Chapter 2 Grounded and ethnographic methods

2.1 Overall research design

2.1.1 Methods within the social construction paradigm

The methods for this research had to be compatible with social construction theory. The social construction framework is designed to describe processes in which people give meaning to the world around them. These processes happen in different places and at different times, and therefore, every person sees the world in a slightly different way (divergence). Because humans are social beings, they share their views with the people around them through language. Consciously and unconsciously they teach their children how everything works, and in their working lives they tell each other how things should be done 'around here'. Through these processes people who live and work together come to share similar cultural views (convergence). Within separate groups of people, different cultures develop. New events are interpreted within the existing cultural framework, but they can also lead to an individual or collective learning process. Because of the divergent and convergent processes, human cultures are continuously revised.

The research question is about a specific area of cultural meaning, namely views on sustainability, which are embedded in the general culture of water companies. Ways had to be be found to unearth these beliefs without provoking socially desirable answers, and also without providing the respondents with new information through interview questions. An extra difficulty is that the researcher also has specific views on the world. These are partly based on education and scientific theory, and partly on Western-European socialization and coincidental life experiences. From the social constructionist viewpoint a scientific researcher doesn't necessarily have a more accurate view on the world than laymen. In search for other peoples frameworks of meaning, a social constructionist has to be aware and critical of her own framework.

The effort of turning off the biased personal framework can turn the research into a hopeless task. Social constructionist research is even criticized as being a *contradictio in terminis* because no researcher is without an interpretative frame (Woolgar and Pawluch, 1985). Careful, systematic approaches and constant confrontation with the data can reduce researcher bias (Miles and Huberman, 1994; Corbin and Strauss, 1990). Furthermore it can help to make remaining biases as explicit as possible. Latour advises to *ignore* the fact that all knowledge is in principle uncertain, and to focus only on a specific area of reality construction (1979). Our main interest here is to shed light on the social construction of sustainability. We need devices that produce original views and a way of analysis and reporting that allows the reader to judge the validity of the conclusions.

Culture and cultural changes are reflected in language. In a debate in which actors try to convince each other the different views often surface and can then be studied. Hannigan (1995) provides an analytical tool which also has inspired the structure of this research (Table 2.1). Another approach is the narrative analysis, where 'the stories that rule our lives' are the focus of research (Czarniawska, 1997). Stories often contain explanatory elements such as historical reasons and cause-effect relations. Such beliefs concerning causalities steer people and organization in their actions, so it is an interesting approach for this research. When data have the form of stories, they also show process aspects.

Table 2.1: Constructionism as an analytical tool (Hannigan, 1995)

1. claims	what is said about the problem?	→	how is the problem typified? (definitions)
	how are claims presented in order to persuade their audiences (rhetoric)?	→	grounds: data, basic facts (examples, numeric estimates)
		→	warrants (justifications for demanding actions)
		→	conclusions: actions, solutions (new agencies, new policies)
2. claims makers	claims makers identity:	→	organizations, social movements or interest groups (self-interest or interest of third parties?), professions
	issue entrepreneurs:	→	politicians, civil servants, scientists and mass media
3. claims making process	arena of public discourse:	→	- whom do the claims makers address? - are there rival claims? - what concerns and interests do the claims makers present - how does this influence the audience's response? - how did the identity of the claims makers affect the response?

2.1.2 Qualitative research

The research question was about views on sustainability, seen through other people's eyes (Jonker and Pennink, 2000). These data are qualitative, so a qualitative research design was the only possible method. The research model also contains questions on strategy and network, which could have been researched with quantitative methods. As we wanted to integrate data on all research questions, we chose to collect all data with the same qualitative method at the same individual/company level. Therefore, all data were collected at the level of respondent perceptions.

Table 2.2: Advantages and disadvantages of qualitative research (King et al, 1994; Miles & Huberman, 1994)

Advantages	Disadvantages
- greater validity (measure what you want to measure) because multiple data sources are used; - rich descriptions; - preservation of chronological flow; - helps to get beyond initial conceptions and to revise conceptual frameworks.	- weak reliability (different measurements do not necessarily lead to the same results); - labour-intensiveness and data-overload; - researcher-bias, methods of analysis are not well formulated > no guidelines for protection against self-delusion; - generalizability of results.

An overview of advantages and disadvantages of qualitative research is given in Table 2.2. An advantage of a qualitative method is that it can surface several levels at which the concept of sustainability is interpreted:

- A respondent can identify governmental bodies as a source of a 'fashionable' term;
- At the same time he can use it in daily language because it has become the normal way to describe energy from renewable resources;
- He can also recognize deeper meanings behind the term and agree with those meanings;
- And he can recognize the strategic value of the term and use it deliberately in external communications.

We would never have found this complexity with a predefined, quantitative method. If we had made a two-dimensional list of academic concepts associated with sustainability, they would have scored eagerly and second thoughts would have remained invisible.

Yin (1994) proposes several ways to improve validity and reliability of qualitative research. The tactics proposed by Yin used in this research are indicated with an asterisk in Table 2.3 and are explained more explicitly below. We'll also sum up the strategies to strengthen advantages and to overcome the disadvantages of Table 2.2.

Table 2.3: Criteria for judging the quality of a research design and tactics to resolve these problems (Yin, 1994)

Criteria	Tactics	Phase
construct validity	use multiple sources of evidence*	data collection
	establish a chain of evidence	data collection
	have key informants review the draft report*	composition
internal validity	do pattern-matching	data analysis
	do explanation-building*	data analysis
	do time-series analysis	data analysis
external validity	use replication logic in multiple case studies*	research design
reliability	use case study protocol	data collection
	develop a case study data base*	data collection

Tactics to improve validity:
- *Use multiple sources of evidence:* internal as well as external interviews were carried out and next to that sector meetings were observed and written data collected;
- *Have key informants review the draft report:* case reports were sent to one respondent from each company, with the encouragement to show it to other respondents as well, but because of time restraints they all chose to be the only reader. The cross case analysis was sent to the same respondents, of whom two have reacted;
- *Do explanation-building*: complete case study reports were written that link up the evidence to make one story out of the evidence;
- *Use replication logic in multiple case studies:* four cases were compared.

Tactics to improve reliability and reduce researcher-bias:
- *Develop a case study data base:* all interviews, documents, drafts, and electronic data are stored in an accessible way;
- During analysis, only statements shared by two or more sources were used.

Tactic to improve labour-intensiveness and data-overload:
- Qualitative software Atlas-ti was used. This software is an instrument to store and retrieve data.

Tactics to make results more generalizable:
- A multiple case study was conducted to improve the generalizability in comparison to a single case study.

2.1.3   Multiple case study

Within the social sciences, five research strategies exist (Yin, 1994): an experiment, a survey, an archival analysis, a historical analysis, and a case study. The choice depends on the research questions, the amount of control and contemporariness, as is shown in Table 2.4.

Table 2.4: Five research strategies (Yin, 1994)

	Type of questions	**Control needed**	**Contemporary events**
experiment	how, why	yes	yes
survey	who, what, where, how many, how much	no	yes
archival analysis	who, what, where, how many, how much	no	yes/no
history	how, why	no	no
case study	how, why	no	yes

This project concerns "how and why" questions; there is no control over events and we are mostly concerned with a contemporary phenomenon. This justifies a case study approach, which retains the holistic and meaningful characteristics of real-life events (Yin, 1994). The definition of a case study: *an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident* (a survey and an experiment decontextualize) (Yin, 1994, p.13). With primary and secondary sources, cultural and physical artefacts, direct observation, and systematic interviews with relevant persons, a full variety of evidence can be collected.

Case study research is often applied by social constructionists. Latour and Woolgar's "Laboratory Life" (1979) is an example in which interviews, historical text analysis, participant observation, photographs, and quantitative analyses are combined to produce a complete account of how scientific facts are produced in a biochemical laboratory.

Yin (1994) advises to select cases that either produce a similar result (literal replication) or cases that produce contrasting results for predictable reasons (theoretical replication), or both. Therefore, it was decided to conduct four case studies and to aim for literal as well as theoretical replication. The selection of cases is further clarified in section 2.1.6. A historical analysis of the drinking water sector in the Netherlands was added. This helped to put the cases in their historical context, and to understand the similarities between the cases.

2.1.4   Grounded theory approach

At the time the study started, there was little knowledge of views on sustainability or the way these views develop. This is why an explorative method was chosen, based on grounded theory. In a 'grounded theory' approach no theoretical propositions are made before data collection and the method comprises no testing of hypotheses (Glaser and Strauss, 1967). Instead, we use a deductive approach, building up theory from the data. The theoretical framework presented in Chapter 1 is intended to produce some boundaries to the research. This theoretical model is used as a set of 'sensitizing concepts' (Strauss & Corbin, 1990) that leave enough room to explore unexpected phenomena.

