Swedish University of Agricultural Sciences
Department of Urban and Rural Development

Master thesis, 15hp
Environmental Communication

# Human Interaction in the Swedish Biogas Sector: An Arena for Change

Uppsala 2009

Author: Steven Smith

# Information


| | |
|---|---|
| **University:** | Sveriges Lantbruksuniversitet, SLU<br>Swedish University of Agricultural Sciences |
| **Department:** | Department of Urban and Rural Development |
| **Program:** | Environmental Communication and Management |
| **Author:** | Steven Smith |
| **Title:** | Human Interaction in the Swedish Biogas Sector: An Arena for Change |
| **Key words:** | *interaction, biogas, symbols, environmental communication* |
| **Mentor:** | Lars Hallgren, SLU, Department of Urban and Rural Development |
| **Examiner:** | Hans Hansen, SLU, Department of Urban and Rural Development |
| **Examiner:** | Lotten Westberg, SLU, Department of Urban and Rural Development |
| **Course:** | Practice and Thesis Work in Environmental Communication and Management |
| **Course code:** | EX0409 |
| **Level:** | Advanced, level D |
| **Credits:** | 15 hp |
| **City:** | Uppsala |
| **Year:** | **2009** |

***Acknowledgements***

I would like to express my gratitude to Kalle and Lars. It has been an excellent opportunity and experience to work and learn with you both throughout this project.

***Abstract:***

The aim of this thesis is to investigate the role of human interaction in defining, shaping, and continuously re-shaping interpretations towards the biogas phenomenon in Sweden. This investigation was conducted via two forms of inquiry. First, a theoretical inquiry was conducted which was grounded in the principles of symbolic interactionism. The purpose of this inquiry was to create a theoretical framework that can be applied to better understand the phenomenon of human interaction. Second, an empirical inquiry was conducted based on participatory research that involved direct interaction with actors working within the Swedish biogas context. The empirical inquiry provided the opportunity to present concrete, tangible results regarding the role of human interaction in the biogas sector, and was based on my own direct participation in the Swedish biogas-context. This theoretical-empirical framework (created through the two forms of inquiry) was established through a somewhat interdependent process; that is, the underlying theoretical framework was used as a reference point from which to conduct the empirical inquiry, while the theory itself was derived with empirical results and observations in mind. As such, each form of inquiry served to support and complement the other.

A main component of both inquiries was to investigate the role symbols play during interaction. Key symbols that were observed during biogas-related interaction were outlined and discussed. A discussion was also provided regarding the role these symbols played in facilitating shared meaning and cooperation amongst the actors, as well as their role in learning, perspective change and knowledge creation. To complement these empirical observations, a personal account of how direct interaction in the Swedish biogas sector has shifted my own perspective towards the biogas phenomenon was also provided.

***Introduction:***

In retrospect, my investigation into the phenomenon of biogas actually began quite some time ago – long before setting foot on Swedish soil or beginning the work for this thesis. However, during the majority of this time I was relatively unaware of my actions or at least did not have the ability (or perhaps, the desire) to critically reflect upon this investigative pursuit. In fact, it can be said that my investigation began the moment I became aware of the term *biogas*. I would be guessing if I tried to associate a specific date and time with when I first became aware of the concept, however, metaphorically speaking, my interaction with the biogas phenomenon has been somewhat of an ongoing relationship which, at times (like now, for example), is relatively all-consuming, and others, comparable to a fleeting 'hello' when crossing paths with an acquaintance on the street.

Chances are that you have heard the term *biogas* yourself – perhaps you have also been engaged in the issue – however, it may be fruitful at this stage to provide a definition for reference purposes. If you are not familiar with the concept of biogas, perhaps this will mark the beginning of your own inquiry into the subject. The Swedish Gas Centre, the Swedish Gas Association, and the Swedish Biogas Association, in their handbook titled "*Biogas from Manure and Waste Products – Swedish Case Studies" (2008; p. 99),* describe biogas in the following manner:

> *"Biogas is produced when organic material (manure, food wastes, plants, sewage sludge etc.) is decomposed by microorganisms in an oxygen-free environment. Biogas mainly consists of methane and carbon dioxide, but also contains small amounts of hydrogen sulphide and ammonia. Biogas is continuously produced in natural environments such as the stomach of cows and other ruminants, in marshes and bogs and in lake sediments. The active microorganisms in the biogas process can be controlled using bio-engineering techniques to produce renewable energy from wastes in the form of methane."*

After a more intense focus on the biogas issue through this thesis, however, I have begun to question my view towards the topic. In particular I have been led to wonder: *is my personal representation of biogas an accurate depiction of the phenomenon?* I have also began to question how this interpretation of biogas has evolved – that is, from what basis have I been constituting the issue, and how and why has it been shaped and continuously re-shaped over time? Before delving deeper into such issues, I ask that you pose yourself the same (or similar) questions regarding an environmental issue that you are interested in (biogas or otherwise). I also ask that you take a few minutes to reflect on the thoughts and answers that come to mind when asking yourself these questions. While the focus of this thesis is on presenting my personal investigation regarding the biogas phenomenon, I am hoping that the work described here may also aid you in realizing a better understanding of the constitution of your own interpretations regarding environmental issues.

***Biogas in Sweden – The Construction of a Personal Perspective***

Since the exact moment that I became interested in biogas is relatively unclear, allow me to choose a time when I consciously remember myself becoming more keenly aware of my engagement with the issue. This occurred while I was working in the environmental engineering consulting field in Canada. I had become slightly more familiar with the technical side of biogas production through my work within the wastewater treatment sector, and, while I was not working directly in biogas-related projects, aspects pertaining to biogas periodically showed themselves in the course of my work. As such, while it is impossible to convey precisely how I perceived the biogas issue at the time (since I am reflecting upon this now), I can remember finding myself being drawn more and more to the issue; and, in particular, the media surrounding the topic. I recall reading glorifying quotes and comments in the news, and beginning to develop a feeling of enthrallment towards the issue.

*The cleanest fuel on the market. Part of the bio-cycle of life. Waste-to-Energy* (or even, the somewhat more crude depiction of *Excrement-to-Energy). Freedom from oil*. Even symbolic images of the creations of science fiction, such as Mr. Fusion and the Delorean – a fictitious car fueled by household garbage in the 1980's movie-series "*Back to the Future*" – would comically pop into my mind. And while I was relatively-aware of the oft-used rose-colored lens of the media – and fictitious, sci-fi creations aside – the fact of the matter still remained clear to me: *it was possible to produce renewable energy from waste*. At the time it seemed so simple; it appeared that you couldn't lose with biogas. Whether I took an environmental, social, or economic perspective on the matter, biogas appeared to be a winning ticket. I also clearly remember thinking that one country had already cashed in heartily on the prize –

Canada's arctic neighbor: Sweden.

