Efficient Environmental Inspections and Enforcement

Translation of ”Effektiv miljötillsyn”, report 6558, Swedish Environmental Protection Agency (Naturvårdsverket), 2013

MATHIAS HERZING AND ADAM JACOBSSON (EDITORS)

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SWEDISH ENVIRONMENTAL
PROTECTION AGENCY

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Preface

The research program ”Effektiv Miljötillsyn” (Efficient Environmental Inspections and Enforcement) was financed by an environmental research grant of the Swedish Environmental Protection Agency (SEPA). The researchers involved in the program were independent from the SEPA and are fully responsible for the results presented in this report. The original Swedish version of this report was submitted to the SEPA in February 2013 and was published in May 2013 (SEPA report 6558). The present translated version has been made possible through a SEPA grant.

Many persons have in different ways contributed to this research program with their time and their skills. Valuable feedback during the course of the program was provided by our reference group, which consisted of (in alphabetical order): Nils Alesund (Swedish Association of Local Authorities and Regions), Jonas Berglind (Federation of Swedish Farmers), Kerstin Blom Bokliden (Swedish Association of Local Authorities and Regions), Dave Borg (Malmö municipality), Björn Eriksson (Avloppsguiden), Åsa Hill (Federation of Swedish Farmers), Jari Hiltula (Östersunds municipality), Pirjo Körsén (SEPA), Berit Lundberg (Jönköping county administrative board), David Lundqvist (Sala municipality), Margareta Palmquist (National Board of Health and Welfare), Nils-Gunnar Sahlman (MI-Gruppen S AB), Lars-Gunnar Sjölund (Sandvik), Arne Sundström (Swedecote AB), Tomas Waara (Uppsala county administrative board), Agneta Westerberg (Swedish Chemicals Agency) and Henrik Willers (Swedish Engineering Industries).

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The research program was led by Mathias Herzing and Adam Jacobsson at the Department of Economics, Stockholm University. The following persons have contributed to the research program (in alphabetical order, see also the presentation of the research program participants, pp. 245-246):

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Michael Ortman has provided assistance in communication of the program. Christina Lönnblad has contributed with proof reading the original Swedish version and helping us translating it into English.

Stockholm, March 2016

Mathias Herzing
Adam Jacobsson

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Summary

Environmental inspections and enforcement (EIE) is a complex phenomenon. How does the inspector communicate with the inspectee? How do inspectors make professional assessments? How can legal certainty and efficiency in EIE activities be attained? What considerations have to be taken into account by the inspector or by the head of the EIE agency? What are the incentives of firms or individuals subject to EIE? What activities require more intensive inspections and enforcement? What are the technical and administrative conditions for persons working with EIE? What are the possibilities for evaluating EIE in Sweden today? How can the efficiency of EIE be measured?

All these and many more questions have been addressed by the research programme Efficient environmental inspections and enforcement (EMT: Effektiv miljötillsyn). EMT is a pilot project that has used a multidisciplinary approach to analyse Swedish EIE from a variety of perspectives. In the context of EIE, EMT is a unique research programme. EMT has focused on municipal EIE activities. However, the results are also relevant for other authorities responsible for operational EIE or EIE guidance, and also for agencies dealing with inspections and enforcement of other legislation and regulation.

One of EMT's subprojects has focused on EIE methodology. Here, EMT has chosen to highlight three important aspects: the professional assessments of inspectors; the inspector's role and competence; and the communication between inspectors and inspectees. The perspectives that have been emphasized are based partly on observations from inspections and the inspectors' daily routines, and partly on the experiences of workshops and inspector training programmes, which have been conducted by EMT.

Making professional assessments is a sophisticated task. For inspectors it comprises having a professional vision regarding people, environment and legislation, objectivity beyond mere impartiality, and consideration of many assessment dimensions. Through the many contacts with inspectors EMT has identified eight criteria (dimensions) for professional assessments: studying the specific case, inspection, communication with the inspectee, communication with colleagues, studying previous decisions, examination of legal aspects, legal certainty and objectivity, as well as appraisal and assessing reasonableness.

The inspector's role and work are complex. The profession requires more than a formal education and knowledge of legislation. As inspectors are their own work tools, personal experiences and characteristics are essential. Values are crucial for the inspector. Therefore, it is important to specify the skills required for the profession.

To improve the communication during inspections EMT has tested an, in the context of EIE, entirely new method - Motivational Interviewing (MI). The aim of MI is to explore

and enhance the inspectee's own individual motives for promoting a better environment, thereby strengthening positive environmental behavior. Inspectors in four municipalities participated in a MI training programme, which led to increased skills in applying MI. Their evaluations show that they assessed MI as highly useful at inspections and that inspectees seemed to be more satisfied after the inspections.

Another of EMT's subprojects has focused on the institutional design of EIE. In an effort to improve the understanding of municipal EIE a survey of municipal heads of EIE was conducted by EMT during the autumn of 2011. The survey showed that the conditions for the execution of and political influences on EIE vary across municipalities in Sweden, thus compromising both legal certainty and EIE efficiency. Presently, there is no nationally accepted way to follow up EIE, because there is no consensus regarding what should be measured and there are no possibilities to collect national statistics.

The lack of nationally collected data regarding EIE over time makes it difficult to measure the outcome of EIE. However, EMT has demonstrated that it is possible to perform statistical analyses given the data available. Analysis of data on environmental sanction charges shows that higher charges reduce the risk of recidivism. Thus, recidivism is possible to use as a measure of EIE outcomes. The same data have also been used to investigate whether there are political factors that may affect EIE. It turns out that the number of environmental sanction charges increase significantly in the municipalities where the Green Party went from not being to being part of the ruling coalition as a result of the 2006 election.

Previous research on EIE has usually not taken into account differences among inspectees. Thus, EMT has initiated research on identifying how incentives for achieving compliance or promoting the environment differ between different types of actors. The focus has been on how inspectees adapt their environmental behavior to different factors such as production technology, market conditions and differentiated EIE practices. Based on the understanding of the incentives of inspectees, it is possible to draw conclusions about the design of EIE. A more differentiated knowledge of inspectees and their incentives is thus a prerequisite for achieving a higher degree of EIE efficiency.