The grounded theory follows a rather loose methodological design. The analysis consists of a series of options to select cases, collect data, analyse data, collect more data, sort data, look for connections, and build hypotheses. Data collection and analysis are not separate steps, but form an iterative process. The analysis method is not part of the evidence, as is the case with hypothesis testing. Besides, it's a research method that takes place in the head of the researcher and is, therefore, less controllable. For example, the criterion of data saturation: this point is reached when the researcher feels this is the case.

However, it can be demanded of a grounded researcher to make her data and methodological decisions accessible for peer review. Therefore, all interviews for this research were literally transcribed, a case study database was built and methodological decisions and procedures are made as explicit as possible in this dissertation.

A grounded approach is very time consuming. We cannot take on too many cases so the number was initially restricted to four, plus a pilot case.

2.1.5   Selection of sector

The selection of the sector was guided by the demand of the research initiators, as was described in Chapter 1. It should involve sustainable groundwater policy and it should have an economic dimension. Economic actors with a relation to groundwater are water companies, industries, and farmers. Of these three we chose water companies because they extract the largest amount of groundwater. This sector has a number of advantages for studying views on sustainability:

- It is expected to have enough access to financial and scientific resources to be able to deal with sustainability in a professional way;
- It reached a near-perfect level of control over product quality and quantity, so it has time to develop a broader view on company goals;
- It covers the whole chain from resource extraction to supplying consumers, so it has the opportunity to make changes without having to consult a whole supply chain;
- It has a long history of dealing with environmental pollution so it can be expected to have a rich view on sustainability.

In short, water companies are expected to be a rich source of information concerning sustainability. A disadvantage of the sector is that it is in an intermediate position between governmental organizations and commercial companies. Dutch water companies have a market monopoly with a mandate to function as if they were commercial companies, without making a profit. Because of this, the results may only be generalizable to a limited set of comparable utility sectors and not to purely commercial companies or purely governmental organizations.

2.1.6   Selection of cases

It was decided to select all cases within the same economic sector. The water companies operate in the same economic and governmental policy context. They share the same legal framework, the same Dutch culture and produce the same product. Differences between these companies are expected to be caused by either physical-geographic differences or by company-specific perceptions.

At the time of selection of cases, in 1998, the Dutch drinking water sector included 25 companies (Water Statistiek, 1998). Together they produced about 1,2 billion cubic metres of drinking water, and the sector as a whole employed nearly 7,500 people (see Table 2.5). At the time of the interviews in 2000, there were 23 companies and at the time of writing this chapter (2003) there were 18 left, because of mergers. WLF merged with Nuon in 1998, and became therefore included in this research. Figure 2.1 shows an overview of each company's supply area in the Netherlands.
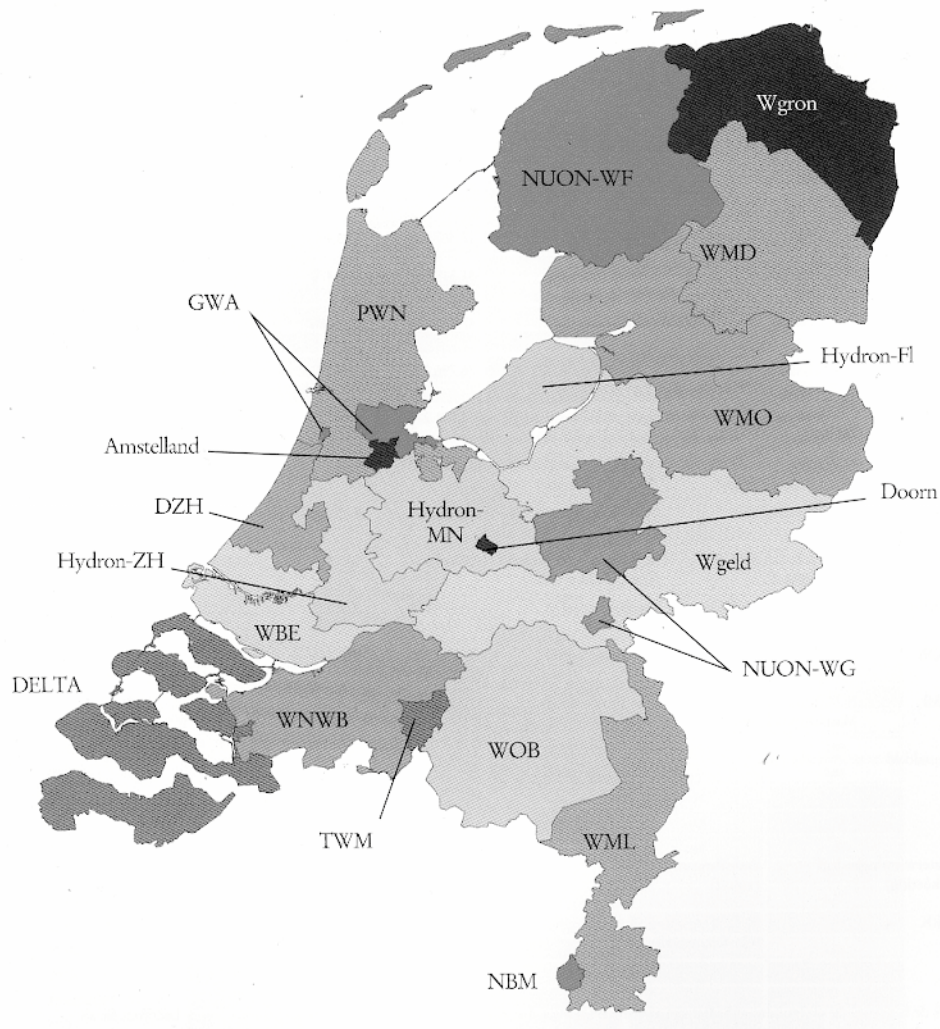
Figure 2.1: Dutch water companies in the Netherlands (Vewin, 2001)

In an attempt to do literal as well as theoretical replication (see section 2.1.3), two companies were selected because they were mentioned by informants from Vewin and Kiwa as 'the greenest' (WMO and PWN), and two companies because they were mentioned as 'the least green' (Nuon and Delta). Nuon and Delta are also described as 'the most commercial'. Greenness and commerciality are not two extremes of the same dimension, of course it is possible to be commercial and green at the same time. Why some members of the sector presented it this way is part of the research and answers will follow in the results.

Next to these four, we selected WMN as a pilot case to test the methods (later renamed Hydron Midden Nederland). For this case no strict criteria were used, it was based on the convenience of an existing contact and geographical closeness (Yin, 1994). This case had an important role in learning to understand the sector and in developing a set of qualitative codes. Because the interview material for this case was less complete, the case was not deliberately selected, and the material for the other four cases was already overwhelming, it was decided not to describe Hydron Midden Nederland in the dissertation.

Table 2.5: List of Dutch water companies in 1998, ordered from north to south, with selected cases in grey (based on Waterleidingstatistiek, 1998)

Acronym	Company name	Water sales in m³ x1000	Personnel
WBGRON	Waterbedrijf Groningen	44 868	320
WLF	Waterleiding Friesland	45 483	280
Nuon ZG	NUON Zuid-Gelderland	47 722	243
Nuon VNB	NUON Veluwse Nutsbedrijven		
Nuon Water	NUON Water		
WOV*	Waterwinningmaatschappij Oost-Veluwezoom	-	-
WMD	Waterleidingmaatschappij Drenthe	31 641	176
WMO	Waterleidingmaatschappij Overijssel	81 848	501
WBGELD	Waterbedrijf Gelderland	86 288	534
Doorn**	Bronwaterleiding Doorn	-	
WMN	Waterleidingbedrijf Midden-Nederland	78 468	480
FDM	Flevolandse Drinkwatermaatschappij	15 912	89
WZHO	Watermaatschappij Zuid-Holland-Oost	50 244	294
PWN	Waterleidingbedrijf Noord-Holland	100 437	776
GWA	Gemeentewaterleidingbedrijf Amsterdam	65 940	661
Amstelland ***	Nutsbedrijf Amstelland	5 592	28
WVH***	Watervoorziening Heemstede	1 529	-
DZH	Duinwaterbedrijf Zuid-Holland	71 013	629
WBE	Waterbedrijf Europoort	149 774	492
Delta	Delta Nutsbedrijven	35 402	254
WNWB	Waterleidingmaatschappij Noord-West-Brabant	59 201	243
TWM	NV Tilburgsche Waterleidingmaatschappij	13 333	95
WOB	Waterleidingmaatschappij Oost-Brabant	106 628	562
WML	Waterleidingmaatschappij Limburg	78 297	533
Maastricht	Nutsbedrijven Maastricht	6 359	53
WRK*	Watertransportmaatschappij Rijn-Kennemerland	-	135
WBB*	Waterwinningbedrijf Brabantse Biesbosch	-	83
Total	*25 companies*	*1 175 961*	*7 461*

*   water production only
**   small private company, no statistics available
***   distribution only

During the research, it became clear that it was not easy to judge the 'greenness'of these companies. If we take a look at the 'best' and the 'worst' companies in Table 2.6, we see that PWN and WMO scored worst in the Vewin benchmark of 2000, and Nuon among the three best. The best-scoring companies all have clean groundwater at their disposal. The benchmark index for environmental performance is criticized because it overemphasizes energy aspects and does not take efforts to develop nature into account. Delta did not participate in the benchmark, so there is no means of comparison for this company.