I remember reading the Swedish success stories in the news and being left wondering why Canada was so far behind in our own development of biogas projects: particularly with respect to the use of biogas as a source for vehicle fuel production. Take, for example, the following quotes from an article written by David Wiles (2006), editor of *Sweden Today* magazine, regarding biogas production and the increased use of biofuels in the transportation industry:

> *"Swedes could soon be filling their cars with smuggled alcohol and animal remains. It is all part of a plan by the Swedish government to wean the country off oil within 15 years and thereby become the world's first oil-free country....[t]oday almost 40,000 – or one per cent – of the four million cars on Swedish roads run on alternative fuels. Last year sales were up 168 per cent. By the end of the year green cars are expected to account for about 20 per cent of new car sales.....[w]ith this level of engagement among the public, determination within the government and a fair dose of ingenuity, Sweden may yet prove that there is life after oil.*

Other articles highlighted similar characteristics of the biogas issue. Not only cars, but buses and trains were also being powered by biogas. Industry was being powered by biogas. Closed-loop heating and electrical systems were being successfully employed, with biogas powering the infrastructure, and resulting in no requirement of external energy input. Biogas was even being sold to the Swedish energy companies and was being incorporated into the local power grid. These depictions of the biogas phenomenon in Sweden were quite amazing – and these are but a few of the many positive aspects that I came across. From the perspective presented in such commentary, it appeared to be clear that biogas was a powerful solution to the pending energy-crisis. I mean, the prospect of a country becoming completely independent of oil? That certainly would be an incredible environmental accomplishment.

All said, it truly was an eye-opening and inspirational experience to read such articles – and is likely one of the original motivating factors as to why I have come to produce this investigation. In retrospect, regarding my previous interpretation, what I have begun to question now is the 'spectacles' I was wearing when interpreting biogas in Sweden; that is, my own 'filter' I was using to engage and interpret the issue, and how I chose to develop knowledge on the topic. More specifically, I have come to realize that my former interpretation of biogas was relatively limited due to the fact that such articles (and consequently my own perspective) tended to have a predominant focus on the positive *results* of biogas technology, rather than the *process* involved in the realization of these incredible environmental achievements. I was so fascinated with *what* had been achieved in Sweden – and, perhaps, with producing glorified thoughts of potential personal opportunities – that I was disregarding *how* these results were achieved. To use a familiar metaphorical expression, I was *putting the cart before the horse*. That is, I was so caught up in focusing on the benefits produced by biogas technology that I was overlooking the most critical component in the realization of any biogas-related endeavor: *human interaction*.

Without human interaction, individuals in Sweden would most certainly not have realized the benefits of biogas production. Nor would have (or will) the rest of world, as even the most innovative, failsafe biogas-related technologies would surely fail to produce positive results in

its absence. In fact, I believe it is safe to say that without human interaction, the phenomenon of biogas (as we know it and define it) would not and could not exist. Building on this discussion, in more general terms, I believe that it is through human interaction that all issues (environmental or otherwise) are constituted by individuals. That is, interaction is the means by which individuals come to create, define, shape, and re-shape their perspective, understanding, and interpretation towards an issue or phenomenon. I also believe that human interaction can be seen as the arena in which we decide our actions towards any particular issue; it is the key decision-making tool by which issues are resolved, disregarded, or never even identified. With these notions in mind, I ask that you think back to several of your own experiences – perhaps when you tackled a difficult problem, learned something new, or even suffered some sort of failure. I would expect that in each of those instances human interaction lies at the core. When broken down in these terms, the Swedish biogas phenomenon is no different.

All said, upon reflection of the importance of human interaction, this realization has led me to question my own interpretation of the biogas issue; that is, how could my perception be an accurate depiction of the Swedish biogas sector when I, myself, had not actively interacted with individuals directly involved in the phenomenon?

To conclude this discussion, in light of the relationship between biogas and an increasing desire to detach ourselves from the use of fossil fuels, I will draw a comparison to a statement made by Daniel Yergin (1992) in *The Prize*, his Pulitzer Prize-winning book on the history of the oil-industry. Yergin explains that: "[t]oday we are so dependent on oil, and oil is so embedded in our daily doings, that we hardly stop to comprehend its pervasive significance" (p. 14). Can the same not be said about human interaction? Building upon Yergin's quote from my own perspective, I believe that it is even more amazing to try to understand the pervasive significance of interaction – nothing is more embedded in human culture and society. And whether we are focusing on the biogas phenomenon or otherwise, our dependency on human interaction cannot be understated.

## ***Aim***

Building on the above discussion, the aim of this thesis is to investigate the role of human interaction in defining, shaping, and continuously re-shaping interpretations towards the biogas phenomenon in Sweden. More specifically, this study will investigate the role of human interaction in the Swedish biogas-context in a two-fold manner. First, in order to develop the underlying theoretical perspective I have applied in this investigation, I will investigate and discuss (in theoretical terms) what I perceive to be three central questions associated with human interaction. These questions include: (i) how does interaction occur?, (ii) why does interaction occur (or, what are the preconditions of interaction?), and (iii) what results from interaction? Second, building upon this theoretical framework, this study will present the empirical results I have obtained while testing this theoretical perspective "in-action" while interacting directly with actors in the biogas sector. These results will be presented based on concrete observations I have made while conducting participatory research within the Swedish biogas-context, as well as by presenting an account of how this interaction has re-shaped my own interpretation of the biogas phenomenon in Sweden.

This theoretical-empirical framework (created through the two forms of investigation) was established through a somewhat interdependent process; that is, the underlying theoretical framework was used as a reference point from which to conduct the empirical inquiry, while the theory itself was derived with empirical results and observations in mind. As such, each form of inquiry served to support and complement the other.

Before proceeding it should be stated that, while I find the technical aspects of the biogas phenomenon extremely interesting, the focus of this study will be less on *content* and more on the *process of interaction* within the biogas-context. It is also important to emphasize that this investigation is simply one frame of reference regarding interaction within the biogas-context and is based on a limited set of observations and participatory research. As such, while the discussion provided in this thesis may prove useful in developing a more keen sense of understanding of the importance of interaction within the biogas issue – and hopefully environmental issues, in general – the intent is not normative in nature; you will not find a specific set of 'rules' to apply in better understanding human interaction, communication, and/or a specified 'plan' for applying such knowledge to produce a particular set of results. I am hoping, however, that this thesis will help facilitate your development of a heightened sense of how human interaction shapes the biogas phenomenon and other environmental issues.

***Methodology***

Generally speaking, the methodology employed in my work was qualitative in nature and was carried out through participatory observation and semi-structured interviewing. The underlying premise I was following with regards to my method was quite clear at all times to me during the study: in order to understand *interaction* it is of utmost importance to *interact*. That is, in order for me to gain clarity on how, why, and what results from human interaction in the biogas-context in Sweden I must actively participate in the interaction process itself.

This interaction within the Swedish biogas sector was facilitated by an individual who, for confidentiality purposes, is referred to in this paper as “AB”. AB is an advisor who is actively involved in a multitude of different engagements within the biogas field – ranging from providing advisory services to farmers considering the implementation of on-site biogas production on their farms, to aiding in the organization and development of collaborative networks of individuals working towards developing large-scale biogas research and development projects in Sweden. It should also be noted that AB's role is not necessarily to *promote* biogas; but rather to provide independent, neutral advisory services based on a case-specific analysis of biogas-project feasibility and potential opportunities. This follows along the lines of the independent nature of the organization AB is affiliated with, which presents itself as being completely independent of institutional establishments within the commercial, religious, and political sectors. As such, I was fortunate to have the opportunity to work alongside AB, as this participation enabled me to gain a more concrete perspective of biogas in Sweden what I perceive to be a more holistic and relatively unbiased manner.

