instance, emissions of combustion sites)	31.8

2. Preferences of political, technological, and economic *strategies* for avoiding waste. The respondents rated thirteen different possibilities on a 5-point scale between 0 = effective and 4 = not effective (Table 3).

The statements comprise all relevant notions in which the recent solid waste crisis is described and the items of Table 3 give an overview of the strategies in favor of source reduction which are objects of discussion, at least in political discourse on waste management, in Germany.

The distributions of the items describing the features of the present situation are somewhat skewed. A few statements receive a rather broad agreement of the respondents' majority as valid descriptions of the present waste crisis: "growing amount of waste" (68%), "present consumption" as a cause of the crisis (57%), "recent way of producing goods" (51%), NIMBY (51%). Whereas other items are only chosen by a minority of respondents: "too many civil rights for people who are against administrative planning" (20%), "increase of hazardous and harmful substances" (21%), "high risks of waste management" (22%). In the case of strategies in favor source reduction, there is a strong consensus concerning the

Table 3. Efficiency of Several Strategies that Could Perhaps Avoid Waste[a]

Item		Median	Mean
p1.	Prohibition of certain goods	1	1.4
p2.	Deposits on more goods	0	0.7
p3.	Increase of environmental regulations (for instance, environmental limits for harmful substances)	1	1.1
p4.	Economic solutions (taxes, duties)	2	1.7
p5.	Duties for some special materials (for example, PVC)	2	1.6
p6.	More public relations work of the administration	2	1.8
p7.	Increase of re-usable packaging	0	0.6
p8.	Education in environmental problems in the school	1	0.8
p9.	Taking back of goods after their usage (for example, cars)	1	0.9
p10.	Development of more goods which produce less waste	0	0.5
p11.	Longer lifespans of products	1	0.8
p12.	Development of production processes with less waste	0	0.6
p13.	Restrictions of consumption	2	1.8

[a]These actions are the ones which are mostly discussed by the public. The respondents rated the items on an ordinal scale: 0 = effective, . . . , 4 = not effective.

efficiency of *all* proposals. The means and medians are always less than 2, which indicates an optimistic view regarding the overall possibilities of a source reduction.

RESEARCH QUESTIONS

More instructive than these first compilations of data are the associations between the different items and the preferences of the social actors. Accordingly, the following expectation forms the background of the analyses: Different definitions of the waste problem and proposed solutions at the technological, economic, or political level are connected in such a way that the social actors can be characterized by the variation of their opinions.

A few studies show such differences between actors in the field of waste management [3, 10, 11]. In our research project the starting point was the notion of a "waste problem" that can be described by different features. The political

debate was picked up in terms of proposed strategies for source reduction. It is assumed that these aspects are related: Perceptions of the situation are connected with certain preferences which are hypothetical solutions to recent problems. It is further supposed that the connections form something like a "*frame*" that varies systematically between the six respondent groups. This does not mean that the relations between the three features can be interpreted in a causal sense. However, the term will be used in the sense of statistical associations.

The notion of "frame" is an idea that originates in communication research. It is defined as an organizing idea that "supplies a context and suggests what the issue is through the use of selection, emphasis, exclusion, and elaboration" [12]. A prominent example of a social *framing process* was formulated with regard to the discourse on nuclear power [13]. Throughout this article, the term will be used in a broad sense. This implies that no causal relationship between the different variables of the frame is assumed, and it is not possible to show its dynamics (the process of generating a frame) because the survey data do not actually depict the evolution of the public debate. It provides a static picture of that debate at a certain point in time.

METHODS

Correspondence analysis as a multivariate method is utilized in order to evaluate the connections between the different variables. It is a method that shows the statistical associations of diverse kinds of tables within a spatial model where connections between categories can be deduced from the distances between points. One usual procedure is the depiction of category points on the plane of the first two principal axes which are related to the major part of dispersion within the data. The method bears some similarities to principal component analysis and multidimensional scaling, but it has the advantage of exclusively dealing with nominal data [14].