Presently there is a lack of data to systematically analyse the outcome of EIE. A major reason for the scant data supply is that the operational EIE agencies' independence has led to a focus on local-specific case management. These data systems thus concentrate on the agencies' case management rather than on what is essential from the environmental perspective. The risk of inconsistency in the data collected by central authorities increases due to the differences in work practices and in case management systems between municipalities.

EMT's third subproject has examined information management at municipal EIE agencies. To improve the efficiency of data management and to facilitate EIE, EMT has developed scenarios and conceptual prototypes together with stakeholders, in particular inspectors. The approach has been user-centered and based on inspectors' work practices.

The starting point has been that inspectors require comprehensive statistics and that they need to learn, relate and develop their EIE practices in collaboration with other inspectors in a simple way. In addition, it has also been taken into account that operational EIE agencies require indicators to facilitate the planning of EIE activities, and that the Swedish Environmental Protection Agency needs consistently collected EIE data to gather statistics and develop guidance, as well as to influence and present data to the EU.

The conceptual prototype demonstrates a number of ideas. It is absolutely crucial to enure the availability of data at different levels and hence, EMT proposes that a common database solution should be developed. However, the problem of inaccessible data is complex, and therefore it is necessary to combine the different perspectives and governance issues related to the system.

EMT has demonstrated how information and communication technology could be used to improve innovation and efficiency and to pursue more proactive EIE activities at the operational level, while at the same time satisfying global information management aspects. Coordinated access to national EIE data would make it possible to achieve more uniform outcomes of EIE and contribute to identifying indicators for sustainable development. A national information system would facilitate the evaluation and the following-up of EIE activities, which could have strong incentive effects for operational EIE agencies. From a research perspective, regular and consistent data collection could create enormous opportunities to analyse EIE. EMT as a pilot project has identified a number of issues and analytical tools that can be employed to study and develop Swedish EIE.

Given the present scant data supply it is somewhat premature to ask which indicators are useful for measuring the efficiency of EIE. Only when the conditions for consistently collecting a variety of data have been satisfied is it meaningful to assess which measures of EIE outcomes are relevant. Hence, to improve the efficiency of present EIE the focus should be on the possibility to measure rather than on what should be measured.

Chapter 1 Introduction

Henrik Artman, Lena Edlund, Mathias Herzing, Adam Jacobsson

The environment is a public property. Humans need a good environment, today and tomorrow. While it is everyone's responsibility to help safeguard the world's resources in a sustainable manner, it is also difficult to clearly know what must be done and by whom. Sometimes the parable, everyone has to do their bit, is used to manage environmental problems. We all need to contribute to the best of our ability to achieve the collective goal, i.e. the 16 environmental objectives as adopted by the Swedish Parliament.

However, even though environmental problems are visible to most, they are difficult to understand. Individuals, companies, organizations and general expertise cannot provide a clear picture of the context and all environmental impacts to enhance an environmentally sustainable development. Numerous problems are invisible to the naked eye, and also to other senses, and it is not possible to see how they interact. How do we know that sorting of waste has a positive effect on our environment? How can we really perceive carbon dioxide and how and when it affects our environment? We all need to contribute, but we may not know in what way and by what means. And perhaps we do not know why, because we do not know the significance of the contribution.

People act on basis of creating meaning. Without meaning, for example, through coherent or connected thinking patterns, where we understand the context, the significance and the patterns, we are paralyzed or act based on short-term gain. Furthermore, people cannot coordinate their actions without understanding the overall picture of the problem. For example, most people readily understand how we can contribute to a good environment by sorting waste – while others may prefer to pay to avoid sorting. Everyone understands that we cannot throw plastic in the woods as it is apparent that it does not decompose. Usually, fuel is chosen based on both economic and environmental understanding.

Generally, it is easier for people to base their decisions on circumstances that relate to their own sphere rather than on the effects of their actions on the general public. What constitutes one’s own sphere depends on the position of the individual in society at the time of the decision to take action. As an individual you are driven by specific incentives; those that influence an employee at work may differ from the motivations and reasons for the choices of an operator. If an individual is employed by a government agency, it is municipal, regional or national views and considerations that are taken into account, while an employee of a supranational organisation is driven by yet other incentives. The individual's conduct is also influenced by a number of sometimes contradictory incentives such as economics, environmental sustainability, laziness, etc. Associated to all this are the overall political motives and an environmental expertise that is not in full agreement about all consequences and how to best achieve the environmental objectives of sustainable development. We are dealing with a dynamic system, which is difficult to visualise. In terms of environmental quality, the problem is that individual decisions are

primarily based on circumstances directly relating to the decision-maker and not on circumstances that concern the general public. Each separate decision may thus contribute to a poorer environment than if the consequences for the public were also considered.

1.1 Environmental inspections and enforcement and regulatory control

The Environmental Code is the law that essentially constitutes the basis for environmental inspections and enforcement (EIE). While the law must apply equally to all, it is open to interpretation. Legislation is required for operators and EIE authorities to act for the common good in terms of the environment. In order to achieve a long-term effect, legislation should be supported by clearly coordinated activities and a common desire to achieve a sustainable future. The law is the promoter of a good environment.

EIE is designed to make it possible to monitor how we comply with legislation that regulates actions affecting the environment. In addition to county administrative boards and other central agencies, Sweden has 290 municipalities whose environmental committees[1] have the task of ensuring that all agents observe the guidelines of the law. There is an infinite number of situations where different players have different incentives, making it difficult to agree on and coordinate actions unless dialogue and exchange of information are supported.

An important player in EIE is the inspector entrusted with the task of dealing with cases that have an environmental impact. In some cases, it is simple and straightforward while, in other cases, the inspector has to make a wide range of judgments. The environmental inspector's task could be described as reading and deciphering the operator and the activity for which he or she is responsible and from a professional perspective determining how to act so that the objective of the Environmental Code and the EU environmental regulations can be fulfilled. A professional inspector listens and is attentive and, at the same time, acts in a way that supports operators' efforts to achieve their environment targets. See chapter 6 which focuses on professional judgments.