Through the help of AB, I was able to observe four separate meetings between AB and various

actors in the biogas sector. A (very) brief description of my interpretation of the purpose of each meeting follows:

> Meeting #1 – Business to Business Marketing. *A German company organized a meeting with AB in order to discuss potential partnership options for expansion into the Swedish biogas market. Three actors representing this organization were present at the meeting.*
>
> Meeting #2 – Advising in the Agricultural Sector. *AB met with the owners of a large-scale pig-farming operation to discuss on-site biogas production potential, feasibility of potential local biogas production projects, and other general inquiries. Two actors from the farm were present at the meeting.*
>
> Meeting #3 – Building Partnerships for Biogas Research. *AB met with a senior researcher at a Swedish university in order to discuss status of existing proposals and future plans for potential research partnerships with several Russian organizations. One actor from the university was at the meeting.*
>
> Meeting #4 – Procurement Process for a New Biogas Reactor. *AB met with a senior researcher at a Swedish university to develop and progress plans for procuring a new biogas reactor (to be used for research purposes by the university). One actor from the university was present at the meeting.*

While the meetings were conducted predominantly in Swedish (and I am an English speaker), I chose to participate as, although the language resulted in personal difficulties understanding specific content, my interaction during the meetings was still conducive to personal-learning. That is, I found myself able to more easily focus on the communication- and interaction-processes that were occurring without getting overly caught up in the technical content. In addition, this situation may have resulted in a greater opportunity for personal reflection during the meetings.

That being said, in order to complement my observations and gain greater insight into the interaction that occurred during each of the meetings, it should be noted that following each meeting I held an informal discussion (or semi-structured interview) with AB. At this time I was able to ask questions and create an opportunity for open-dialogue and joint-reflection with AB (regarding the meeting process and content). It should also be noted that, when deciding on the methodology for this study, I felt that by working closely with AB (rather than conducting interviews with many different actors, for example) it was possible to develop a more comfortable working relationship – resulting in a higher amount of open-discussion, informal dialogue, and personal interaction regarding the biogas issue.

***Theoretical Framework***

As I have already mentioned, the discussion in this investigation provides just one frame of reference – or *perspective* – regarding the biogas phenomenon in Sweden. It is not the whole truth of the matter – not even close – but it does present what I see as a unique view on the

subject. In a similar light, the theoretical framework from which I have based my research is also just one perspective that is useful in investigating how and why interaction occurs in the biogas sector in Sweden, and what results from this interaction.

Theoretically speaking, from my perspective, it can be stated that human interaction is always dictated by human action. That is, in a most basic-sense, human action is at the root of all forms of human interaction; be it in the form of *overt* physical action, or *covert* cognitive action. In either case, in order to better understand action – and interaction – it is essential to try to first understand *how* and *why* the human being acts. As such, when trying to understand interaction in the biogas phenomenon – as well as how we develop our own interpretations or perspectives – we must try to better understand human action as it occurs in-context.

One theoretical framework – or, better, sociological perspective – which helps to understand human action and capture the essence of the human being, is the theory of *symbolic interactionism*. The main reason why I believe symbolic interactionism is more applicable then many other sociological perspectives in understanding human action is that it focuses on the *immediate* or the *present*. As discussed by Joel Charon (2007; p. 42), symbolic interactionism regards the human being as "active in the environment; an organism that interacts with others and with self; a dynamic being; a being that defines immediate situations according to perspectives developed and altered in on-going social interactions". Building on this, as discussed by Herbert Blumer (1969), "human action is built up through a process of self-indication" (p. 96). This process occurs iteratively, constantly, and continuously, in all interactive situations and "is not a release of an already organized tendency.... [but rather] is constituted by a flow of self interaction in which the individual indicates various things and objects to himself, defines them, judges them, selects from among them, pieces together his selections, and thereby organizes himself to act" (p. 94).

Thus, it can be seen how important each and every interaction is that occurs within the biogas-context; as all will have some form of impact on human action, and consequently, the biogas issue itself. And, as such, I believe we can learn a great deal about the biogas phenomenon by observing how individuals act during interaction (myself included) while *in-the-moment* when discussing the biogas issue. This leads me to the next important theoretical question in this inquiry. If human action dictates interaction,then how does self-indication and human action occur, and how can it be observed? Again, applying the perspective of symbolic interactionism, it can be theorized that the most forms of human action occur through *symbolic communication*.

Charon (2007) defines symbols as 'social objects': they are created socially and used in many different situations in many different ways, and they are understood by the users. Symbols are meaningful – we know when to use them, why we are using them, and have particular set of assumptions or expectations as to how they will be interpreted by others. Charon describes that "symbols allow us to share understanding, to tell others what we think, what we know, what we are, what we intend, what we feel" (p. 50), as well as that "symbols are also used to communicate to ourselves, to think with, to converse about ourselves and about objects in our environment" (p. 50). Building on this, Turner & Spencer (1997), who have conducted research into the development of a more keen understanding of the role of symbols in

organizational culture, note that "[s]hared symbolic systems are an inherent outcome of the communications involved in the social interaction of human beings. These shared symbols allow for the continued interaction of individuals without the need constantly to renegotiate meaning" (p. 3). I believe this statement applies well to the biogas-sector, as from my perspective, if we are to take a overarching view of all actors involved in the biogas issue, the group can be viewed as a form of organizational culture in itself. In essence, under the majority of circumstances symbols are the tools which facilitate human action. As such, when studying interaction in the biogas context, I believe it to be imperative that we focus on developing a higher-level of awareness as to how symbols are used during interaction, as well as what the intended meaning of such symbols.

At this stage, in order to support my choice of theoretical framework, it may be useful to draw a more concrete parallel between the theory of symbolic interactionism and the biogas phenomenon. One relatively new discipline that I believe establishes this connection is the phenomenon of *environmental communication.* And while several definitions exist for this phenomenon, I will present the definition outlined by Robert Cox (2006), one of the most renown scholars in this field. Cox explains that environmental communication is:

> *"[T]he pragmatic and constitutive vehicle for our understanding of the environment as well as our relationships to the natural world; it is the symbolic medium that we use in constructing environmental problems and negotiating society's different responses to them."(p. 12)*

Cox defines environmental communication as a form of *symbolic action.* That is, that "language and symbols do more than transmit information: *they actively shape our understanding, create meaning, and orient us to a wider world"* (2006; p. 12). From this explanation, it is clear that Cox has incorporated the same principles of symbolic interactionism into his definition of environmental communication. From my perspective, Cox is implying *how* environmental communication occurs: through the use of symbols. Cox also describes that environmental communication serves two different functions: it is *pragmatic* and *constitutive*. When considering the aim of this thesis, these are two key phenomena in building upon this theoretical framework. In particular, these two phenomena are key to understanding *why* interaction occurs, and *what results* from interaction.