Table 2.6: Best- and worst-scoring companies on the environmental burden index according to the benchmark of 2000 (Vewin 2001)

Best-scoring three	Index	Worst-scoring three	Index
WMD	13.5	WG	28.2
Nuon-Gelderland Hydron	16.8	WMO	28.8
Flevoland	16.1	PWN	38.3

If we look at the subjective opinions expressed in the interviews (Table 2.7), PWN is seen as the greenest company, with DZH in the second position. If we look at it from the respondents' views, then each company is the most sustainable in its own way.

Table 2.7: Companies mentioned as sustainable or green during the interviews

Companies	Number of respondents
PWN	6
DZH	5
Nuon	2
WMO	2
WMD	2
GWA	2
WML	2
WG	2
Hydron-Flevoland	1
Hydron-Midden Nederland	1
Brabantse Biesbosch	1

2.1.7   Selection of respondents

We were interested in how the concept of sustainability influenced the strategy of the companies. Therefore, we needed respondents from the senior management level, preferably including the director or CEO. Letters were sent to the director of each company asking if they to cooperate with our research, and if so, if we could meet them for a first interview. All companies agreed to participate in the research. Respondents received an information sheet (see Annex 1). For Delta, our first meeting was indeed with the director. At WMO and PWN, the first interviews were held, respectively, with the manager of the strategy department and the director of the nature & recreation department.

To find more respondents we used a snowballing method. In the first interviews we asked who were involved in strategy decisions in their company, and with whom we could talk next. There was no explicit effort to include dissidents in de set of respondents, because the aim was to find a coherent, generally shared view in each company. During the next interviews we kept asking who were involved in strategy making, to check if we had indeed talked to the right people. Table 2.8 shows that, in general, we have spoken with half the group involved in strategy making. The respondents also pointed out 'sustainability experts' instead of managers for the follow-up interviews and they were interviewed as well.

We wanted a minimal check on how the management views were shared by the rest of the employees in these companies. Therefore, one member of the Workers Council was interviewed in each company. These respondents agreed largely about what their management was doing. Maybe this was because we were sent to members with whom managers had the most positive contact. In general, the level of disagreement within these companies seems low. Employees stay within a job for a long time in this sector (12-13 years on average) and everyone seemed to know who was who (except for Nuon).

At Nuon selection of respondents was more difficult. This company had relatively independent business units across the Netherlands and at the time of the research even the head office was spread over different locations. It was decided to focus on their water business unit in Gelderland. The snowballing exercise sent us to other business units as well, so we talked to three people from the Water Gelderland business unit; one person from Water Friesland, one person from the Sustainable Energy business unit, and one person from the corporate strategy unit. Unfortunately, the CEO of Nuon could not be interviewed. Some of his views were found in newspaper interviews so they were used for the analysis.

Table 2.8: Selection of internal respondents. The first and second rows contain everyone mentioned as influencing company strategy in at least one interview. The third row shows interviews with non-management employees including Workers Council members. (between brackets the code used for each respondent in Chapters 4 to 7 (with R of Respondent) and the number of interviews held with this person)

	PWN	WMO	Delta	Nuon
People with influence on strategy, interviewed:	• general director (R1, 2x) • director production (R2, 2x) • director nature & recreation (R3, 2x) • manager technology (R4, 1x)	• director (R1, 2x) • manager marketing (R2, 1x) • manager strategy (R3, 2x)	• general director (R1, 2x) • deputy director (R2, 1x) • manager water production (R3, 2x)	• manager water technology (R1, 2x) • manager distribution (R2, 2x) • manager water production (R3, 1x)
People with influence on strategy, not interviewed:	• financial manager • manager P&O • executive secretary	• financial manager • deputy director • regional manager	• manager electricity production • financial manager • manager marketing	• CEO • director water • board member foreign strategy • manager international retail • manager Build-Own-Transfer
Other respondents	• Workers Council, distribution (R5, 1x)	• sustainability expert (R4, 2x) • Workers Council, quality system (R5, 1x)	• project leader industrial contracts (R4, 1x) • Workers Council, information technology (R5, 1x)	• director sustainable energy (R5, 1x) • sustainability expert (R6, 1x) • Workers Council. quality system (R4, 1x)
Evaluation	4 out of 7	3 out of 6	3 out of 6	3 out of 8

Another research question was about how the network of organizations around water companies introduced meanings into the companies. Therefore, we asked the first set of respondents which external organizations inspired them and with whom we could talk. There was no explicit effort to select 'enemies': it was up to the respondent to decide from whom he had learned. The priority was to achieve data saturation for a limited number of shared views, and not to describe a broad range of external views. Table 2.9 gives an overview of external respondents and their organizations. We aimed at 3 to 5 external respondents per case, in order to limit the total amount of data. Often we talked to only one person of an organization. Therefore, external data were less saturated than internal data.

Table 2.9: Overview of external respondents: organization, function (between brackets the code used for each respondent in Chapters 4 to 7)

PWN	WMO	Delta	Nuon
• colleague company, manager nature department (DZH) • nature organization, director (NAT1) • provincial government, official (PROV) • nature organization, regional manager (NAT2)	• provincial government, political leader (PROV1) • provincial government, official (PROV2) • water board (WAT) • nature organization (NAT)	• provincial government, political leader (PROV1) • provincial government, official (PROV2) • chemical industry, manager utilities (IND1) • water supply industry, manager (IND2)	• KIWA, project leader (KIW) • Vewin, coordinator (VEW) • provincial government, political leader (PROV)

Next to the snowballing method for selecting internal and external respondents, two extra interviews were held within the Ministry of Environment (VROM) and the Ministry of Economic Affairs (EZ). This was done to enhance the researchers understanding of the liberalization debate.

We interviewed a larger number of respondents for Nuon internally. There was less time left for the external respondents: we interviewed only three. External interviews for Nuon were conducted with respondents from the Province of Gelderland, Vewin and Kiwa. An extra limitation here is that Vewin and Kiwa form a national context for all water companies and do not have a specific, regional role for Nuon. To enhance our understanding of the Nuon case we use additional data, namely an interview with the respondent from the Ministry of Economic Affairs and notes made during a lecture by an official from this Ministry during a water sector meeting.

2.2   Data collection

2.2.1   Ethnographic interviewing

We were looking for data about the views of respondents, as seen from their point of view. Ethnographic interview techniques were used as described by Spradley (1979). Ethnography is a research strategy that fits well within the social construction paradigm, because it also presupposes a variety of equally valid cultural 'realities'. Spradley uses a more static definition of culture, assuming that a culture has developed over a long period of time and its validity has been tested over that period. Therefore, cultural knowledge should have a structure of its own (Spradley, 1979). Nowadays, more dynamic views on culture have been developed (for example, Schein, 1999). This thesis focuses on a dynamic process: it studies how an alien concept called sustainability enters water companies, and how they make sense of this new idea within their own context.

The 'native' language of water companies can be used for generating and analysing data about perceptions of sustainability and strategy. Principles of this technique are supposed to have as little influence on the respondents as possible while asking questions, and to reflect their own language in follow-up questions. Interviews are conducted in a conversational style, so without prescribed questions or a prescribed order. This is to stimulate the respondent to go on talking in his or her 'native' language, instead of being aware of being interviewed by an outsider. That would provoke a respondent to translate cultural knowledge into the outsiders language. Questions should be lengthy to provoke lengthy answers. Ethnographic interviewing demands taping and verbatim transcription to preserve as much of the original language as possible.

It also calls for interviewing during as many hours as possible. At the same time, we wanted to compare a number of cases. To keep the amount of data within manageable limits, total interview time must be between fifty and one hundred hours. Besides, the respondents were expected to have limited time for interviews. Therefore, we aimed at interviewing most of the internal respondents twice for one hour.

Our interest was restricted to the relations between perceptions of sustainability, company strategy, and the network of organizations surrounding the water company. By introducing these concepts in the interviews we deviated from ethnographic principles. We did this because we're not only interested in the internal culture of the water company 'tribe', but also in their interaction with the outside world and the social construction processes. So we made a semi-structured interview format (see Annex 2). For different categories of respondents (managers, workers council, and external respondents), slightly different versions were made.