The complex world of different incentives and the equally complex needs of reaching consensus, combined with the scope for interpretation of the Environmental Code, means that inspectors need to relate their own view of the situation to what is ideally to be expected. There is obviously a difference between those who deliberately try to cheat and those who unknowingly make mistakes despite good intentions and those who would rather take a financial penalty than doing the right thing. Therefore, it is reasonable to consider how an inspector perceives individuals and adapts the inspection style to the situation, but within the framework of the law. As always, differences must be taken into account when we work with people.

[1] Environmental committees are responsible for the implementation of the Environmental Code at the municipal level. Some municipalities have a common environmental committee.

But the EIE work must not be performed arbitrarily. Nor should there be any systematic non-transparent regional differences. Naturally, the aim is that EIE should be reasonably equal under all given similar circumstances. The problem is that the operational EIE authorities do not necessarily have common knowledge or coordination. The Swedish Environmental Protection Agency does not have access to systematically gathered data, which is required to continuously maintain a comprehensive and quality-guaranteed information view. Presumably, this also applies to other central agencies that are responsibile for EIE guidance, but EMT (the research program Efficient Environmental Inspection and Enforcement) has focused on the Swedish Environmental Protection Agency and therefore only has knowledge regarding the situation there.

Environmental and business interests coexist in a municipality. This can be problematic when a municipal politician weighs these two interests against each other – a balance which, in principle, should already have been struck as EIE are carried out on behalf of the state. Decentralized inspections have the advantage of better knowledge regarding local conditions and better possibilities for a more continuous dialogue between the operational EIE authority and operators. In addition, it is easier to focus on local problem areas and target inspection efforts where the need is greatest. However, decentralization can also create incentives for municipalities to compete in business friendliness and let EIE stand back. On the one hand, everyone likes a good environment – the municipality in question as well as the adjacent municipalities. On the other hand, each municipality obviously wants to support its firms and thus, stimulate jobs. This is where problems may arise. Previous studies (see, e.g., Decker & Maxwell, 2010; Johannesson & Johansson, 2000) and also our own research (see e.g. chapters 2 and 4) have found indications that “strict” EIE may “scare away” some operators. Depending on the type of operator in question, these may seek out municipalities with “more lenient” EIE. This creates conditions for a kind of unsound competition between municipalities in EIE “leniency” – a phenomenon that has internationally been recognised as a “race to the bottom”. The solution to this problem demands good coordination and follow-up.

1.2 Coordination and national environmental inspections and enforcement

As individuals cannot easily understand their contribution to sustainable development, problems can arise. Individuals have different incentives to do their bit in different roles (for example, as operators), in different places and at different times, and have different ways of making EIE performed by municipalities and county administrative boards meaningful and relevant. It is undeniably a complex situation. Consistent (comparable) data is required from all operational EIE authorities in order to create conditions for a national overview and consensus. Consequently, the collection of data requires coordinated information management systems that, for instance, ensure comparability. Overview and consensus can then contribute to a target-oriented and coordinated inspection methodology.

Today, the different municipal EIE administrations have local case management systems and associated databases which are described in chapter 5. Most have different implementations of one of the two dominant case management systems, but a large number of municipalities have their own solutions in the form of spreadsheets or database systems. All data is stored locally and not according to the same database schedule. Currently, this makes it difficult to compile existing EIE information. This is a consequence of each municipality being autonomous and being able to choose its working method, based on its own circumstances.

As mentioned above, society is so advanced and multifaceted that it requires an intensive exchange of information to achieve coordination. Presently, an example of such a procedure is the Environmental Protection Agency querying the municipal committees and then compiling and analysing the responses. However, the problem is that municipalities do not always provide consistent answers, which impedes the compilation process. As the data that the Environmental Protection Agency receives is not always correct or comparable, the guidance provided by the Environmental Protection Agency can be perceived as unclear, irrelevant or incorrect by local inspectors. This is undoubtedly the most common criticism expressed by inspectors against the Swedish Environmental Protection Agency.

Previous research and reports have already shown that inspections are carried out differently in different regions in Sweden. Consequently, the law is not equal for everyone. At the same time, no one has information that can identify how, and for which players, and in which situations the inspections vary, or for that matter how reasonable a degree of variation is. Inspection data is not available in such a way that a basis for the implementation of EIE is provided. Transparency is absent. This, in itself, is a problem as different players may feel disadvantaged. It is also an explanation for why the Environmental Protection Agency cannot provide any clear guidance for EIE. Without the compilation of inspection data, it is not possible to evaluate the efficiency of inspections in terms of a better environment.

1.3 About EMT

In order to address the problems and issues regarding Swedish EIE as described above, the Environmental Protection Agency issued a call in 2008 where Swedish researchers were invited to submit proposals for a three-year research programme. After an evaluation process, the research programme “Efficient Environmental Inspection and Enforcement” (Effektiv miljötillsyn – EMT) was, in the autumn of 2009, entrusted to work on increasing knowledge and understanding of the multifaceted phenomenon of EIE. Due to this complexity, we have used an interdisciplinary approach to describe and understand the multitude of dimensions that affect all those involved in and affected by EIE. More specifically, the purpose of EMT is:

> *“... to produce knowledge that can form a basis for the efficient implementation of environmental inspections and enforcement.”*

(the Environmental Protection Agency's Call for Proposals, March 18, 2008)

The call for research proposals also states that "the aim is for the results to be used as the basis of the Environmental Protection Agency's work with inspection and enforcement guidance..." and that the target group is "...officials at the Environmental Protection Agency, but also at county administrative boards and municipalities as well as other players involved in inspection and enforcement" (ibid.). The research is aimed at operational EIE activities where EMT has chosen to focus on municipal authorities as this is where the major share of these activities is carried out. This does not mean that officials at county administrative boards will not benefit from the programme research as most results are so universal within an inspection and enforcement context that they are also relevant to them and other players involved in inspections and enforcement of other legislation. To the extent that the research concerns central authorities with responsibility for EIE guidance under the Environmental Code, we have focused on the Swedish Environmental Protection Agency.

It should also be noted that EMT has not had the task of reviewing Swedish environmental legislation or other relevant laws and regulations in an inspection and enforcement context. Accordingly, the legislation has been taken as given. However, the point of reference for EMT has obviously been existing laws and ordinances, which constitute the framework within which operators and EIE authorities work.