The first question then, is *why* interaction occurs; or more specifically, why human action occurs and particular symbols are used to communicate. In theoretical terms, I believe – and it can be inferred that Cox also believes – that this question is best-answered through the sociological theory of *pragmatism*. To help motivate and justify this claim, I will drawn from the work of Charon (2007; p. 31 – 32), who outlines that pragmatism is a key part of symbolic interactionism and is grounded in four central concepts, including:

i. "humans do not respond to their environment; instead, they almost always interpret their environment...[t]he world does not tell us what it is; we actively reach out and understand it and decide what to do with it";
ii. "humans believe something according to its usefulness in situations that they encounter...[k]nowledge is learned, remembered, and believed in relation to our

ability to successfully apply it";

iii. humans "are selective in what we notice in every situation...[o]bjects that we notice are defined by us according to their usefulness"; and,
iv. understanding humans should be done so by observing and understanding human action as it occurs in the *present*; "[i]t is not personality, past events, a trait or quality that is central, but what actors are doing in their situation".

Thus, if we use the first three principles (above) as a theoretical guideline, it is clear that an actor's choice of symbols used to interpret – and subsequently act out – during a situation are dictated by the following: active interpretation of the situation in-the-moment; the actor's previous experience, understanding, knowledge, and beliefs regarding the situation (and/or issue); and, a selective focus pertaining to particular objects of interest in the situation. Based on this theory it is clear that all acts made by the actor are *purposeful*. Therefore, by observing the use of symbols during interaction we can have a better understanding of how the situation is being defined by the actor; the actor's knowledge and experience regarding the issue; and what the actor defines as important. In essence, when considering the biogas phenomenon, we can begin to understand *why* the actor is choosing to interact with the issue and how the actor's perspective towards the issue is changing throughout the interaction. The fourth principle described by Charon again reinforces the need to observe interaction 'in-action' in order to truly understand human action; and, with regard to this investigation, to better understand the social-phenomenon of biogas in Sweden.

The next question of this theoretical investigation seeks to better understand the results of interaction in the biogas sector – or Cox's explanation that environmental communication is constitutive. From my perspective, the results of interaction (and constitution of an issue) can be summarized by presenting three mutually-occurring phenomena: *learning, perspective change, and knowledge creation*. From a theoretical point of view, each of these results occur in a somewhat interdependent manner and are facilitated through symbolic interaction. As discussed by Charon (2007; p. 113), learning takes place primarily through "taking the role of the other" during symbolic interaction; that is, "we do not simply react to words or acts of others; we also try to get into their heads and try to understand their words from their perspective". Linell (2005) builds on this view in his theory of dialogism, stating that "it is the disruptive influences of the other which introduce tensions; the other brings in extra ('surplus') knowledge other than you had before or you had expected to encounter; she may see things from points of view that are so far strange and unfamiliar to your self, which forces you to reflect and try to understand, thereby possibly enriching your (and our) knowledge" (p. 24). Through interaction and the use of symbols we come to learn, to know, and to remember. This is highlighted by Säljö (2002), another scholar focusing on communication and human learning, who states that "[r]emembering is something that people do in social life, it is not an automatic outcome of an inner, biological system that can be described as such" (p. 401).

I believe, that it is through these phenomena that the successes of biogas have been realized. Creativity and progress are spawned through interaction and our exposure to new perspectives; or as put by Linell (2005), "[t]he differences in perspectives, the asymmetries inherent in alterity relations, are important for the creativity in social life. If we want to acquire something new and productive from our participation in discourse, we must actively struggle with the

other's strange contributions" (p. 24). That is, we must be able to develop a shared symbolic meaning between ourself and others.

Thus, when observing interaction, it important to try to observe the phenomena of perspective change and shared meaning, as these phenomena are what I perceive to be clear indicators that some form of learning and knowledge creation has taken place. Tying this discussion back to the biogas issue, as well as Cox's definition of environmental communication, we can see that it is through a continuous process of learning, perspective change, shared meaning, and knowledge creation – resulting from symbolic interactionism within the biogas-context – that the biogas phenomenon is defined, shaped, and iteratively re-shaped. In essence, as I perceive it, these phenomena are the manner by which the biogas-issue is *constituted.*

The purpose of the above theoretical discussion was provided to serve as a basis for discussion of my empirical results. The theory I have outlined provides insight into what I was looking for while conducting my participatory research (but was also shaped based on my empirical results). To summarize this discussion, when considering *how* interaction occurs, it can be stated that it is dictated by human action occurring through symbolic communication; when considering *why* interaction occurs, pragmatism can be theorized as the underlying reason; and when considering *what results* from interaction, I am suggesting that shared meaning is developed and changes in perspective can occur, both of which are key indicators that some form of learning and knowledge creation has taken place. The focus of the following empirical discussion and interpretation will be based on observations made with respect to these three phenomena.

***Empirical Discussion and Interpretations***

As stated earlier, the basis for the discussion is grounded within two distinct means in which observation occurred: (i) via observing the overt action of others during social interaction, and (ii) recognizing and reflecting upon my actions (both overt and covert) and personal perspective change that occurred as a result of interaction with others and self. These empirical results will be presented – be it in a somewhat implicit manner – according to the three key phenomena I have defined through my aim and theoretical investigation (above), including: (i) the actor's choice of symbols (and my perception of their intended purpose or meaning) during biogas-related discourse; (ii) signs of pragmatism with regards to why actors selected and used these symbols; and, (iii) key perspective changes (both personal and with regards to others) resulting from symbolic interaction that I have observed during my empirical research. I ask that you keep these key phenomena in mind during the following discussion.

It should be re-stated at this point that the the meetings that I participated in were conducted predominantly in Swedish. Being an English speaker (who is currently in the process of learning Swedish), this resulted in personal difficulties with regards observing specific words used within the discourse (and at times, some feelings of exclusion or social discomfort). However, upon reflection I believe I may have gained more of an 'overall' perspective in my observations than I may have if I had been exposed to the extensive array of technical content associated with biogas projects. In retrospect, I now believe that this language 'barrier' ultimately allowed me to discern a somewhat more unique perspective from which to observe

the symbolic usage of language in the biogas sector. In fact, what I originally perceived as a limitation to my research may have allowed me to more easily separate my interest in the biogas content and focus on my interest in understanding human interaction during the meetings. In should be noted, however, in order to be somewhat more thorough in my research, particulars regarding meeting-content were confirmed though informal discussion and semi-structured interviewing with AB immediately following each meeting.

During my participatory research, it was clear that actors within the biogas culture often used a common set of symbols in an effort to establish and maintain shared meaning towards the biogas issue at hand. Based on my observations – and, perhaps, as we would expect – no symbols proved more important in the facilitation of shared meaning than the actor's choices to apply a particular language. The importance of language as a symbol cannot be over-emphasized. As discussed by Joyce Hertzler (1965) (as quoted in Charon (2007; p. 53)), "[t]he *key and basic symbolism of [human beings] is language*. All other symbolic systems can be interpreted only by means of language". As such, it can be stated that language is the symbolic root at the core of all socially created phenomena; the biogas phenomenon is no exception to this fact. And while I was dealing with the Swedish-English language barrier, what was interesting to note that I was still able to observe two relatively distinct forms of symbolic language which were applied during interaction. This included: (i) a 'biogas-specific' language, and (ii) a 'common' language. And while it is difficult to draw such fixed boundaries in the language (as often the two overlapped in their application during interaction), I perceive this as a useful separation as each appeared to have its own particular pragmatic functions and results.