In a second step, discriminant analysis [15] is used to analyze the dispersion of preferences with regard to the six actor groups. It is thus possible to discriminate the actors according to their responses to preference items. For this reason, linear combinations of the discriminating variables are determined (so called "discriminant functions"). The results of the statistical method can be described by the evaluation of the correlations between the variables and the functions or in respect of the different group centroids.

RESULTS

The Perception of the Waste Problem

In Figure 1 the results of a correspondence analysis are pictured. The input of the analysis was the frequency table of the perceptions of the situation. This

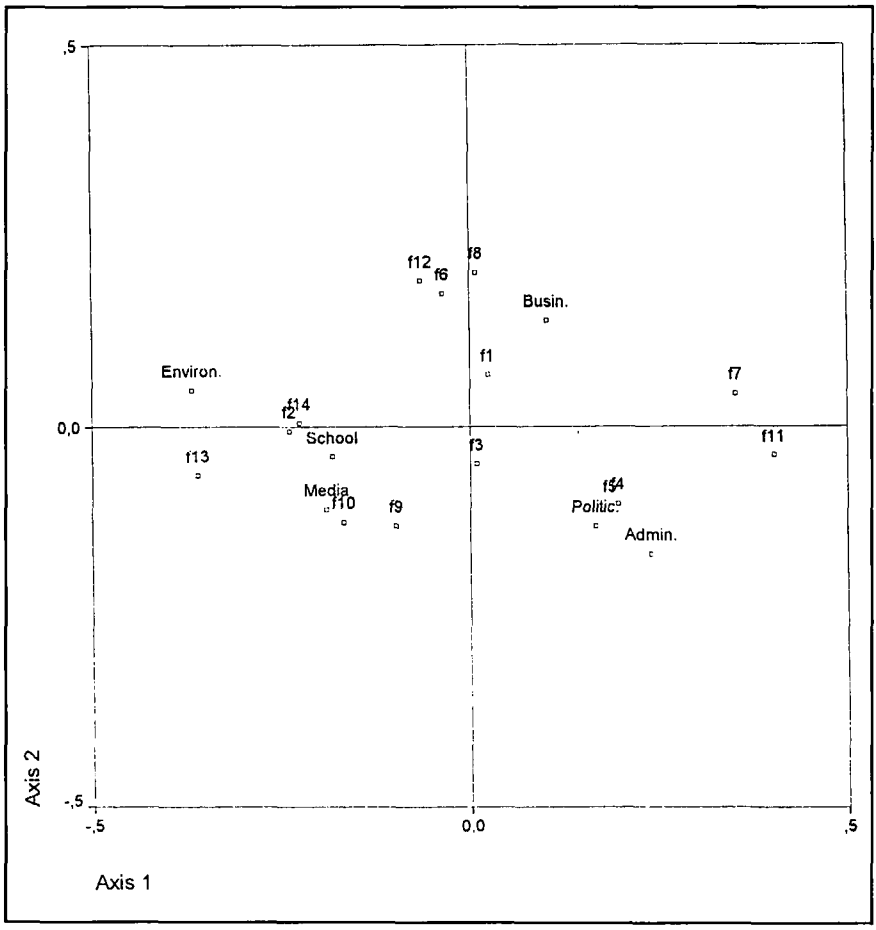

Figure 1. Correspondence analysis of the perceived features of the waste problem. Eigenvalue 1 = 0.0333 (according 63.0% of dispersion), eigenvalue 2 = 0.0136 (25.7%). The number of the points refer to the statement numbers in Table 2.

variable indicates the rows of the input table. The columns are built by the six actor groups. The first two principal axes of the correspondence analysis represent 83.5 percent of the dispersion within the data.

If one looks at the perceptions of the recent situation, a main difference between the assessments is connected with the notions of "no acceptance of waste management plants" (statement f4, Table 2), NIMBY (f5), "planning time too long" (f7), and "too many rights for citizens who are against administrative

decisions" (f11). These items correlate highly with the first horizontal principal axis that is drawn in Figure 1.

Especially politicians, administrators, and business respondents approve *this* perception of the situation. In other words, respondents of these groups often define the waste problem by these statements.