We first asked a 'grand tour' question, namely "How would you characterize this company?" This is a safe way to collect some 'native language' with which follow up questions can be built. The questions about sustainability also used the ethnographic principles. Respondents

were asked if they used the term sustainability in their daily language within the company, and in which situations (with R of Respondent and I of Interviewer):

I   : Do you use this term in here, let's say, in this building, when you talk to each other?
R   : Sustainability?
I   : In a meeting?
R   : Well, not really, no. Not really, no. (71:7)

The answer to this usually provided enough connections for ethnographic follow up questions, for example:

I   : When you are talking about sustainability, you mainly talk about the green countryside?
R   : Well, no, we also talk about the environment, industries, emissions that are allowed or not allowed (78:14)

The questions about strategy and the network had a more directive content. A complete understanding of the cases required theoretical sampling until the data were saturated (Glaser & Strauss, 1967). This means that the interviews could have a different content: it depended on the researcher's level of understanding, and on the specialization of the respondent (for example, distribution or marketing). Because we were looking for shared views, the same questions were asked in a number of different interviews.

The interview round was concluded with a group interview in each company. At this interview, preliminary results were presented by the researcher and final questions asked. Also these meetings were taped and transcribed.

Finally, the ethnographic idea of cultural 'immersion' was used: to live in a culture for a long time, and to work on interviews for days at length without interruptions (Spradley, 1979). The researcher became a member of the association for water company personnel (KVWN), read their two-weekly magazine H_2O, and visited as many of their meetings and seminars as possible. Furthermore, the analysis of individual cases was done subsequently; so coding, analysing and finishing up a whole case description before starting with the next.

2.2.2   Taping, transcription and translation into English

Through internal and external interviews, we collected 57 interviews that took 45 minutes to 1,5 hours, and five group meetings of about one hour. A tape recorder was used for all interviews and meetings. The taping procedure failed three times. Of these three interviews, notes were made, based on memory and on a few notes made during the interviews. This usually resulted in only a quarter of the material compared to a taped interview. The three interview transcriptions based on notes and memories were returned to the respondents for validation. They were returned without many corrections.

The interviews were typed out literally; an interview of an hour resulted in about 15 pages, which made a total of 930 pages of data. Because we were interested in the cognitive content of the interviews, just the basic text was typed, so not every hesitation or intonation. If a respondent corrected his or her sentence while speaking, only the corrected version was typed. These typed texts were used for the analysis.

After the analysis was completed, a selection of quotations had to be translated to English, to become part of the dissertation. It is hardly possible to translate Dutch grammatical mistakes (which happen a lot in spoken language) or broken off sentences to English equivalents. Therefore, we chose to translate the quotations to (mostly) correct English.

2.2.3   Other data

In the data collection period, a field diary was used (Andersen *et al*, 1995). During company visits, observations were written down in this diary, for example, what impression the entrance of a building made. Conversations before and after the tape was running were noted down. Also while the tape was running notes were taken in case of technological failure and to keep track of follow up questions during the interview. Ideas and memo's while waiting for the next interview or on the way back home were also noted. All scribbled down data were later typed out and entered as Atlas-ti primary documents or stored into the case study database.

Furthermore, many meetings of the drinking water sector were attended (of which notes were made). The trade magazine H_2O, year reports of the companies, and the internet also provided useful data (web sites of the companies, governmental web sites, and so on).

2.3   **Grounded analysis**

2.3.1   Mixed methods

For the analysis several methods were used. We took ideas from Yin about case studies to be able to investigate the complexity of a contemporary process. We did not take his advice to enter cases with a limited set of propositions, because we considered the meaning of sustainability was too uncertain. Instead, we chose a grounded approach with more explorative possibilities. We used the grounded ideas of theoretical sampling, data saturation, and open coding, but we abandoned the idea of conceptualising the codes in researcher terms. Instead, we chose the ethnographic idea of 'emic' codes, in an effort to describe reality as seen from within water companies. And then we had to abandon the ethnographic proposals of how to collect and analyse data, since we only wanted to know about sustainability issues. The ethnographic method is violated when people within a water company are asked about sustainability, before they use this term themselves. We did it anyway because the research questions are about the diffusion and interpretation of such a term, and about the interaction with other organizations.

The consequence of using ideas from several approaches and then abandoning parts of it was that we were on our own again with regards to the analysis. The method of analysis was developed while working with the data. To improve reliability, all decisions made in this process were explicitly recorded. Ideas of Yin and Miles & Huberman were used to write complete case descriptions (Chapters 4 to 7). Many original quotations were used in these descriptions according to social construction tradition (see for example Czarniawska, 2000) to give the reader insight in the relation between data and inferences. To enhance the understanding of the Dutch water sector, a chapter on its history was added (Chapter 3). For the cross case analysis, grounded analysis was used for theory building (Chapter 8). The original conceptual model of Chapter 1 was compared with the stories in the case descriptions, which led to a new theoretical model.

2.3.2   Atlas-ti and coding procedures

Atlas-ti software was used for ordering and managing the data. All data were converted from MS Word (.doc) to Text documents (.txt) and entered in one hermeneutic unit. For each company a 'family' of documents was created so that cases could be researched separately.

The coding strategy was based on grounded theory, which states that substantive theory can be developed in an iterative process of data collection, coding of data, further data collection, coding, and so on, until an integrated theory emerges (Glaser and Strauss, 1967). The coding process was started after the interview set for the pilot case was completed. At that moment, 15 interviews for the pilot case and 6 interviews for the other cases were available. From the ethnographic approach a choice was made for open coding instead of using a predefined set of codes. Chunks of text between 2 and 10 lines were selected: the 'quotations'. Quotations were numbered by the program, for example, 43:10, showing a document number and a quotation number. These numbers can be found between brackets in the quotations in Chapters 4 to 7.

Each quotation got a label with one or more words that seemed to cover that piece of text: a code. The code preferably consisted of words used in the text itself. Most quotations got two or more labels. Later in the process, the quotations grew longer (between 10 and 20 lines) and the number of codes per quotation less (maximum of three). Longer quotations make interpretation of their meaning more reliable. To make sure we noticed all relevant themes for a company, we coded the whole text, unless a piece of it was clearly irrelevant (e.g. fetching coffee or a governmental respondent straying into another policy domain).

During the coding process, the difference in behaviour between organizations was already felt. Especially for the external interviews the list of codes seemed inadequate. This often resulted in new codes or adaptation of old ones. The emerged codes not only reflect what was important for the companies; they also reflect the interview questions, in other words, the interests of the researcher. Examples of researcher codes are: 'define sustainability', 'influence strategy', and 'formulate strategy'.

The growing list of codes was evaluated several times. Closely related codes were merged, and codes with a double meaning split up. In a final evaluation, the following criteria were used:

- The code had to have a link to the concept of sustainability (for example, lead pipelines are more a health issue than a sustainability issue)
- The code had to be linked to a high number of quotations (some codes seemed attractive in the beginning but were forgotten later on, which resulted in a very low number of quotations: a 'dead' code)
- The code needed to be of a higher abstraction level because this integrates more data (for example, 'product differentiation' is a better code than 'bottled water')
- The code should should characterize intriguing data.

Eventually, the list was condensed to 48 codes concerning sustainability and strategy themes, and 23 codes about actors in the network. This number of codes falls within the feasible limits of 60-80 codes advised by Miles & Huberman (1994). To focus on the process aspects, the 48 codes were rewritten in a verbal form (for example 'strategy' > 'formulate strategy', 'energy' > 'save energy'. For all codes a definition was produced (see annex 4). This whole process took about one year. This period was also used for conducting and transcribing interviews.

The resulting list of verbal codes was tested on the interviews of the first case (Delta) and the verbal form worked out well. The switch from the pilot company to Delta was felt in the inadequacy of several codes so they were adapted one last time. After the coding of Delta's interviews was completed, it was decided to freeze the code list in order to generate comparable results for other cases. The set of codes did not fit the other cases perfectly but was mature enough to cause only a few problems. Examples of these problems are described in section 2.3.4.

The codes were sorted into larger categories which were labelled Actors, Process, Strategy, Operations, and Method. Table 2.10 shows the overview of codes and categories used during analysis.