To elaborate, when using the term 'biogas-specific' language, I am referring to a specific form of symbolic discourse that I observed that appears to be some form of standardized – or 'expert' – technical language used by biogas-professionals. Interaction in this form occurred via a specific set of technical vocabulary and terminology. For example, in Meeting #2 AB and the two farmers discussed conceptual details pertaining to biogas production opportunities based on the available substrate (organic waste) produced on the farm. Numerical calculations were carried out, the results were discussed, and conceptual biogas production and delivery options were highlighted. This shared meaning would have not been possible if the actors were not familiar with the symbols comprising this technical language. From my observations, this form of language appeared to serve a unique symbolic purpose during the meetings in that it, at times: conveyed (and/or 'proved') an actor's knowledge and previous experience pertaining specifically to the biogas issue at hand; established (and/or reinforced) actor prestige or credibility; created shifts of power amongst actors; facilitated actor inclusion or exclusion in the dialogue; and expedited the communication of complex biogas concepts.

On the other hand, interaction during the meetings also occurred via a more 'common' symbolic language. This form of interaction will be defined here as all other forms of symbolic language outside the 'biogas-specific' form I have discussed above. This 'common' language included both verbal (words) and non-verbal symbols (such as gestures, posture, etc.). For example, before Meeting #3, and #4 (and at the end of Meeting #2) a short symbolic ritual called a *fika (*which included coffee/snacks, introductions, and informal discussion) was attended by all actors involved in the meeting. Another example of a symbolic act within this

form of symbolic interaction is writing or note-taking. Most often when note-taking, we are displaying that we find a symbol that has been conveyed (or a perspective that has been shared) to be useful or purposeful to us – take, for example, the notes I recorded during my observations in order to write this paper. 'Common' language such as this, when used during interaction in the meetings I have observed, appeared to serve a symbolic function in that it, at times: controlled the 'atmosphere' of the interaction; promoted story-telling amongst the actors; and created a more concrete sense of progress in the meetings.

If we assume that some form of cooperation (or collaboration) is the principle goal of most interactive endeavors within the biogas sector, what I have found in my observations is that if a sense of shared meaning was achieved for both of these forms of symbolic interaction there was a greater potential for the development of trust and strong working relationships between the actors. In addition, the ability to develop shared meaning also produced a higher likelihood for diverse and creative ideas and thoughts. On the contrary, if there was a failure to develop shared meaning in one (or both) of these symbolic forms of language, then the ability to produce positive working relationships decreased. As such, both forms of language that I have identified have proven to be powerful symbolic components in facilitating positive progress and results from interaction, and consequently, biogas-project progress and results. I will build upon this discussion in the following sections.

A lack of shared meaning regarding the 'biogas-specific' symbolic language occurred in Meeting #1. Often during the meeting, I observed misinterpretations with respect to the technical aspects of the biogas and energy market in Sweden, as well regarding specific technical details of operating a biogas reactor in Northern European countries. AB had to repeatedly correct these misunderstandings. During my follow-up discussion (or interview) with AB after the meeting, AB expressed a feeling that his expectations were not met regarding the technical knowledge conveyed by actors from the German organization; that is, AB indicated that he had felt that "*they would know more than they did*". From my perspective as observer, it appeared that the German organization's lack of expertise with regard to the biogas-specific symbolic language resulted in a decrease of their credibility in the situation.

There were indications of a lack of shared meaning with regard to the 'common' social symbolic language during Meeting #1 as well. While I perceived the social atmosphere during the meeting to be predominantly comfortable – with many smiles, light joking, a willingness to take the perspective of the other (through nodding, confirmation), and open-dialogue – there was some unclarity regarding the intentions behind the social symbols used in the during the situation. For example, while the German organization had initiated the meeting, the actors did not lead or facilitate the meeting in any concrete sense: AB initiated the introductions, the organization presented no formal agenda, and the purposes and expectations that the organization had with respect to the meeting (and the future) only became clear as AB asked them questions and requested clarifications. AB indicated to me after the meeting that he had expected that the organization would take on a stronger facilitation role in the meeting as they were the ones who had initiated it. This ongoing need to renegotiate meaning of the 'common' or social symbols being used during the interaction resulted in AB describing a feeling (following the meeting) that the engagement appeared to be somewhat 'immature'. In addition, I observed that AB took little in the way of notes pertaining to the dialogue; nor was there any

concrete plans made for future collaboration. From these actions, it may be inferred that this was a result of a lack of shared symbolic meaning during the meeting as well: perhaps AB felt that what the actors were saying was not meaningful?; or, perhaps, there was a feeling that it was unnecessary to document progress in the meeting?

Ultimately, because such a considerable amount of time was spent trying to establish shared meaning with regards to the symbols being used (both biogas-specific and common social symbols), there appeared to be lower feeling of usefulness tied to the interaction; both during the meeting and afterwards. This was apparent when AB indicated to me afterwards that (during the meeting) there was a feeling that the actors representing the organization appeared to be somewhat unprofessional and lacking confidence regarding their work (at least within the context of the meeting). Thus, this inability for each party to develop a shared social meaning (of both the biogas-specific and common social symbols) led to what I have perceived to be a decrease in the likelihood of the formation of a cooperative effort between the two parties. In this case, due to the inability to find shared meaning through symbolic usage, AB appeared to display a perspective change towards the German organization.

During the remaining three meetings, based on my observations and interpretations, there appeared to be a greater ability to develop shared meaning when compared to Meeting #1. For example, following Meeting #2, during our discussion regarding the technical content of the meeting, AB mentioned that it was clear that both actors (representing the farm) "*understood what I was saying*". Based on my observations, this was clear during the interaction, and although I did not interview the other actors, I would assume that they would have indicated that they had the same impression of AB. This was an important part of this interaction as *being understood* is a core pragmatic purpose as to why certain symbols are selected and used, as well with respect to what we wish to achieve during dialogue. In effect, what AB may be stating is that he observed the other actors were actively taking into account his perspective and, perhaps, changing their own to some degree. Because there was a development of shared meaning during the interaction it was likely that the farmers felt the same way regarding AB's actions; and in turn they viewed the interaction as purposeful as well.

Building on this, during Meeting #2, I observed that shared symbolic meaning was facilitated mainly through dialogue (particulary through the use of biogas-specific symbols) – however, other important visual symbols also played a key role in this phenomenon. The farmers referred to maps and diagrams of the farm and local-area, as well as printed spreadsheets and other presentations of in-house calculations. AB utilized a laptop to call upon helpful diagrams and documents. In effect, it appeared that these visual symbols expedited the meaning-making process of the technically complicated biogas-specific symbols. More specifically, such visual symbols helped to facilitate the ability of the actors to develop a shared conceptual representation of a relatively complex issue (i.e. a future biogas generation plant in the local-area). Based on my observations, this ability to develop a shared meaning regarding biogas-specific symbols led to a greater efficiency in meeting progress and, ultimately, biogas project development stemming from the interaction.