An initial starting point is the Environmental Code, whose purpose is described as *"to promote sustainable development which will ensure a healthy and sound environment for present and future generations."* (Environmental Code chapter 1 §1). According to chapter 26. §1, inspections and enforcement shall *"ensure compliance with the objectives of this Code and rules issued in pursuance thereof..."*

The problematic picture of inspections and enforcement varying between different authorities, as previously described, has also been highlighted by previous studies (see e.g. Johannesson et al, 1999; Johannesson & Johansson, 2000; Bengtsson, 2004; Cedstrand et al, 2006). This implies that operators in different parts of Sweden have different conditions for carrying out their activities, which jeopardizes both legal certainty and efficiency (see section 1.4).

The fact that legislation is extensive, complex and provides room for interpretation allows the local EIE authorities to have an important influence on how legislation is actually implemented. The decentralised structure with over 300 operational EIE authorities creates room for many different interpretations which, in turn, leads to the law possibly being applied differently depending on the EIE authority we look at. How do we coordinate more than 300 operational EIE authorities? Increasing the legal certainty and efficiency of EIE requires a better understanding of the conditions, the organisation and the working methods of the different operational EIE authorities. On the one hand, the differences must be systematically mapped. On the other hand, it is necessary to develop

a theoretical framework to better understand the mechanisms that govern the relationships between the conditions and the work of the operational EIE authorities.

Operational EIE according to the Environmental Code can be conducted on basis of several different methods. The Environmental Protection Agency's Handbook 2001:4 on operational inspection and enforcement states that *"the inspection and enforcement method shall be adapted to the activity, the group of activities or the inspection area in question, without having an impact on tasks related to the inspection to ensure the objectives of the Environmental Code."* Furthermore, an operational inspection authority must, pursuant to the Ordinance on Environmental Inspections and Enforcement (SFS 2011:13), chapter 1. §9, *"conduct inspection work efficiently"*. Therefore, it is important to increase the understanding of the inspection methods that are best suited in different contexts. In chapter 2, we show how specific inspection methods vary between municipalities and, in chapter 4, we provide examples of how the impact of different EIE methods on different types of activities can be analysed.

The call for research on efficient EIE noted that *"[a]n important problem is that inspection activities vary geographically."* In addition, regarding the room for interpretation of the Environmental Code, it states that: *"[i]f the room to act is not dealt with in the same way across the country, there is a risk that the intentions of the legislator are not achieved, whereby legal certainty may be in danger."* Variations in inspection activities can largely have natural explanations, for example, differences in industrial structure or geographical conditions. Yet other less obvious explanations may exist. If these can partly explain the variation, we obtain clues for how we can influence efficiency and the outcome of EIE. A descriptive account of specific patterns of EIE is presented in chapter 2, while the different mechanisms that can explain some of these patterns are discussed in chapter 4.

We have previously mentioned the advantages and disadvantages of a decentralised EIE organisation. Currently, it is difficult to weigh these advantages and disadvantages in order to draw a firm conclusion concerning which ones are most important. Thus, within EMT, we do not take a stand regarding the principal responsibility for EIE, but restrict ourselves to describe and analyse the current decentralised system.

1.3.1 What have we done?

Since the research programme EMT has involved many researchers and has been in progress for three and a half years, we would like to briefly present all contacts we have had in the field and how we have gathered the data that has constituted the basis of the analysis and results of the programme.

As previously mentioned, the inspection conditions, the organisation and the working methods have been studied in EMT through an interdisciplinary (multidisciplinary) approach (see section 1.3.2 for a detailed description). During the course of the programme we have alternated between gathering material (data), i.e. by going out into the field and carrying out studies in the form of participant observations, interviews,

finding information on the internet, and then processing the material based on the objectives of the programme and forming theories and knowledge, and then once more gathering material and repeating the procedure. The method of approach can be described as abduction, which means that theory and empiricism enrichen our understanding of the field or phenomena being studied as the research progresses and that the researcher moves between data collection, processing and analysis (Alvesson and Skjöld Berg, 2008).

One part of the research programme has focused on the inspector and his/her work situation and interaction with the operator. Field studies have been conducted, such as observations of environmental offices and at inspections and interviews with heads of environmental offices, inspectors and operators. EMT also developed a training programme of a new conversation method (Motivational Interviewing, MI) in the context of EIE with the aim of improving the communication between inspectors and operators. The results were then also used in the design of a prototype for decision support in a different part of the research programme. The purpose of this prototype is to support the inspector in his/her work and provide a consistent and efficient method to gather inspection data that can be used by operational inspection authorities in their planning and evaluation and by inspection guidance authorities for evaluation and delivery of statistics to e.g. the EU. Currently there exists no such system. Work on the prototype has been user-oriented through e.g. design workshops with different stakeholders, from inspectors to representatives of the Environmental Protection Agency. Another part of the research programme focused on the institutional framework within which inspections are conducted. This has been performed by means of e.g. visits to inspection authorities and operators, through a survey of all municipal environmental administrations, through a study of available nationally gathered inspection data and a model-based analysis of the incentives that affect the players in EIE – both operators and inspection authorities. Each of the research approaches has made it possible for the programme to identify a number of problem areas concerning the efficiency and legal certainty of EIE in accordance with the Environmental Code.

The data gathered and used in our analyses and descriptions has primarily been characterised by availability and organisational and geographical spread. By availability, we mean that we have met the people and organisations that have given us access, that we have attended consultation and information meetings to which we were invited and that we have subscribed to newsletters from relevant authorities and organisations recommended or encountered when looking for information about EIE. We have achieved organisational spread by contacting and inviting different municipalities, county administrative boards, interest groups, companies, environmental cooperation meetings, information meetings and project meetings. Geographical spread of our fact finding became important when we realised that environmental inspections were carried out in different ways in different parts of the country. Previous reports on the subject primarily dealt with studies conducted in central and southern Sweden. By geographical spread, we mean both a spread across Sweden and a spread between different types of municipalities. All in all, we have been in contact with close to 40 municipalities and six county

administrative boards. Some we have visited to conduct field studies and interviews, others we have contacted in order to get to know more about their data management systems. Some municipalities have actively participated in workshops while others have been involved in the study about the conversation method Motivational Interviewing.