2.4   Individual case studies

Based on the overview of Table 2.10, a wallpaper storage system was made for the case by case analysis. For each category a piece of wallpaper was hung on the wall, with a paper 'basket' for each code (see Figure 2.2). In these baskets quotations and memos could be stored, while waiting for analysis. Research questions and ideas for quantitative testing were pasted on top of the appropriate pieces of wallpaper as a reminder. Atlas-ti output of quotations was generated for one company for each of the verbal codes. This was divided over the 'baskets' and then analysis of the case could begin. This system improved the researchers' overview, enabled some time management and made it easy to store stray quotations and new ideas in their appropriate places.
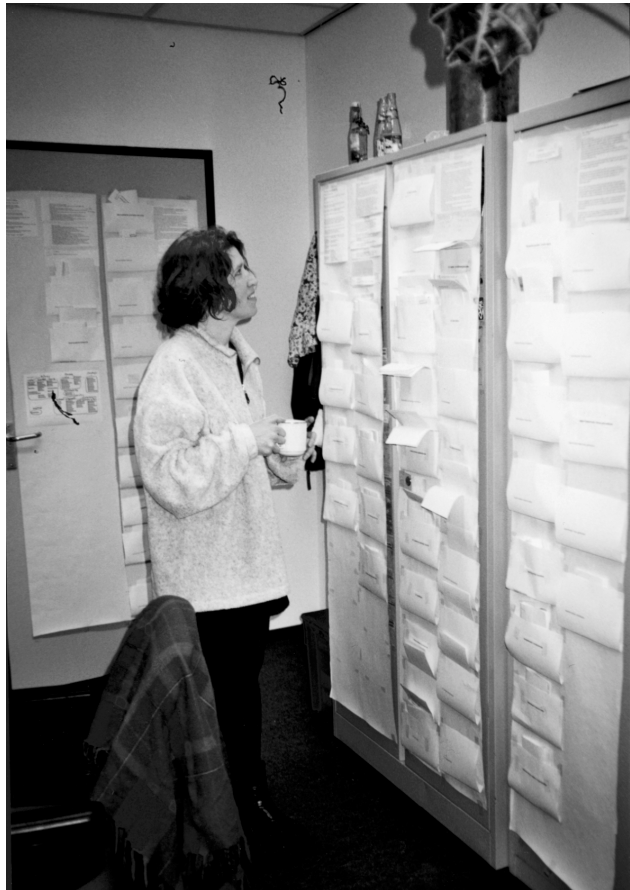

Figure 2.2: Wallpaper storage system for quotations and memo's.

Table 2.10: Overview of codes and categories

ACTORS

SECTOR	GOVERNMENT	OTHER
AC-water boards	AC-European Union	AC-consumers/ citizens
AC-water companies	AC-Parliament	AC-industry/ business
AC-Ministry Water Works	AC-Ministry Economic Affairs	customers
AC-VEWIN water company association	AC-Ministry Environment	AC-agriculture
AC-RIWA Rhine association	AC-Ministry Finance	AC-fire brigade
AC-consultants	AC-province	AC-nature organizations
	AC-municipalities	AC-energy sector
	AC-shareholders	AC-property developers
	AC-Board of directors	AC-housing associations
		AC-Rail Infra Management

PROCESS

DEBATE	INFLUENCE	STRATEGY
discuss	influence strategy	formulate strategy
describe history	influence sustainability of strategy	aim for continuity
assess future	promote public health	aim for guaranteed supply
recognize culture	influence with legislation	aim for high water quality
create image	influence spatial planning	aim for larger scale
define sustainability	cooperate with other organizations	aim for low costs
use term sustainability	cooperate water chain	aim for multi-utility
		aim for privatisation/ monopoly
		aim for product differentiation
		compete abroad

OPERATIONS

PRIMARY PROCESS	ORGANIZATION	GENERAL	SUSTAINABLE ACTIVITIES	
			GREY	GREEN
use groundwater	justify higher costs	implement sustainability	save energy/green energy	promote water saving
use surface water	strengthen financial position		reduce waste & emissions	implement individual metering
produce water	operate commercially/ in the interest of society		choose materials	develop household water
distribute water	improve service		replace lead pipes	protect groundwater
	innovate organization			protect nature
	innovate technology			prevent desiccation
				optimize water system
				reallocate water production

METHOD

criticise method

Atlas-ti can also generate quantitative overviews of quotations per code. The number of quotations indicates how often a subject is discussed in the interviews. This is partly due to recurring interview questions, related to codes such as 'define sustainability' and 'formulate strategy'. For another part it indicates how 'hot' an issue was at the time of the interview. The quantitative overviews of codes and quotations are not very revealing as such, but form the starting point for a qualitative analysis. Table 2.11 shows an overview of the numbers of quotations for Nuon. Here we see, for example, that 'aiming for larger scale' is the most important strategic theme within Nuon. The code 'use surface water' doesn't seem to be that important within Nuon. Such an overview provides some first hints about the company. This was a way to enhance theoretical sensitivity (Corbin and Strauss, 1990).

The quotations were used to develop case stories, which form Chapters 4-7. The first case description took about three months, because it was hard to find a structure in the data, and to decide what to use and what not to use. The second case took six weeks, and the third and fourth case four weeks. Each case description consists of four sections, namely on perceptions of sustainability, strategy, operations and the network. The subsections were specific for each company, based on codes with high numbers of quotations. The quotations were used as pieces of a puzzle, together forming the decision processes in these companies (see figure 2.3). Only issues mentioned at least by two respondents made it to the case stories, because the intention was to describe shared views.
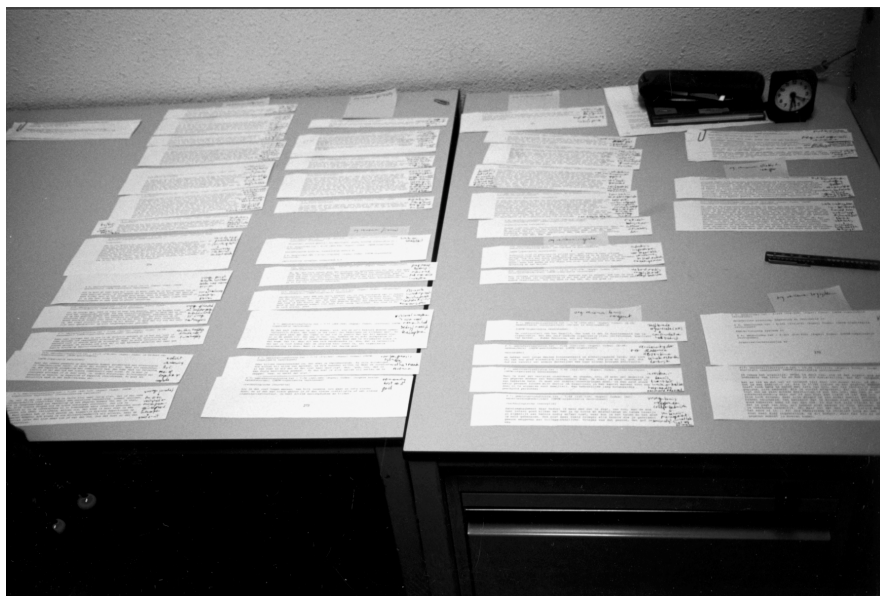
Figure 2.3: Quotations as pieces of a puzzle

After the case descriptions were finished, a section was added to introduce each company to the reader. This introduction does not contain any interpretations yet, but provides some material that a researcher normally has before an interview takes place:

- a photograph of the water company's head office;
- a description of the entrance of this building;
- the first few sentences of the preface of the year report of 2000;
- and some basic figures as provided by the company in this year report.

Table 2.11: Overview of output for Nuon case (primary document = one interview; each interview is numbered by the program)

```
----------------------------------------
Codes-Primary-Documents-Table
----------------------------------------


File: analyse3water1aug2002
Date/Time: 08/28/02 09:41:43 AM
Code-Filter: Code Family werkwoord codes
PD-Filter: Primary Doc Family nuon intern
```

CODES	24	66	67	68	73	76	77	79	80	82	83	102	Totals
influence sustainabi	12	16	3	6	5	3	12	0	7	0	0	0	64
influence strategy	4	2	7	3	9	4	6	2	14	1	4	3	59
aim for larger scale	7	2	3	5	9	2	7	2	7	1	5	0	50
innovate organizatio	1	13	3	5	6	8	4	0	1	0	1	4	46
formulate strategy	7	2	7	6	5	0	10	3	2	0	1	1	44
define sustainabilit	12	12	3	4	5	0	3	0	0	0	1	0	40
cooperate other orga	6	7	0	2	2	5	0	0	8	0	3	2	35
innovate technology	5	0	0	4	5	3	1	2	1	0	2	9	32
save energy/green en	5	3	2	3	1	0	4	0	1	3	7	3	32
aim for low costs	5	5	0	0	7	6	0	0	3	0	2	3	31
create image	4	2	4	2	6	0	2	1	1	0	3	3	28
compete abroad	6	0	0	5	0	0	4	2	1	2	5	0	25
prevent desiccation	0	6	0	6	0	2	2	0	2	0	0	6	24
use groundwater	11	7	0	2	0	1	1	0	2	0	0	0	24
aim for multi-utilit	6	0	0	4	1	0	1	1	3	0	2	1	19
develop household wa	2	7	0	1	5	0	0	0	2	0	0	2	19
recognize culture	1	1	1	2	0	4	4	0	2	0	0	4	19
aim for privatisatio	1	0	3	1	2	3	1	2	2	0	3	0	18
describe history	5	0	1	3	2	0	0	0	4	0	1	0	16
operate commercially	2	4	3	0	0	1	3	0	0	2	0	0	15
protect nature	6	5	0	1	0	1	0	0	1	0	0	0	14
reduce waste & emiss	4	1	0	1	0	5	0	0	3	0	0	0	14
aim for high water q	3	7	0	0	0	1	0	0	0	0	0	2	13
implement sustainabi	3	4	2	1	0	0	1	0	1	0	1	0	13
optimize water syste	4	4	0	0	0	0	0	0	2	0	0	2	12
cooperate water chai	1	0	0	0	1	1	1	0	7	0	0	1	12
use term sustainabil	1	3	1	1	1	0	3	0	0	0	1	0	11
distribute water	3	0	0	0	1	1	2	0	1	0	0	2	10
protect groundwater	4	3	0	0	0	0	0	0	3	0	0	0	10
improve service	1	1	0	0	0	2	0	0	0	1	0	4	9
aim for product diff	1	3	0	1	0	0	0	0	1	0	0	1	7
aim for continuity	0	0	0	0	0	4	0	0	0	0	0	2	6
criticize method	0	0	1	0	2	0	0	0	0	0	0	2	5
influence with legis	0	2	0	0	0	0	1	0	0	0	0	0	3
produce water	2	0	0	0	0	0	1	0	0	0	0	0	3
promote water saving	0	0	0	0	0	3	0	0	0	0	0	0	3
strengthen financial	1	0	0	0	0	0	0	0	0	1	0	1	3
use surface water	0	2	0	1	0	0	0	0	0	0	0	0	3
reallocate water pro	0	0	0	0	0	1	0	0	0	0	0	1	2
influence spatial pl	2	0	0	0	0	0	0	0	0	0	0	0	2
justify higher costs	2	0	0	0	0	0	0	0	0	0	0	0	2
assess future	0	0	0	1	0	0	0	0	0	0	0	0	1
choose materials	1	0	0	0	0	0	0	0	0	0	0	0	1
discuss	0	1	0	0	0	0	0	0	0	0	0	0	1
implement individual	0	0	0	0	1	0	0	0	0	0	0	0	1
promote public healt	0	0	0	0	1	0	0	0	0	0	0	0	1
aim for guaranteed s	0	0	0	0	0	0	0	0	0	0	0	0	0
replace lead pipes	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	141	125	44	71	77	61	74	15	82	11	42	59	802