From my observations, shared meaning was also established during Meeting #2 with respect to the 'common' social symbols. The meeting was held in the home of one of the farmers, on-site

at the farm. AB began the meeting by providing the plan or agenda for the meeting and outlining the purpose of the interaction. A laptop was used by AB for note-taking purposes and to fill out a question-based form (i.e. to gather preliminary information regarding the farm). A *fika* was held towards the end of the meeting allowing actors to continue discussion over some food and drink. Each of these acts was symbolic and developed a shared sense of the value of time, effort, relationships, cooperation, and progress. For example, the note-taking was symbolic in that it: served as a concrete indicator of progress attained in the meeting; indicated to both AB and the farmers that they had been able to develop a shared meaning towards specific issues; confirmed that their acts had purpose; and, documented perspective changes and knowledge creation during the meeting. The *fika* was another example, which allowed the actors to 'step-away' from the issue, reflect on the interaction, and communicate in a more informal dialogue. Based on my observations, symbols such as these helped to produce an comfortable atmosphere throughout the interaction, and also helped create a shared feeling of mutual-respect. This was demonstrated by individuals giving one another the opportunity to contribute in a relatively equal manner, and by misinterpretations being corrected and confirmed in a quick and non-confrontational manner.

In effect, during Meeting #2 all actors appeared to be “on-the-same-page” with a common goal or purpose. My interpretation was that this became more apparent as the meeting progressed; with the atmosphere becoming more and more relaxed, and the actors speaking freely and openly with each other. From my perception, this atmosphere appeared to help facilitate symbolic acts of “story-telling” amongst the actors – a phenomenon that is seen by some sociologists as a key component in facilitating relationship development and decision-making effectiveness (see Forester, 1999). This importance was duly noted during my observations, where story-telling appeared to be an indicator of trust and relationship development between individuals, as well as a sign of an individual's confidence in the interaction.

Story-telling also enabled the actors to demonstrate their knowledge in a creative manner; in their own unique terms and drawing from personal experiences. For example, AB described the complexities (e.g. technical, economical, political, etc.) associated with biogas production for car-use, as well as the potential opportunity to twin a water-pipe (that is planned for construction to connect a community that is in the proximity of the farm to the Stockholm area) with a biogas delivery pipe; the farmers outlined the potential for using an existing (currently decommissioned) gas-pipe at the local landfill, as well as potential opportunities for collaboration with other local farmers in creating a larger-scale biogas production operation. These stories, as well as the constructive dialogue and use of visual symbols (discussed above) resulted in the ability of actors to exchange ideas and perspectives, and to develop a common creative vision for the biogas-project.

While it is difficult to prove explicitly, my perception was that this purposeful, positive working atmosphere was originally grounded in the ability of the actors to establish shared meaning with regards to the biogas-specific symbols. In many regards, shared meaning towards such symbols appears to be some form of 'gateway' to purposeful communication and interaction within the biogas-context. And while this may appear to be quite obvious – as the predominant precondition of the meeting *was* biogas – as I have shown in Meeting #1, when shared meaning of the biogas-specific symbols cannot be established there is difficulty in

creating purposeful, positive interaction. As a side-note regarding Meeting #2, being an 'outside' observer of the interaction, it was fascinating to see a professional engagement be conducted under such comfortable and informal terms while still producing what appeared to be positive and productive results.

Meeting #3 and #4 had a different social dynamic than the first two meetings that I attended, as it appeared that AB had already established a cooperative relationship with the actor present in each of the meetings. As such, I perceived there to be a greater ease in developing shared meaning with regards to both biogas-specific and common social symbols. Based on my observations, it appeared all actors assumed that this shared meaning to already exist. Upon reflection, it may be inferred that it was likely this shared meaning had already been developed during previous interaction and was an important precondition as to why another meeting was being held (i.e. each actor felt that another meeting would be useful).

Meeting #3 and #4 followed what I perceived to be a similar interactive process. In both meetings focus was mainly on collaboration to complete administrative documents. I will focus on Meeting #4, where much of the interaction was directed towards to the finalization of a "request for quotation" document that was planned to be distributed to consulting/construction companies interested in designing and building the new biogas reactor. AB mentioned to me (during a break in the meeting) that the document presented and considered during the meeting was a "work-in-progress", and had been the result of considerable historical collaboration between himself and the actor representing the university. Visual tools played an important symbolic role in the interaction (similar to as noted in Meeting #2) with respect to facilitating meaning making of biogas-specific symbols: AB utilized a laptop and projector to display the document on a large screen, and AB and the other actor negotiated suitable text within the document on a sentence by sentence basis.

As such, the development of shared meaning was much more highly attached to biogas-specific symbols during the meeting; i.e. both AB and the actor representing the university worked together to make improvements and corrections to the document and produce a product which they both agreed was accurate, purposeful, and meaningful. What was particularly interesting to note, however, was that both actors felt it was necessary to *meet face-to-face* to conduct this work, when it appeared (from my perspective as observer) that this process could have been completed remotely by each actor via electronic means (i.e. email). A similar phenomenon was observed with respect to Meeting #3.

The above-noted observations and results were based on my own experiences while participating in the Swedish biogas sector. At this stage, I believe it is important to re-state that this discussion is but one perspective regarding the interaction that took place and was grounded in my own pre-understanding, interpretations, and definition of what I perceive to be useful (or helpful) observations in understanding the role of interaction with respect to shaping interpretations of the biogas phenomenon. What is fascinating to note is that if the other actors involved in the interaction I observed were asked to prepare a similar inquiry, it is more or less inevitable that they would present an entirely new perspective on the matter.

I believe that it is important that this 'individualistic' component of interaction should be

recognized and acknowledged; that is, while interaction stresses action *between* individuals (i.e. "*inter"*), recognizing the uniqueness of action that occurs *within* individuals (or "*intra"*) is of equally high importance. Due to this individualistic component of interaction, I believe that there must be caution taken in regarding the phenomenon as being normative in nature. And while I view interaction as meaningful, useful, and highly important, there is no concrete method for predicting the results of interaction, nor is there conclusive means of establishing a pre-defined framework (or arena) for guaranteeing purposeful or meaningful interaction. It is important to make this reflection, as my observation-related discussion was not meant to take on a critical stance towards the structure of the interaction, or to suggest areas for improvement; rather, it was meant to serve as a reflective basis for trying to better understand the role of interaction in individual perspective change, learning, and knowledge development. And while I will never know to what extent other individuals experienced such phenomena, my interaction in the biogas sector has certainly led to a significant change in my own interpretation of the issue. I will highlight this shift in the following sections.