On the other hand, there are the groups of environmentalists, journalists, and teachers (those who are responsible for environmental issues in schools) who see the waste problem completely different in connection with an "increase of hazardous and harmful substances" (f2), with the "recent way of production" (f10), with risks, and with general "environmental hazards" (f13, f14). In the correspondence analysis which is depicted in Figure 1 these opposing notions of "*the*" waste problem can be seen by the distribution of category points with regard to the horizontal axis.

The vertical axis provides a second differentiation according to a presumed "lack of motivation to avoid waste" (f6), "insufficient information of the population" (f8), and "deficits of governmental politics" (f12). This last statement is (not surprisingly) rejected by administrators and politicians. It can thus be said that the definition of the waste problem differs widely between the actors.

In correspondence analysis it is possible to differentiate between *explained* variables (high correlations with the principal axis and relatively low contributions to the dispersion of the axis) and *explaining* variables (high correlations as well as high contributions to dispersion [16]). If one refers to this difference, the statements "planning time too long," "too many civil rights," and "high risks connected with waste management" (f7, f11, f13 in Table 2) will explain the dispersion of the other variables which correlate with the first principal axis. With regard to the second axis, its location is mostly explained by the category point "deficits of governmental politics" (f12 in Table 2).

It seems that the waste problem is defined in different terms: some actors mainly described it by risks, environmental hazards, or manners of production and consumption, but other actors understand it by NIMBY, lack of acceptance, and the difficulties of effective planning.

If one takes similar items on hazardous wastes into account, two topics will additionally become clear [9]:

1. The assessment of the waste problem is more dispersed in comparison to that of hazardous wastes. The differences in opinions between the actors are greater in the first case than in the second.
2. If formulated in the notion of frames, it seems that particularly risks and environmental hazards of "*normal*" solid wastes are only a central issue for media, school, and citizens' initiatives. In the case of the other actors, the frame of the waste problem is *not* related to the idea of risks and dangers to such an extent.

It seems that some administrative strategies, which have been proposed in order to solve "*the*" problem, are regarded as essentially inadequate or wrong in the perspective of some other actors. This hypothesis will be further elaborated in a second step of the analysis. The ratings of different proposals for source reduction mentioned by the respondents are taken into consideration.

A Differentiation of Preferences for Suitable Political, Economic, or Technological Actions for Source Reduction

The thirteen items (strategies in order to avoid waste, Table 3) were used to discriminate between the six actor groups. The results refer to 642 cases (missing values are excluded in a listwise manner). The analysis reveals that 66 percent of the dispersion is essentially attributable to a differentiation between "harder" and "softer" types of regulations. Consequently the first discriminant function mainly correlates with the items

- "restrictions of consumption and production" (statements p1 and p13 in Table 3, the correlations are 0.54 and 0.58 respectively),
- "increase of administrative regulations" (p3, 0.49), and
- "more economic solutions" as taxes and duties (p4, 0.44).

The centroids of groups with regard to the first discriminant function show a separation between business on the one side and the other five collective actors on the other. This distribution represents the rejection of or the agreement with the statements mentioned above.

The second discriminant function only explains 17.2 percent of variance. Especially the items "deposits on more goods" (p2), "more goods which produce less waste" (p10), and "longer lifespans of products" (p11) correlate with this function: The correlation coefficients of the axes and the items are 0.70, 0.59, and 0.41, respectively. With regard to the centroids, the second function allows us to discriminate between school and environmentalists located on one side. Both actor groups are more convinced of the items' effectiveness. The other three actors (media, politicians, and administration) do not share this conviction. The centroid of business is located in between. (The remaining 3 discriminant functions are only of minor importance.)

If one uses the discriminant functions as a classification procedure, the best result of true classifications will occur for the environmentalists (47% of the cases are correctly assigned), businessmen (47%), teachers (31%), and journalists (30%). The politicians and the administrators are difficult to classify, since their ratings are more dispersed. In the case of the politicians this result obviously represents the range of political parties in Germany.