FIELD STUDIES

When we talk about the field, we mean the places and occurrences (context) where people (subjects) are located and undertake activities. In order to create an understanding of how environmental inspectors work, the programme has conducted field studies with environmental inspectors. The field studies did, among other things, mean that we accompanied the environmental inspector during inspections. This may have included the inspection of sewage treatment plants, sausage factories, fish slaughterhouses and crematoria. It has been important for us to see the inspectors exercise their profession. We have also participated in the work of a number of inspectors at the office, on several occasions as observers during internal work meetings and we have been present at coffee breaks in the lunch room. In connection with the field studies, we have also interviewed the inspectors or spoken to them about their work tools and practices.

LITERATURE STUDIES, STATISTICAL ANALYSIS AND TESTING THEORETICAL MODELS

Through literature studies and by reading newsletters, we have gathered information about previous studies and research performed in the EIE field and about what is currently going on and which issues inspectors are interested in and consider important. We have examined which data in the field that is available and how it is designed, and we have explored which statistical analyses are possible. In addition, we have designed economic models to be able to describe and analyse the operators' incentives and how these impact on the inspection work.

We have also examined which existing literature is useful to provide a framework for observations made during field studies and interviews. For example, ethnological and sociological studies have been performed on roles and role behaviour. An individual has several different roles in his or her life, as a private person (parent, partner, club member, etc.) and as a professional. We have used some of the models in the studies of how people's roles interact with each other to illustrate and analyse the role and expertise of the environmental inspectors. See chapter 7 on roles and competence.

TEST OF THE CONVERSATION METHOD

EMT has also tested a conversation method called Motivational Interviewing (MI). It has previously been used in a healthcare setting, for example, to help people deal with addiction or to support new parents. In brief, the conversation method is based on helping individuals discover their own motives for wanting to make a change. The approach focuses on holding talks with open-ended questions instead of simply telling the person what he or she needs to do. This has been tested in four different municipalities. The

focus of the study was to teach inspectors this method and test it in the field. More about the study and its results can be found in chapter 8 (MI – attitude and communication).

WORKSHOPS

We arranged six design-oriented full-day workshops to develop activity and system work, where we invited inspectors and other stakeholders to examine their need for decision support. Each workshop was arranged in two parts. The first part concerned structuring and reflecting on current practices, and the second part concentrated on how one can envisage a future working method and the benefit from interconnected decision support.

The following workshops were organised:

1) Inspectors; initial inventory
2) Operations controllers at municipalities; initial inventory
3) Inspectors; design of scenarios
4) Inspectors; validation of scenarios
5) Environmental Protection Agency; function inventory
6) Inspectors; prototype assessment

The three initial workshops were based on current information management and how one could imagine how things would work in practice in the future. The three subsequent workshops were based on the scenario developed together with the participants and were of a more evaluative and function-oriented nature. Invitations to workshops were issued to reach as many people as possible within our network of contacts. There were between six and 20 people at each workshop. The developed prototype was created between workshops five and six.

An additional number of more or less internal workshops were also arranged to coordinate the programme in general. These included discussions on economics and the inspector's methodological perspective relative to the scenario developed for a future information system. (For a detailed description of the scenario of a future information system, see chapter 9.)

It is crucial to understand that it is mainly the inspector's perspective that we have dealt with, even if we always initiated the workshops by expressing the general motive of the programme – i.e. to create a more structured entirety and analytical foundation based on an efficient collection of quality-assured EIE data. This is currently not the case. From the perspective that the data from the 290 municipalities needs to be interconnected, the workshops have focused on the needs and benefits of the groups we worked with.

The different methods used reflect the fact that EMT is an interdisciplinary research programme. What this interdisciplinarity comprises, and the opportunities and challenges it has offered, is discussed in more detail in the following section.

1.3.2 EMT – an interdisciplinary research programme

The research programme EMT is, as previously mentioned, a multidisciplinary or interdisciplinary research programme. What does an interdisciplinary approach mean in the case of EMT and what is scientific knowledge? Based on a general view of science, one could say that scientific knowledge originates from observations and experimentation. Scientific knowledge should be free from all personal viewpoints. The knowledge gained by scientific means is reliable because it is systematically collected and has been subjected to a special review process. The review process can be said to form the basis for the knowledge to be considered to be objectively tested (Chalmers, 1982, p 1).

However, it is not enough to just emphasise this in order to explain what science is about. Scientific knowledge is also a product of the choices made. If taking the research programme EMT as an example, it is a consequence of several choices. The Environmental Protection Agency chose to issue a call for a research programme entitled *Efficient Environmental Inspection and Enforcement* as it wanted to know more about the efficiency of Swedish EIE. The Environmental Protection Agency also chose to invite researchers who traditionally have not previously studied the field of EIE. This was done because they wanted to obtain new perspectives on the issues. Making these choices meant that the research focused on certain topics, thereby guiding the research in a specific direction.

Furthermore, the Environmental Protection Agency chose to emphasise collaboration between different scientific disciplines within the framework of a coherent programme in the call. Instead of allowing researchers from different disciplines to deal with different issues separately, the ambition was to achieve, through interdisciplinarity, a holistic approach to the complex field constituted by EIE. Consequently, the researchers who were involved in the research programme EMT and were chosen by the Swedish Environmental Protection Agency came from numerous scientific disciplines. EMT comprises: computer science, ethnology, human-computer interaction, statistics, psychology, economics and philosophy. The different disciplines focus on the different issues and use different methods to arrive at their results. These different interests and the expertise of the researchers, in turn, also influenced the research that later came to be conducted.

By mentioning this, we would like to emphasise that EMT's research is very much the result of the choices of individuals and organisations. Yet, the research is also affected by what is possible to do. For example, this includes the accessibility of data, as well as the time available to the researchers. If only limited data is available, it becomes difficult to study the field. It is also difficult if the available data is not comparable. The time aspect is also crucial for researchers to explore a phenomenon on different levels and understand its problems.