***Biogas in Sweden: Reconstruction of a Personal Perspective through Interaction***

While my personal interpretation towards the Swedish biogas phenomenon was without a doubt influenced by my observations during the meetings, I believe the greatest shifts in my perspective towards this issue occurred as a result of my direct interaction with AB. I do believe, however, that both means of interaction were useful. In fact, upon reflection, I now perceive the combination of these two somewhat unique forms of interaction to have complimented each other in a relatively symbiotic manner; each supporting the other and facilitating the development of a favorable setting for personal perspective change and knowledge creation. In brief, I now perceive the meetings to have enabled me to develop a more thorough understanding of the process of interaction and human action in the biogas sector, while my informal discussions and interviews with AB resulted in a greater level of personal perspective changes towards the particulars of the Swedish biogas issue itself. As I have already discussed my observations from the meetings, the following sections provide a (somewhat brief) account of how my perspective has changed towards the Swedish biogas issue itself.

"*It's a long journey from a biogas plant to vehicle gas production"*. My advisor, AB, made this quote during the first meeting that I observed. Upon reflection now, this statement highlights brilliantly – be it in a symbolic, metaphorical manner – how the positive results and benefits witnessed in the Swedish biogas sector are much more than simply the product of an innovative scientific/engineering venture. It is not as simple as *waste-to-energy*; rather, as I perceive it now, these results are realized via an ongoing combination of collective cooperation, relationship building, individual perspective change, and knowledge development. And, from my perspective, this *journey* begins, progresses, and is continuously facilitated through individual action and human interaction. In fact, the constitution of my current interpretation of the biogas issue has been constructed following a similar journey (or process) resulting from my own action and interaction in the Swedish biogas context. Allow me to provide some concrete examples when my own perspective changed as a result of my direct interaction with AB.

During a discussion following the final meeting in which I observed, AB made the comment, when comparing energy production from biogas to other alternatives (e.g. nuclear), that *"we are attached much more so to biogas; it requires motivation; it requires individual action"*. This quote, perhaps more than any other, had a startling impact – both immediate and, I believe, long-term – on my perspective towards the biogas phenomenon in Sweden. When considering this statement, I have come to more acutely realize that biogas is not a stand-alone process that can be initiated and run in a relatively remote-fashion, detached from the public (such as a nuclear power plant, for example). Rather, biogas production (and subsequent energy usage) *depends* on a much more complex network of individuals outside the biogas production facility itself, as the substrate used for energy production stems from organic waste produced at (often) numerous satellite localities (e.g. farms, industry, commercial venues, etc.). As such, AB's statement again reinforced the need for me to view the biogas phenomenon with a core-reference to human action and interaction. Coming back to the quote of David Wiles (2006) that I used as a reference in my introduction to this study, I now perceive that it is not as easy as "filling [our] cars with smuggled alcohol and animal remains". No, it is now clear that this phenomenon is definitely much more complex than that.

Building on this discussion, through my interaction with AB I have come to realize that this dependency on such a complex network of individuals has an inherent set of potential difficulties built within its structural framework. To elaborate, during one of our discussions AB presented me with a clear and concrete representation of where these potential difficulties could stem from when considering biogas as an alternative energy source. He mentioned that *in order to produce the same amount of energy from one nuclear power plant we would need to have thousands of biogas plants operating in unison*. When hearing the word *thousands* it was easy to begin to understand the number of potential difficulties associated with viewing biogas as the answer for the world's energy crisis. Consider it yourself: thousands of reactors, thousands of pipelines, thousands of networks of individuals; all needing to operate in unison to produce the energy created by *one* nuclear reactor. In addition, coming back to our unavoidable *attachment* to the biogas phenomenon (discussed above), AB also asked me to consider the fact that, with thousands of reactors being required, we would then need to rely on (and trust) thousands of farmers and industries in their food production and operations, as well as the ability of the market to maintain thousands of such operations as profitable and lively business opportunities. It is easy to begin to imagine the difficulties associated with such a large network. (Note: before proceeding, it should be mentioned that this discussion is not meant to promote the nuclear industry over the biogas industry; rather, the above-example was provided as a means to more tangibly convey the relatively complicated and complex nature of the biogas phenomenon).

Another interesting shift in perspective that has occurred through my interaction with AB was to discover that biogas was stilled perceived to be in its initial stages in Sweden. AB made the comment that "*in biogas, it's often learning as you go because, as a whole, it is still in its infancy*". This was a stark contrast to my own perspective, as I was under the impression that Sweden was quite advanced in the biogas sector, considering the positive progress that I had been exposed to through the media (as per the discussion in the introduction section of this study). What I have come to realize, however, is that such a comparison is purely a matter of context; based on one's previous -experience, -understanding ,and -interpretation towards the

issue. I now perceive that I must be cautious when making such clear-cut, comparative assertions towards the biogas issue (or otherwise). For example, considering my limited experience within the biogas sector in Canada, was it reasonable for me to draw conclusions on the status of the phenomenon in the country? Perhaps yes, perhaps no – the important aspect, which I have come to realize however, is that I must openly recognize the limitations and bias in my own perspective towards the biogas issue (or any other issue, for that matter). Generally speaking, I have also come to realize that in order to develop a more thorough understanding – or holistic perspective – on any issue, it is necessary to 'test' my own perspective through interaction with others who are actively involved with the issue.

All said, even though the interaction I have had with AB and others was somewhat limited – and considering the Swedish-English language barrier that was apparent at times during my work – I feel as if I have had a much more significant perspective change towards the Swedish biogas phenomenon then I would have had if I had been simply developing my understanding through reading written text and observing visual media. I have come to realize if I want to *know* more about an issue I must interact not only with the issue itself, but perhaps more importantly, with other *people* involved in the issue. That said, I see myself as fortunate to have had this opportunity to interact within the biogas sector here in Sweden, and owe much of the knowledge and experience I have gained to those that I have worked with.

***Conclusions:***

The aim of this thesis was to investigate the role of human interaction in defining, shaping, and continuously re-shaping interpretations towards the biogas phenomenon in Sweden. My efforts to conduct this investigation were two-fold in nature. First, to provide the theoretical framework on which I perceive interaction to be based, and second, to test this theoretical basis "in-action" through direct interaction with actors in the Swedish biogas phenomenon, and present concrete findings from this participatory research. The main source of findings was through direct interaction with my advisor, AB, who is an advisor in the biogas sector, and via observations I made while attending meetings with AB and other actors involved in the biogas phenomenon. Emphasis in this study was placed less on specific biogas-related *content* and more on the *process of interaction* within the biogas-context.

From a theoretical perspective I have shown that human interaction can be viewed as being dictated by human action. I believe that, when trying to understand interaction in the biogas phenomenon – as well as how we develop our own interpretations or perspectives towards the issue – we must try to better understand human action as it occurs in the present and in-context. To summarize my theoretical inquiry, I have shown that, when considering *how* interaction occurs, it can be stated that it is dictated by human action occurring through symbolic communication; when considering *why* interaction occurs, pragmatism can be theorized as the underlying reason; and when considering *what results* from interaction, I have suggested that shared meaning is developed and changes in perspective can occur; both of which are key indicators that some form of learning and knowledge creation has taken place.