2.4.1 Sustainability themes analysis

The first part of each case story looks at perceptions of sustainability. I started with the answers to the question: "Do you use the term in this company?" The answers often revealed the individual attitudes towards the concept. It was also checked if respondents within one company gave the same answer; in other words, if there was consensus between these people.

Then I looked at the meaning of the word 'sustainability' for the respondent. Only interview fragments with a clear link towards the concept of sustainability were coded with 'define sustainability', such as fragments in which respondents use the word 'sustainable' and direct answers to a question about sustainability.

The coded quotations were printed for each company and the prints cut up into single quotations. The quotations were sorted into piles, labelling each pile with the themes I discerned. While sorting, sometimes a better label came up and this was added to the pile. Sometimes, I decided to cut up quotations because I could not choose between piles. Some piles were combined, when their content seemed close to each other. Especially the piles with only one quotation in it were combined with other piles. Labels moved with them, resulting in piles with 2 or sometimes 3 labels. From the labels I distilled a theme, and I counted the number of quotations on which it was based, in order to get an idea of the numbers of times respondents talked about a certain theme.

For example, for PWN 46 quotations were coded with 'define sustainability'. These quotations were sorted and labeled as indicated in Table 2.12. The themes were then described and illustrated with quotations.

Table 2.12: Sorting quotations coded with 'define sustainability' and choosing labels for PWN

Number of quotations	Theme
16	Balancing drinking water production and nature management
7	Integrated, quantitative analysis
6	Sustainable energy use
5	Long term investments
3	Future-oriented technology
2	Raw materials and waste management
2	Choice of material
2	Clean up surface water
6	- (not informative, opaque or otherwise not useful for analysis)
46	Total

2.4.2 Strategy analysis

For the analysis of strategy the quotations coded with 'formulate strategy' were used. These quotations are mostly the result of asking respondents what their company's strategy is. The opening question about characterizing their own company also led to descriptions of strategy. With this set of quotations a backbone story was created, linking up elements the same way they did in the quotations. After the backbone was created, more specified strategic codes were inserted into the story, for example 'aiming for product differentiation'.

In Table 2.13 an overview of relevant strategy codes and quotations is given for WMO and PWN. 'Formulate strategy' is the dominant code within WMO, and there is a relatively large gap between this code and the next (aim for larger scale). Many quotations deserving the code 'formulate strategy' could be labeled with none of the 'aim'-codes. Apparently, the set of strategy codes was not appropriate for WMO's strategy. This was not a big methodological problem because I could simply work with 'formulate strategy'.

Table 2.13: Overview of involved strategy codes and numbers of quotations for WMO and PWN

Codes WMO	Number of quotations	Codes PWN	Number of quotations
Formulate strategy	44	Formulate strategy	18
Aim for larger scale	17	Aim for low costs	31
Aim for low costs	15	Aim for high water quality	14
Aim for privatization/monopoly	12	Aim for guaranteed supply	11
Aim for high water quality	10	Aim for larger scale	8
Aim for continuity	9	Aim for privatization	7
Aim for guaranteed supply	4	Aim for multi-utility	2
Aim for multi-utility	1	Aim for continuity	2
Aim for product differentiation	1	Aim for product differentiation	0

The quotations for PWN show that protection of nature is a goal at the *strategic* level. This did not match with the set of 'aim'-codes either, and, therefore, does not show in Table 2.13. This was caused by the decision to 'freeze' the set of codes after analysis of the first case, Delta, to keep the analysis comparable. Because I kept looking at the original quotations, I found out the strategic importance of nature management for PWN anyway.

2.4.3 Operations analysis

Analysis of operational aspects was the most difficult part of every case study. Table 2.14 gives an overview of all codes related to operational practices, and the number of quotations coded with them for Delta. Operational aspects concerned a large number of codes, and an even larger number of quotations. Because the interviews were mostly about sustainability, the activities linked to sustainability were well covered, but all other operational information appeared fragmentary. There was no basic structure in it along which a story could be developed. We tried to organize quotations according to the strategic fields related to sustainability, as identified in the strategy analysis (for example for Delta: sustainable opportunities in industry). For codes with a large number of quotations that did not fit into these strategic fields a separate story was written.

This resulted in a number of rather chaotic operational paragraphs that had a lot of overlap with the paragraphs on strategy. In a later version of the case stories, the operational section was cleaned up by focusing on the 'sustainable activities' only. All non-sustainability material was integrated in the section on strategy or deleted. Here the problem of data overload, announced in Table 2.2, became manifest. The deleted material may have been interesting to use in order to develop a complete view on each company, but was less relevant to answer the research questions in this dissertation.

Table 2.14: Codes for operational activities and number of related quotations for Delta

primary process		organizational aspects		activities linked to sustainability	
use groundwater	18	operate commercially	48	implement sustainability	29
use surface water	17	strengthen financial position	21	prevent desiccation	17
distribute water	4	compete abroad	15	protect nature	12
produce water	1	cooperate with other	15	optimize water system	7
		organizations innovate	13	reallocate water production	6
		technology		reduce waste & emissions	5
		improve service	12	promote water saving	5
		innovate organization	9	develop household water	4
		cooperate in water chain	9	save energy/green energy	3
		justify higher costs	0	choose materials	1
				replace lead pipes	0
				protect groundwater	0
				introduce individual metering	0

2.4.4   Network analysis

For the network analysis, 3 methods were used to discern which external actors were important for a company:

- The total number of quotations per actor in the internal interviews of the case (see Table 2.15);
- An evaluation which external actors were considered to be inspirational enough for follow up interviews;
- And direct statements about stakeholder influence were coded with 'influence strategy', 'influence sustainability of strategy', 'cooperate water chain' and 'cooperate other actors'.

For example, if we compare the list in 2.15 to the external respondents proposed by PWN, we see that we have been sent to the number 1 on this list, the provincial government. Furthermore, we were sent to nature organizations, which are number 5. Of course, it would have been difficult to single out a consumer for an interview, but why weren't we sent to the Ministry of Environment or municipalities? Maybe because our first respondent was director of the nature division and, therefore, less involved with the Ministry of Environment's drinking water control. Furthermore, we asked 'who inspires you', and so we were not sent to uninspiring relations, and maybe this is the case with consumers and municipalities. So the comparison gives rise to questions which could often be answered by looking at the content of the quotations.

For each of the 'important' actors it was described how they influenced a company's strategy and how they influenced sustainability aspects. To these descriptions the views of external respondents on strategy and sustainability were added. Furthermore, a comparison was made between views on sustainability within a company, and the views of their network partners. Of course, this comparison could only be made for the network partners we were sent to for interviews.

The section on the network was concluded with an overview of network partners and an estimate of their influence on strategy and sustainability issues. This ended with an evaluation of how a company deals with their network: are their relations focused or broad, are they managing their network actively or not?