The common research task of the three sub-projects is to highlight EIE in Sweden and its complexity. Below follows a brief description of the scientific aim and scientific methods

for the different sub-projects. The first project concentrates on the issue of how the environmental inspectors' work is organised and how their meetings with the operators can be improved. This sub-project has made use of field studies and interviews, as well as tested and evaluated a conversation technique called motivational interviewing (MI). The methods that have been necessary in the research of this subproject have been to observe, interview, train and interpret what is said and done both during field studies and in the analysis of recorded conversations between inspectors and operators. One of the aims of sub-project 1 has been to come into contact with environmental inspectors and environmental agencies, and to inform EMT as a whole about the inspectors' practice. Another aim has been to examine the inspectors' work and problems and to analyse these.

While the primary focus of the first sub-project can be said to be the encounter and communication between inspectors and operators, the second sub-project is aimed towards the different agents' incentives and interaction. This signifies a shift in perspectives away from the interpersonal and individual to a more general level, where the overall effects are studied. The second sub-project has focused on developing theoretical models that make it possible to analyse the different players' incentives, as well as to statistically analyse data. The theoretical work has been carried out with the aim of better understanding which mechanisms govern the links between the conditions of the operational EIE authorities and the operational EIE work. The analysis of the data has been a first step to statistically evaluate the outcome of inspections. The methods used have primarily been based on economics, game theory and statistics. In addition, a survey, targeted at municipal environmental managers, has been conducted.

The third sub-project has focused on the question of whether researchers can support the environmental inspectors at inspections and when assessments need to be made ahead of a regulatory decision. The methods used by this sub-project has included field studies, workshops and inventory of IT support that currently exists at municipal environmental offices. Based on expertise from human-computer interaction, the expressed needs have been interpreted to develop a prototype for an information system that strengthens legally secure, equal and efficient EIE.

Despite differences in the research fields and methods, there are some ideals that the different scientific disciplines and hence the different sub-projects within EMT have in common.

- Science is about systematizing and accumulating.
- Science shall articulate new questions.
- Science shall use methods and data in ways that are transparent.
- Science shall generalize based on acquired experience.
- Science shall examine whether there are other perspectives from which results may appear in a different light. (Jönsson, 2008, p. 159)

The researchers in EMT have taken all these points into account. In terms of the second point, that science shall articulate new questions, we have emphasised examining the research area EIE in Sweden from perspectives that have previously not been common.

That is why we have raised questions concerning communication techniques, the role of the environmental inspector and the advanced judgment work that the inspectors perform. We have emphasised questions regarding the interaction between politicians and representatives of EIE authorities, such as inspectors and heads of environmental offices. We have studied how the operator's incentive to follow legislation is influenced by different factors such as industry affiliation, market conditions and inspection methods. By processing the data, the incidence of recidivism (relapse) and political influence has been analysed. The possibilities of empirical analysis have unfortunately been limited, as it is currently very difficult to compare data or even obtain data regarding EIE in Sweden. All of these issues that we have been interested in investigating partly concern what the Environmental Protection Agency directed our research towards, and partly what we, based on our expertise, have found it important to investigate. “What affects the efficiency of today's EIE?” is the main issue on which all our sub-questions have focused, from different perspectives. The answers to these questions and the results of our research are presented in this report.

What we especially want to emphasise is that our results are interdisciplinary. What does that mean? It means several things. First, it means that researchers from different scientific disciplines collaborate on common research issues. Using their respective scientific tools, their task is to find out the state of reality surrounding the research question. The researchers in EMT have used various methods to find out how Swedish EIE are structured.

Second, interdisciplinarity means that we jointly analyse the collected material across scientific borders. In this work, we try to find explanations for the phenomena we have discovered while collecting all material. We compare with each other and try to find out whether anyone else has seen the same thing. At this stage, an important issue is whether we have discovered something that has not previously been noted. If we feel that we have discovered something uninvestigated, we set this against our overall research question concerning efficient EIE. We ask whether this uninvestigated issue might be something crucial to the problem of achieving efficient EIE. If the answer is yes, we continue the work on this particular discovery. If the answer is no, we set it aside. At this stage, we also attempt to problematise our discoveries. We ask the question whether the discovery can be seen from an entirely different perspective, i.e the last item above: “Science shall examine whether there are other perspectives from which results may appear in a different light.” What we then investigate is which consequences other perspectives have on the results that we have begun to derive.

Third, interdisciplinary work implies collaboration on the results. We investigate how the results can relate to each other. At first, it may not be obvious that e.g. the objectivity of the inspectors in exercising authority has anything to do with the prototype of a computer system. However, when you begin to understand how multifaceted the work of the inspectors is in order for their judgement to be considered objective, it is easier to see how a well-functioning national computer system could possibly support their work and contribute to objective judgements. More examples of how the results are related can be

found in the various chapters of this book. At this stage, we also investigate whether there are results that contradict each other. If this is the case, it does not automatically mean that one of the results is incorrect. Instead, it may mean that there is a problem in Swedish EIE that requires further investigation, a problem that we overlooked when we collected the material and investigated different research questions in the field. At this third stage for multidisciplinary work, we also compile our results in a report. This report is the result of these efforts.

There is also a fourth stage, which applies to all research. The results are taken care of and passed on, i.e. items one and four above: "Science is about systematizing and accumulating" and "Science shall generalize based on acquired experience". In all research, it is a question of accumulating material and methods, both methods to collect materials and methods to analyse the material. Knowledge is accumulated and researchers continue either to investigate a research field or let others take over. The acquired experiences are generalized and, in the future, may be challenged by new researchers. In this way, research progresses. And that is how it should be. All this takes place within each discipline, but in terms of interdisciplinary research results and knowledge, there are no pre-defined recipients, because they do not fit easily into their traditional disciplines. Who can review the results, discuss them and pass them on outside the interdisciplinary research team? How can you make use of the interdisciplinary knowledge generated by EMT? These skills cannot really be found among other researchers when EMT's researchers return to their original disciplines. Therefore, it is important to ask how the results reach those concerned, what can be done with them and how to move forward to find out more. All in order to strengthen EIE in Sweden.

With our results, we want to give all players in the field of EIE knowledge tools. Some knowledge tools are new, others improved. What we hope for is that our research will contribute to a deeper understanding of the complexity of EIE, but also that the knowledge tools which we hereby put in the hands of inspectors, decision-makers, government officials, politicians etc shall contribute to innovative thinking and communication.