Building on this theoretical framework, I have observed that key symbols play an integral role in the interactive process within the biogas sector. Based on my observations, no symbols

proved more important than the actor's choices to apply a particular language. There appeared to be two relatively distinct forms of symbolic language which were applied during interaction. First, a 'biogas-specific' language (consisting mainly of technical vocabulary and concepts), and second, a more 'common' symbolic language (consisting of all verbal and non-verbal symbols outside the biogas-specific language, such as rituals, note-taking, etc.). From my observations, the biogas-specific form of language appeared to serve a unique symbolic purpose during the meetings in that it, at times: conveyed (and/or 'proved') an actor's knowledge and previous experience pertaining specifically to the biogas issue at hand; established (and/or reinforced) actor prestige or credibility; created shifts of power amongst actors; facilitated actor inclusion or exclusion in the dialogue; and expedited the communication of complex biogas concepts. The 'common' language appeared to serve a symbolic function in that it, at times: controlled the 'atmosphere' of the interaction; promoted story-telling amongst the actors; and created a more concrete sense of progress in the meetings.

Based on my observations, if a sense of shared meaning was achieved for both of these forms of symbolic interaction there was a greater potential for the development of trust and cooperation between the actors, as well the proliferation of creative ideas and thoughts. If there was a failure to develop shared meaning in one (or both) of the symbolic forms of language, then the ability to produce positive working relationships decreased. To a certain degree, the development of shared meaning with regards to the biogas-specific symbols appeared be of high importance in achieving cooperation; in many regards it appeared to be some form of preliminary 'gateway' to purposeful communication and interaction between the actors.

From my observations, the symbolic ritual of “story-telling” appeared to indicate a relatively high degree of shared symbolic meaning, trust in the interaction, and relationship development between the actors. Story-telling appeared to enable the actors the ability to demonstrate their knowledge in an innovative, creative manner; in their own unique terms, by drawing from their own personal experiences. This phenomenon appears to be a key component in biogas-project development as it seemed to elucidate creativity of the actors, and provided the chance for the actors to explore opportunities that may otherwise not be expressed or considered. Visual tools (such as maps, books, spreadsheets, overhead-presentations, etc.) were another key symbol used as it appeared that they expedited the meaning-making process towards the technically complicated biogas-specific symbols. More specifically, such visual symbols appeared to help facilitate the ability of the actors to develop a shared conceptual representation of relatively complex issues. Often this led to a greater efficiency in meeting progress and, ultimately, biogas project development stemming from the interaction.

Each of the above-noted symbols I have observed appeared to have a role in shaping the interpretations of the actors involved in the interaction (mine included). It should be noted that this list is far from comprehensive, and is merely a personal interpretation of what I have considered to be key forms of symbolic communication occurring during biogas-related interaction.

On a more personal level, my the role that human interaction played in shaping my current interpretation of the biogas phenomenon in Sweden cannot be understated. Through my

interaction with AB and other actors involved in the biogas issue, I have come to realize that the positive results and benefits witnessed in the Swedish biogas sector are much more than simply the product of an innovative scientific/engineering venture. It is not as simple as *waste-to-energy*; rather, as I perceive it now, these results are realized via an ongoing combination of collective cooperation, relationship building, individual perspective change and knowledge development. Unlike many other energy-production schemes, people are much more *attached* to the biogas phenomenon, as the substrate used for energy production stems from organic waste produced at (often) numerous satellite localities (e.g. farms, industry, commercial venues, etc.). I have also come to realize that this dependency on such a complex network of individuals has an inherent set of potential difficulties built within its structural framework.

All said, it was fascinating to be part of the work in the biogas sector in Sweden – even if it was just for a short period of time. Through this interaction, I have acutely realized that I must openly recognize the limitations and bias in my own perspective towards the biogas issue (or any other issue, for that matter). I have also realized the necessity to continually 'test' my own perspective through interaction with others who are actively involved with the issue. On this note, my interpretation towards the organizational structure of the biogas sector has also changed. Rather than being closed to outside observers (i.e. a student like myself), there was a strong willingness of individuals within the Swedish biogas sector to accommodate such actions. Even with the barriers that I faced in my interactive endeavors (i.e. my inability to communicate in Swedish), AB and the other actors were welcoming and willing to facilitate my engagement with the biogas issue, and provide me with opportunities for learning and personal growth. This is something I will take away from this experience, and something I believe we can all learn from; a 'comfortable professionalism' that strives for participation and inclusion of individuals, facilitating learning and knowledge development.

Building on this realization, I will conclude my work by referencing an interesting statement made by AB. During our discussion following the last meeting that I observed, AB indicated to me that, in the most basic-sense, the underlying "*intention behind all of these meetings is personal learning and growth*". From my point of view, it was refreshing to hear such a perspective – particularly coming from a well-respected professional (or expert) in the biogas sector – as it seemed to place all professional credentials, prestige, and expertise aside and draw a stronger parallel between both our work and ourselves. Simply stated, it can be implied that we both were *interacting to learn*. That is, we were (and are) interacting with other individuals within the biogas-context in order to create opportunities for perspective change, learning, and knowledge development towards the biogas phenomenon. And, coming back to the aim of this study, based on my personal experience in the Swedish biogas sector, I believe it is clear that the role of human interaction in shaping interpretations of the biogas phenomenon is a critical one; it is the forum within which we can communicate most explicitly with the greatest amount of meaning in our actions; it functions to produce concrete action out of intention; and it facilitates perspective change, learning, and knowledge development. In essence, human interaction is – in itself – an arena for change.

***References***


Blumer, Herbert (1969). Symbolic Interactionism – Perspective and Method. University of California Press, Ltd.

Charon, Joel M. (2007). Symbolic Interactionism: An Introduction, An Interpretation, An Integration. 9th Edition. Pearson Prentice Hall.

Cox, Robert (2006). Environmental Communication and the Public Sphere. SAGE publications.

Forester, John (1999). The Deliberative Practitioner. Encouraging Participatory Planning Processes. The MIT Press, US.

Linell, Per. (2007 draft). Essentials of dialogism. Aspects of a dialogical approach to language, communication and cognition. Paper. Department of communication studies. Linköping university.

Säljö, Roger. 2002. My brain is running slow today – the preference for things ontolgies in research and everyday discourses on human thinking. Studies in philosophy and education. Vol 21. 389 – 405.

Swedish Biogas Association, The Swedish Gas Association, & the Swedish Gas Centre (2008). Biogas from manure and waste products – Swedish case studies (Report). Online: http://www.sbgf.info/_filer/Biogasinfo_english.pdf. Date last accessed: May 22, 2009.

Turner, Gregory B., Spencer, Barbara (1997). Understanding the Marketing Concept as Organizational Culture. European Journal of Marketing. Volume 31, No. 2, pp 110-121.

Wiles, David (2006). The Road to Sweden's Oil-Free Future. Online: http://www.sweden.se/eng/Home/Work-live/Sustainability/Reading/The-road-to-Swedens-oil-free-future. Date last accessed: May 22, 2009.

Yergin, Daniel (1992). The Prize: The epic quest for oil, money, and power. Simon & Schuster.