2.4.5   Cross case analysis

The purpose of this chapter is not only to account for the dissertation that eventually emerged. I also want to inform the reader who might want to try these or similar methods. With grounded and ethnographic methods a multitude of data is generated, that not only can be used to answer the original research questions, but dozens of other questions as well. The grounded method even legitimizes such an expansion of the research questions. A true researcher is easily seduced to wander around for ages, comparing hosts of data with hosts of other data. At least seven versions of the cross case analysis were written, trying a different structure every time. It led to frustration and confusion, for the writer as well as for the ones who had to read these earlier versions. It also led to an enhanced understanding of the research domain. The sixth version rendered the prototype of the new theoretical model that was subsequently used to structure the final, seventh version. I find it difficult to say if I could have done it more efficiently, but it is clear that a cross case analysis like this one requires a lot of effort and time.

Table 2.15: Actors in order of number of quotations for each company

WMO		Delta		PWN		Nuon	
water boards	46	province	36	province	41	municipalities	56
province	44	industry/business	23	consumers/ citizens	37	province	46
consumers/ citizens	33	shareholders	18	Ministry Environment	22	consumers/ citizens	44
industry/business	31	energy sector	18	municipalities	19	energy sector	37
municipalities	23	Ministry Environment	15	NGOs nature & environment	16	industry/business	37
agriculture	21	municipalities	13	industry/business	15	shareholders	24
NGOs nature & environment	18	consultants	11	consultants	12	consultants	19
shareholders	17	water boards	11	water boards	11	NGOs nature & environment	18
consultants	16	consumers/ citizens	10	agriculture	9	Ministry Environment	14
Ministry Environment	13	NGOs nature & environment	8	VEWIN water association	8	Ministry Economic Affairs	11
VEWIN water association	6	agriculture	7	shareholders	7	VEWIN water association	10
energy sector	2	VEWIN water association	7	fire brigade	5	water boards	9
European Union	2	Ministry Economic Affairs	3	RIWA Rhine association	5	European Union	7
housing association	1	Ministry Water Works	3	energy sector	3	agriculture	6
Ministry Economic Affairs	1	RIWA Rhine association	3	European Union	3	Ministry Water Works	3
Ministry Water Works	1	housing association	1	Parliament	3	housing association	1
Parliament	1	Parliament	1	Ministry Economic Affairs	2	RIWA Rhine association	1
fire brigade	0	European Union	0	Ministry Water Works	2	fire brigade	0
Ministry Finance	0	fire brigade	0	Ministry Finance	1	Ministry Finance	0
RIWA Rhine association	0	Ministry Finance	0	housing association	0	Parliament	0
Totals	276		199		221		343

The final cross case analysis in Chapter 8 systematically tests if the findings of individual case descriptions confirm the theoretical model of Chapter 1. Matrices as described in Miles and Huberman (1994) were used to compare differences and to look for explanations. Additional data from year reports, water statistics and other literature were used to check these explanations. The additional data can be found in the tables in Chapter 8.

With help of the Atlas-ti program a word count was done for the term 'sustainable' and related terms. Because the use of this term was dependent on the length of an interview, a relative frequency was calculated: the percentage of 'sustainability' compared to the total number of words. The frequencies within the four companies were compared and the companies were compared to their external networks.

These exercises led to a number of new hypotheses on how the concept of sustainability enters these companies, how it is interpreted and how it is implemented. Based on the findings the original model of Chapter 1 was adapted and expanded into a new theoretical model. In this model it was tried to relate all factors that influence company decisions on sustainability operations.

2.5 Evaluation of the method

2.5.1 Criteria for qualitative research

For this study, several qualitative methods were combined in order to answer the research questions. In this section the results are evaluated.

It is recognized in the methodology literature that qualitative methods can be useful and even necessary, when the world view of others is the topic of a research project. At the same time, qualitative methods are generally seen as unscientific and vague, whereas quantitative methods are seen as scientific and precise (Jonker and Pennink, 2000 p32). The reputation of vagueness is caused by the fact that qualitative methodology has less rigid procedures. Several authors provide detailed guidelines for the initial phases, such as data collection and storage (for example, Spradley, 1979; Maso, 1989; Strauss and Corbin, 1990; Wester, 1991; Miles & Huberman, 1994). However, halfway through the analysis phase, every method leaves it up to the individual researcher to come up with the main themes, and to choose the basic storyline that ties it all together.

The criteria for judging qualitative research differ from those for quantitative research. An overview of these criteria is shown in Table 2.16. The qualitative criteria are used below to discuss the quality of this research project. The criterion of efficiency is added in the final section.

Table 2.16: Criteria for quantitative and qualitative research (Miles & Huberman, 1994, p278)

Quantitative	Qualitative	Basic issue
objectivity, replicability	confirmability	relative neutrality and reasonable freedom of researcher biases or at least explicitness about inevitable biases
reliability	dependability, auditability	consistent research process, quality control of research design and subsequent steps, peer review
internal validity	credibility, authenticity	truth value, does it make sense?, type of understanding that emerges, plausibility
external validity, generalizability	transferability, fittingness	larger import of a study, transferability to other contexts
utilization	application, action orientation	can it lead to more intelligent action, response of decision makers and information users to the report

2.5.2 Confirmability and explicitness of biases

This dissertation research was done from the biased position, that sustainability is an important issue and a valuable goal for the future. The study was partly a reflection on this bias.

The ethnographic style of interviewing, including taping and verbatim transcription, rendered authentic data. Sustainability is often experienced as a moral issue, so it provoked socially desirable answers, but, in general, there was enough self-criticism and openness about uncertainties. Some respondents were not talkative and then interviewing using this open method was difficult. Fortunately, this happened with only a few respondents.

The interview questions which remained within the ethnographic criteria (not introducing alien concepts, reflecting used language) produced the best data. As soon as the interviewer started to offer interpretations or give examples, the origin of a response became blurred and the data could not be used. Below is an example of an occasion in which the interviewers (I1 and I2) inserted their own views in the questions:

R   : First, we look at the financial consequences of closing an extraction, and if this is positive for us, we offer it to the Provincial government. The Provincial government scores if it can close down an extraction: then it can say, "Look, we forced WMO to close down that extraction".

I1   : Is that based on the idea that the environment should always cost money?

I2   : Well, everybody knows about win-win situations nowadays, don't they?

R   : Well, yes, maybe that's true. I have a nice example here, of an extraction area where we develop nature, there is some recreation and it's good for drinking water. So it's a win-win-win-situation, but we definitely cannot score with that. It has to cost money, or it's not sustainable. (63:10)

Here, the interviewers introduced a view that was obviously new to the respondent, and although he agreed with it, his answer cannot be trusted as a native view. This happened early in the interview process. It is difficult not to come up with one's own views in an interview, if it is done in a conversational style. In the beginning, it is hard to believe that asking people *nothing* can render such good results. This was a learning process, but after a while it worked, which shows in the sometimes puzzled reaction of later respondents:

R   : Well... your business card says 'Environmental Science Department', so don't you already know all these things?

I   : But it's not so important what I know.

R   : I'm just trying to figure out the expression on your face if I give certain answers. (...)

I   : To be entirely clear (...) my intention in this research is not to put my own opinion in a model and to measure that everywhere.

R   : No, I understand. But there must be a lot of information in your head and you cannot deny that it exists.

I   : Yes, sure. But I want to know how other people put that picture together.

R   : No, I understand. (54:9)

Only in the second half of the research, I had mastered this technique to the extent that more complicated questions could be formulated with good results.

The transcription of the taped interviews was an extremely time-consuming procedure, but was essential. The original quotations form the fundamental evidence in this style of research. Without it, peer review is impossible. It already proved to be very useful during the analysis. Coding and interpretation of the transcribed data often led to surprises: did he/she really say all that? It had not stuck in my memory. The taping procedure failed once at Delta, once at WMO, and once in an external interview for Delta. From these failures, it was calculated that working from notes produced only one quarter of the data (measured in number of pages), which were also less reliable, even though they were validated by the respondents.

To enable peer review, a case study database was established, containing all the data and accounts of the intermediate steps in the analysis. This database is not equipped with a user's manual, and the files are not catalogued on paper, but the database is accessible to interested colleagues with the guidance of the researcher.

2.5.3   Consistency of research steps and auditability

In this dissertation, we aimed at maximum transparency by writing down the methodological steps in detail, and by presenting as many quotations in the case descriptions as possible. The disadvantage of this is that it makes the case descriptions difficult to read. It was

decided to give readability less priority than the accessibility of the data for peer review of the steps taken in the dissertation.

The selection of cases and respondents in each company was evaluated in sections 2.1.6 and 2.1.7. The intended selection of greenest and least green companies failed, because there was no consensus yet on which company was 'green' and which was not. The selection of respondents turned out to be reasonably good, except in the Nuon case. In several companies, we interviewed 'sustainability experts' instead of the intended managers. This could have been prevented with a stricter selection of the respondents in the snowballing phase. For example, we could have asked two respondents for other people we might interview, instead of relying entirely on the first respondent.