1.4 Efficiency

The fundamental question of the programme concerns efficiency. Hence, we would initially like to briefly discuss efficiency in general. The notion of efficiency is widely used in the texts – laws, ordinances and guidelines – which describe the purpose of EIE. For example, the Ordinance on Environmental Inspection and Enforcement (SFS 2011:13), chapter 1 §9, states that an operational EIE authority shall *"conduct inspection work efficiently"*. The Environmental Protection Agency (2012) states that EIE must both be in compliance with the rule of law and efficient. Rule of law means that legal rule is applied equivalently, while efficiency implies that EIE resources are used to attain the maximum effect in terms of achieving the environmental objectives.

However, it is not entirely clear how efficiently EIE can be achieved. According to the Environmental Code, operational EIE can be conducted on basis of several different methods. On page 13 of the Environmental Protection Agency's Handbook 2001:4 on operational EIE, it is stated that: *"the inspection method shall be adapted to the activity, the group of activities or the inspection area in question, without having an impact on the inspection's task to ensure the objective of the Environmental Code."* In the Environmental Code, chapter 26. §1, it is emphasized that EIE shall *"ensure compliance with the Environmental Code"* and also *"through guidance, information and similar activities, create conditions for the objective of the Code to be met."* However, room has been left for interpretation with regard to the proportions of these EIE methods. This may give rise to different opinions among municipalities regarding the efficiency of EIE methods and hence, what constitutes an efficient use of resources.

Previous studies (see e.g. Johannesson et al, 1999; Johannesson & Johansson, 2000; Bengtsson, 2004; Cedstrand et al 2006) have found that EIE according to the Environmental Code varies between different operational EIE authorities in Sweden (both among municipal committees and county administrative boards) in terms of the scope, emphasis and quality of inspections. The Environmental Protection Agency's call for research into efficient EIE emphasizes that *"[a]n important problem is that inspection activities vary geographically."* In addition, regarding the possibility for interpretation of the Environmental Code, it states that: *"[i]f the room to act is not handled in the same way across the country, there is a risk that the intentions of the legislator are not achieved, whereby compliance with the rule of law may be threatened."*

The aforementioned studies suggest that this variation is largely a product of the Environmental Code's extensive scope, complexity and the room for interpretation it allows, as well as the decentralized structure of the operational EIE authorities. Accordingly, a better understanding of the conditions, organisation and working methods of the different operational EIE authorities is required. This has been the point of reference for EMT.

In practice, the geographical variations in EIE imply that the operators in different parts of Sweden have different conditions for carrying out their activities, which jeopardizes the compliance with the rule of law. A common interpretation is that this leads to EIE not being efficient. In this case, a reference is made to what is known as economic efficiency (which is explained in more detail in the next section). If the law is applied differently on two competitors, an inefficiency arises as one company gains a competitive advantage, which results in a disruption on the market where the two companies operate. The combined resources of the companies will then not be used as efficiently as possible, which means a loss to the economy as a whole. The balance between the societal benefits of the companies' production and the possible negative environmental consequences of this production is disrupted when the rule of law is applied differently. Efficiency problems arise when individual municipalities have limited incentives to take into account their impact of applying the law on surrounding municipalities, but strong incentives to take into account the effects on the local business climate.

Compliance with the rule of law is an important prerequisite for achieving economic efficiency. Thus, it seems reasonable to draw the conclusion that the possible non-compliance with the rule of law addressed in the aforementioned studies leads to reduced economic efficiency. However, does this mean that individual authorities have conducted EIE inefficiently? Not necessarily. Even if resources are used efficiently by all administrations, differences in access to resources can result in variations in EIE and hence, lead to economic inefficiency.

What is illustrated by the above discussion is that the concept of efficiency can have different meanings. Exactly what is considered to be efficient EIE is therefore not entirely clear. In the following section, we describe how the concept of efficiency is interpreted and used by the researchers involved in EMT.

1.4.1 Internal and external efficiency

In Swedish "*effektivitet"* corresponds to two concepts in English, both *effectiveness* and *efficiency*. A distinction is therefore usually made in Swedish between external *(yttre)* and internal *(inre)* efficiency. *External efficiency (effectiveness)* refers to doing the right things. In an EIE context, this might concern the design of the inspection plan, so that efforts are made where the anticipated effect is greatest. *Internal efficiency (efficiency)* is about doing things right. When it comes to EIE, this could refer to how the objectives set out in the inspection plan have been achieved in relation to the resources used. While effectiveness can be said to measure the degree to which goals have been reached, efficiency corresponds to the degree of reaching goals in relation to the use of available resources. Efficient EIE partly concerns priorities (effectiveness) and partly implemening these priorities as efficiently as possible (efficiency).

Within social sciences in general and economics in particular, the concept of *economic efficiency* is often used. It is achieved when the use of a resource is at a level where the additional income, given by a further increase of resource usage, is equal to the additional cost it involves. If you were to invest more resources, it would lead to a marginal loss. Regarding activities with an environmental impact, the problem is usually that producers do not take the environmental costs that arise in society into account. Since producers do not always consider these economic costs, more than what is economically efficient may be produced. Hence, there is a need for environmental laws and regulations. For producers, this implies an additional cost, which ideally leads to production at the economically efficient level, where the producer's additional income by increasing production corresponds exactly to the costs, including those for the environment, from producing more. The concept of economic efficiency thus refers to how resources are used, but also where these resources are deployed. Thus, the concept covers both efficiency and effectiveness.

In the texts mentioned in the previous section, it is not always clear which of the efficiency concepts is used. When an efficient use of resources is explicitly mentioned, it is clear that this refers to efficiency. In other cases, it is more about making the right

priorities, i.e. effectiveness. In the context of EMT, EIE has been analysed from different scientific perspectives. This is also reflected in how the concept of efficiency is used.

In the remaining chapters of this report, efficiency will be used as a reference point. The concluding chapter discusses in detail efficiency based on the results presented in this report and provides an account of the problem of measurability of EIE.