Further special types of correspondence analyses reveal that the strongly *prohibitive* strategies (the point p1+ in Figure 2) are favored by those who

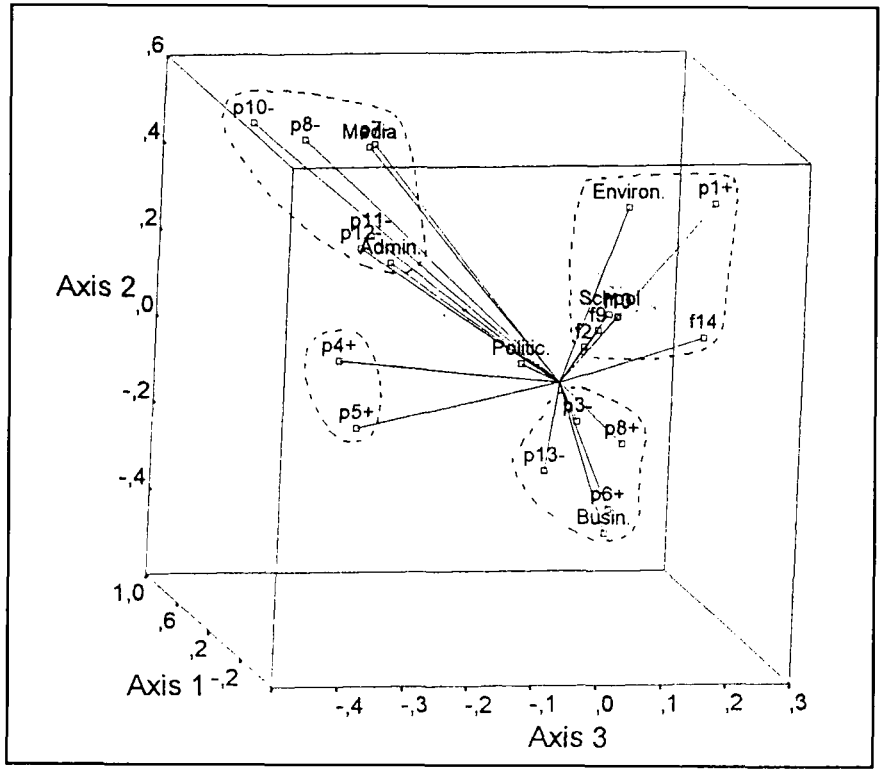

Figure 2. Multiple correspondence analysis of the strategies for source reduction. The statements are doubled and the items of Table 2 are used as supplementary points [14]. Eigenvalue 1 = 0.0971 (corresponding 24.5% of dispersion), eigenvalue 2 = 0.0521 (13.2%), eigenvalue 3 = 0.0408 (10.3%). The abbreviations of the points refer to Tables 2 and 3, respectively. Only chosen variables are displayed. "+" or "–" indicate the agreement or disagreement with the item in question.

perceive the waste problem as being mostly determined by risk issues (f13), environmental hazards (f14), the present way of consumption (f9), an increase of hazardous substances (f2), and the current way of industrial production (f10). This connection between the perception of the problem and preferred strategies can be detected for the members of citizens' initiatives and teachers. For those social groups it can be said that the preferred strategies are framed by *general* or *critical* issues: The overall reason for the waste problem is the way of living in industrial countries.

The same does not hold true for the other social groups. In these cases the preferred strategies are only at least weakly connected with certain perceived features of the waste problem. In other words: the framing of the waste problem and its solutions are particularly for the journalists, administrators, politicians, and businessmen more dispersed.

The multivariate analyses of the statistical associations between actors and the preferred strategies for source reduction can be used to differentiate between at least four partly *combined* strategies (Figure 2):

1. In favor of *"soft" and against "hard" regulations*. People from companies tend to place higher importance on "more public relations work of the administration" (point p6+ in Figure 2) and "more environmental education at school" (p8+), but they are against an "increase of environmental regulations" (p3–) and "restrictions of consumption" (p13–).
2. Explicitly in favor of *restrictions* (p1+). The relevant groups are teachers and citizens' initiatives both of which prefer prohibiting the production of goods as an effective means of avoiding waste.
3. Journalists and administrators are *skeptical about "soft" strategies* and the effectiveness of alterations in economic production, such as: the "increase of reusable packaging" (p7–), "education in environmental problems in schools" (p8–), "development of more goods that produce less waste" (p10–), "longer lifespans of products" (p11–), and the "development of new production processes" (p12–).
4. Nevertheless some respondents, who cannot be easily described by a certain group membership, seem to be in favor of *economic solutions* (p4+) and more duties for special materials (p5+).