A grounded theory criterion for dependability is saturation of the data. Although this is based on subjective judgement, we estimate that data are saturated for the domain of sustainability perceptions inside the water companies. For the external actors, the data on sustainability perceptions have many gaps, because only one or two interviews were held in the external organizations. This was not enough to describe their views of sustainability in a reliable way, but it was useful to discern how water companies are influenced by them. The data were saturated for the domains of strategy and the network, but not for the operations level. This was due to the fact that a direct question on operations was lacking in the interview scenario.

Memos were useful for generating new interview questions, for recording methodological experiences, and for the cross-case analysis. During the analysis of individual cases, memos were hardly used because of information overload and because the case descriptions themselves soon went beyond the immature stage of many memo ideas.

The final step of condensing rich data into conclusions remains an intuitive, creative process. Therefore, the final result must be seen as an intermediate step in the construction of the reality of sustainability in the water sector. It is open to criticism from science as well as from the water sector itself.

2.5.4 Credibility, authenticity, and internal validity

The first question concerning internal validity is, whether the selected respondents were representative of the whole company. This was judged in three ways:

- By checking whether the respondents were indeed from the higher management and, therefore, in touch with company strategy. This was confirmed in section 2.1.7.
- By checking whether the rest of the employees shared the ideas of the managers, by conducting one interview with a person from the employees' council. Their opinions fitted well with the management views.
- By checking whether the quotations could be fitted into one, plausible story. In three cases, this was not difficult. It took much time to understand the companies, but once this was achieved, seeing more data no longer caused surprises. A larger picture emerged and all new data fitted in.

At Nuon, it was more difficult. The first reason for this was probably that the highest managers (Nuon's CEO and the director of the water division) were not included in the group of respondents. They probably would have given better insights into the 'mainframe' of Nuon's strategy. Secondly, Nuon was given the same 'quotum' of respondents as the other companies, and these interviews were spread out over too many business units (the water business units in Gelderland and Friesland, a green energy business unit, a corporate strategy unit). This gave a view of how the water units functioned within the whole company,

but also caused unsaturated data for the business unit in Gelderland, and incoherence in the data, because the responses came from different subcultures. A stronger focus of the interviews on the business unit in Gelderland possibly would have led to better results.

Halfway through the research, preliminary case results were presented in a meeting with two or more respondents. These meetings were also taped and transcribed. They often caused a fundamental review of the case descriptions. The final case descriptions and the cross-case analysis were validated by the respondents. The remarks on the final case descriptions and on the cross-case chapter were limited to details, with the exception of the Nuon case. During interviews, the respondents often made remarks about other companies in the sample (not knowing that they were involved in this researching too) and these remarks usually matched with the stories I had heard within the companies themselves. So this offered the opportunity for some triangulation.

2.5.5   Transferability or generalizability

According to Yin, generalizability to a larger group of organizations becomes possible with a multiple case study, but some precautions are necessary. In this study, the number of cases was limited to four, plus a pilot case. According to grounded theory (Glaser & Strauss, 1967), the conclusions at the case level are better than those of quantitative study, because they are based on a richer understanding. The generalizability of the findings is more difficult: Glaser & Strauss consider the conclusions to be theory that needs further testing.

There are different steps in the generalization process:

- From these four cases to the rest of the sector: although the companies showed a distinct culture and function in specific regional situations, the issues they came up with showed a remarkable likeness. This is due to the frequent contacts that exist in the sector. It is expected that no entirely new categories of strategies would emerge from the analysis of other Dutch companies. The next step would be a comparison with sectors abroad. Some aspects may be generalizable, such as the relation of these companies with the water resources, and their relations with the customers. The relationship within their networks will be incomparable.

- From this sector to other public utilities, and to more commercial sectors: the researched companies are in between 'real' commercial firms and 'real' governmental organizations. It is likely that the mechanisms in this sector would emerge in similar settings, such as other public utilities. Some aspects are generalizable to commercial companies, for example, the strategic choices the water companies make with liberalization in mind, such as mergers.

- From these cases to Dutch society, Western-European society, and to humanity in general. The last two steps are doubtful because the companies functioned within the context of the Dutch legal, cultural, and physical systems. Most of the meanings ascribed to sustainability are likely to be specific to this situation, for example, the abundance of surface water. The sector's view of product quality seems to be unique, and so is the network of actors, for example, the water boards do not exist elsewhere. Governments are generally trusted and citizens are rather wealthy in the Netherlands, both of which may not be the case in other times and places.

All of these steps were taken as carefully as possible in forming the conclusions.

2.5.6 Application and action orientation

The study had the character of an exploration of societal processes, and a reflection on the concept of sustainability. It was not intended to provide clear-cut answers to practical problems. Nevertheless, recommendations were produced, because the research dealt with an issue of interest to the water sector as well as society at large. It also described the impact of the trend of liberalization on thinking and action in respect of sustainability.

2.5.7 Efficiency

The loose design of a qualitative method meant, that the method was partly developed during the data collection and analysis phases. In hindsight, much time was wasted. This was partly due to the researchers' inexperience, but was partly unavoidable because of the grounded approach. The price of some inefficiency must be paid to develop a proper understanding of the empirical field.

The data collection could have been more efficient. Because the transcription of the interviews was outsourced, and the whole procedure was so time-consuming, there was a long delay between the interviews themselves and the actual availability of the data. Because of this, the analysis was mostly postponed, so it became separated from further data collection. If this had been combined properly, as is advised by Strauss and Corbin (1990), forty to fifty interviews may have been enough, instead of sixty.

Atlas-ti software was an efficient tool for the management of the data. To give some insight as to how efficient, I will compare some figures on data collection with the data management. The transcription of a one hour interview took 10 hours, resulting in 15 pages of text. The interview files had to be converted from MS Word to text files (with line breaks) and could then be loaded into the program in seconds. Coding took about 2 hours per interview, and generating printed Atlas-ti output for a whole case with about 11 interviews only took 30 minutes. The dialogue of the program is cheerful; the screen is attractive and easy to understand. The memoing options were not helpful: there are so many places to store memos in Atlas-ti that they are likely to get lost. Another limitation is that the program stores the memos as unattractive text files. After using Atlas memo options in the initial phase, it was decided to write all memos in MS Word, separate from the Atlas-ti program.

The purpose of memoing is to record ideas while working with the data. This can happen at any moment: while waiting for the next interview, while transcribing an interview, while coding, and so on. Memos materialized as handwritten pages in the field diary, as MS word files, as Atlas-ti files, and as post-its. In an effort not to lose track of them, they were all typed, printed and stored in folders, meant for the analysis of individual cases and cross-case analysis. It is advisable to decide on a management system for memos early in the research process, to prevent inefficiency.

The most difficult problem concerning the auditability of the final chapters was data overload. The intention was to present rich data, but if it becomes too rich, it is indigestible for the reader. The researcher can deal with more detail than the average reader, having been acquainted with the companies for several years. The fact that case descriptions take up around 30 pages is a bad sign. Hopefully, the clear classification of chapters and sections allows for selective reading without losing the main storyline.

2.5.8 Consequences of the method for the conclusions

How valuable was the method used for answering the research questions? Originally, there were three questions, and after data collection, a fourth question was split off from the third, because strategy and operations could be clearly discerned as different things in the data. The question on the network was expanded, because in the grounded analysis other influencing factors emerged.

- What perceptions do people within Dutch water companies have of the concept of sustainability?
- How is this influenced by network partners, and what other factors influence their perceptions of sustainability?
- How are the perceptions of sustainability woven into the company strategy?
- To what activities does this lead?

The method worked especially well in answering the first question. It showed how companies perceive such a concept within their own cultural frameworks, and apply it to their own, present situations. The data were saturated and could be transformed into rich and reliable descriptions.

On the second question, many valuable insights surfaced, for example, what the networks of the water companies generally look like, and what strategies the companies use in dealing with their network partners. However, the data on how sustainability was perceived within each of these network partners were far from saturated. The main reason for this was that only one respondent was interviewed within each of these organizations, or sometimes two. Therefore, comparisons between the water companies' views and the other organizations' views were sometimes hard to make.

The data on the company strategies were again saturated, and the interplay between perceptions of sustainability and strategic goals came out well. The strategies were sometimes hard to describe, because they were continuously revised by the companies. A process of about ten years was described in this dissertation, so what was *the* strategy? The CEO speech of six months ago, the strategy document of one year ago, or the overall picture that emerged from the decisions made in the period between 1990 and 2000? And what if a company did not even use the word 'strategy' (PWN)? Nevertheless, the strategies were constructed and condensed into pictures. In the validation process, the respondents hardly commented on these pictures.

The fourth question emerged from the data. When questions were asked about sustainability, many respondents started to talk about activities, instead of conceptual ideas. I could have ignored these data as beside the point, because I was looking for verbal descriptions of the meaning of sustainability. However, the meaning of a concept does not have to be in words, it can also be in deeds. This was especially true in the companies researched, because they are action - and technology - oriented. Therefore, I tried to make sense of these data, which gave valuable extra insights into the company strategies. It is likely that the lists of activities are not complete, as the data were collected in a less structured way than the data on the former three questions.