The evaluation of detailed strategies reveals that the framing of solutions in terms of certain features can only partially be detected. That is a certain contradiction to the hypothesis about the clear framing of situations *and* preferred strategies by actors.

CONCLUSIONS

The aim of the analyses was to give an overview of the "frames" used to articulate the waste problem in Germany. The results exhibit a widespread heterogeneity of perceptions concerning "the" waste problem. The different perspectives on the problem can be associated with two general groups of actors: journalists, environmentalists, teacher vs. business, administration, politicians. The main difference between their framing of the recent situation is essentially related to the inclusion or exclusion of risks and environmental hazards. NIMBY, obstacles to an effective administrative planning, and the critique of the present way of living point to other central issues of different frames.

If one looks at the proposed strategies to remedy the situation in terms of source reduction, the main difference will be between "harder" and "softer" types of *regulations*. Especially the businessmen prefer "softer" strategies in relation to *all* other groups. An overall framing as a general connection between the perception of the situation and certain strategies cannot be detected. However, the results reveal different interpretations of the problem which are, for example, essentially rooted in assumptions about environmental risks. These contrasting framings can be seen as important obstacles to consensus in the field of waste management.

REFERENCES

1. G. Himmelmann, Abfallentsorgung als neues Politikfeld, *Gegenwartskunde, 39*:3, pp. 377-404, 1990
2. K. A. Gourlay, *World of Waste: Dilemmas of Industrial Development*, Zed Books, London, 1992.
3. J. P. West, S. J. Lee, and R. C. Feiock, Managing Municipal Waste: Attitudes and Opinions of Administrators and Environmentalists, *Environment and Behavior, 24*:2, pp. 111-133, 1992.
4. J. M. Jasper, The Political Life Cycle of Technological Controversies, *Social Forces, 67*:2, pp. 357-377, 1988.
5. S. L. Cutter, *Living with Risk*, Edward Arnold, London, 1993.
6. W. Rathje and C. Murphy, *Rubbish! The Archaeology of Garbage*, Harper Collins, New York, 1992.
7. A. E. Ladd, The Solid Waste Crisis and Support for Recycling: A Research Note, *Sociological Spectrum, 10*:4, pp. 469-484, 1990.
8. A. E. Ladd and S. Laska, Opposition to Solid Waste Incineration: Pre-Implementation Anxieties Surrounding a New Environmental Controversy, *Sociological Inquiry, 61*:3, pp. 299-313, 1991.
9. B. Martens, Was ist am Abfall problematisch? Ergebnisse einer Befragung in Baden-Wuerttemberg, *Klagenfurter Beitraege zur Technikdiskussion, Heft 59*, 1993.
10. C. Zeiss, Impact Management Priorities at Waste Facilities; Differences between Host Community Residents' and Technical Decision Makers' Values, *Journal of Environmental Systems, 19*:1, pp. 1-23, 1989.
11. J. P. West, M. M. Haley, S. J. Lee, and R. C. Feiock, The Implementation of Local Solid Waste Policies in Florida, *Journal of Environmental Systems, 20*:1, pp. 71-90, 1990.
12. S. Dunwoody and R. J. Griffin, Journalistic Strategies for Reporting Long-Term Environmental Issues: A Case Study of Three Superfund Sites, in *The Mass Media and Environmental Issues*, A. Hansen (ed.), Leicester University Press, Leicester, pp. 22-50, 1993.
13. W. A. Gamson and A. Modigliani, Media Discourse and Public Opinion on Nuclear Power: A Constructionist Approach, *American Journal of Sociology, 95*:1, pp. 1-37, 1989.

14. M. J. Greenacre, *Correspondence Analysis in Practice*, Academic Press, London, 1993.
15. I. H. Bernstein, *Applied Multivariate Analysis*, Springer, New York, 1987.
16. M. Jambu, *Exploration informatique et statisque de données*, Dunod, Paris, 1989.

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