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THEME A

ENVIRONMENTAL INSPECTION AND ENFORCEMENT FROM AN OVERALL PERSPECTIVE

Chapter 2
Municipal environmental inspection and enforcement today – analysis of a survey for municipal environmental managers

Adam Jacobsson and Håkan Källmén

2.1 Introduction

Inspection and enforcement according to the Environmental Code is an important tool for achieving the objectives of the Environmental Code – a sustainable development. Most of the Swedish environmental inspection and enforcement (EIE) is carried out by municipal committees. Therefore, it is important to understand how and under what conditions municipal EIE is conducted throughout the country. Previous studies (see e.g. Johannesson et al, 1999; Johannesson & Johansson, 2000; Bengtsson, 2004) have found that municipal EIE varies between different parts of the country in terms of the scope, the direction as well as the quality of the work. Naturally the fact that there are differences does not need to be a problem in itself, as both operators and their local environments vary. However, if the differences, for example, are due to different interpretations of the Environmental Code, a lack of resources at the EIE authority, political influence on the EIE with respect to compliance etc., both the efficiency of EIE and rule of law can become weakened. For the EIE to have the intended effect, it must, as previously mentioned, be both efficient (see chapter 12 for a discussion) and in compliance with the rule of law.

We have conducted a survey study aimed towards the heads of inspection and enforcement activities under the Environmental Code at all municipal environmental departments in 2010 to get an updated picture of municipal EIE. Of the 290 municipalities, 155 responded, giving a response rate of 53%. When we analyse the non-respondents, we cannot find any systematic differences between responding and non-responding municipalities. In other words, it appears that the responding municipalities are relatively representative of the whole of Sweden. The survey confirms the results from earlier studies by demonstrating significant differences between municipal inspection and enforcement in accordance with the Environmental Code regarding resources, scope, political influence etc. Furthermore, we can see certain patterns in the EIE that we will discuss further on in this chapter. We will present the survey respondents' answers in the categories *"Organisation and resources", "EIE implementation", "Government support, control and guidance", "Political influence"* and will conclude with a summary.

This chapter is a summary of the study by Jacobson & Källmén (2012), and those interested are advised to read this for a more detailed account and analysis of the EIE survey.

2.2 Organisation and resources

In this section, we focus on how the EIE activities are organised and how the needs and available resources for EIE vary across Swedish municipalities.

2.2.1 Organisational aspects of municipal environmental inspection and enforcement

On a municipal level, the municipal committee is the operational EIE authority and has at its disposal an administration (department) that performs the actual EIE. The committee, which is responsible for EIE according to the Environmental Code, may take different forms depending on the municipality in question. In their survey studies (e.g. SKL, 2011), The Swedish Association of Local Authorities and Regions has divided the different types of committees into the following five categories, which we have also used in our survey study:

1) Committee in which building, environmental and/or planning matters are included.
2) Environment and public health committee.
3) Committee in which the environment is included together with rescue or property matters or engineering.
4) Municipal executive board or municipal executive committee.
5) Other committee.

Since 1992, the municipalities can decide on their internal organisation (Johannesson & Johansson, 2000). Prior to 1992, a special regulated and independent environmental committee with its own administration was required. The number of merged committees and departments has increased after this regulation ceased to exist. In 1993, 72% of the municipalities had a separate environment and public health committee, while the figure in 1999 was 39% (ibid) and today it is about 22% (SKL 2011[2]). The corresponding figures for an independent environment and public health department were 68% in 1993, 42% in 1999 (ibid), and approximately 24% in 2011 (SKL 2011).

In addition to mergers within a municipality, it is possible for municipalities to cooperate with each other in the field of EIE, for example, by forming a local federation. Local federations are, in principle, independent of their member municipalities, see chapter 3 §§ 20-28 of the Swedish Local Government Act. Another form of inter-municipal collaboration is to build a joint environmental committee, which unlike a local federation is not a separate legal entity. A joint committee is part of the political organisation at one of the member municipalities that is then called the host municipality.

[2]The data is supplemented with information from the municipalities' websites.

In previous research (see, e.g. Johannesson & Johansson, 2000) and in our own work, indications became apparent that the form of committee and departmental organisation can affect the implementation of EIE. We will return to how different forms of organisation co-vary with different variables in the analysis below.

In addition to the different kinds of committees and departments, municipalities can be grouped, according to SKL (2011), into the following municipality categories:

1) Major cities,
2) Suburban municipalities to major cities,
3) Large cities,
4) Suburban municipalities to large cities,
5) Commuter municipalities,
6) Tourism and visitor trade municipalities,
7) Manufacturing municipalities,
8) Rural municipalities,
9) Municipalities in densely populated regions,
10) Municipalities in sparsely populated regions.

We have merged the major cities category with the large cities category to avoid presenting individual municipalities.

Committee organisations and municipality categories are two different organisational characteristics that can be assumed to affect the conditions for a municipality's EIE. There are, of course, other possible aspects that might affect these conditions. For example, the nature of the specific delegation order from committee to department, how the department is organised, the attitude of the head of (the part of) the department dealing with EIE, etc. In the following analysis, we will make use of both the committee organisation and the municipality categories in our analysis of EIE's conditions, implementation and outcome.

2.2.2 Need for environmental inspections and enforcement

In this report, we only have the respondents' answers to work from concerning how many activities[3] are covered by EIE according to the Environment Code in a municipality. This is obviously not a complete description of the EIE requirements in a municipality, but can still give an idea of the size of the need. Furthermore, these statistics are relatively easy to collect, at least for EIE objects with a need for recurring EIE, since chapter 1 §7, in the Ordinance on Environmental Inspection and Enforcement requires a register to be kept of these objects of EIE. The following questions were asked in the survey:

[3] By activities we mean, unless otherwise stated, activities that can have environmental and/or public health related consequences and that are regulated by the environmental code. Examples of such activities can be factories, petrol stations, mines etc.

12. HOW MANY ACTIVITIES, COVERED BY EIE ACCORDING TO THE ENVIRONMENTAL CODE DID YOUR MUNICIPALITY HAVE IN 2010?[4]

Type of activity	Respondents	Min	Max	Mean	Standard deviation
A-activities	60	0	12	2.3	2.6
B- activities	121	1	130	20	21
C- activities	132	6	910	80	103
U- activities with a fixed annual fee	85	0	794	72	115
Other U- activities	106	3	1521	247	301
Notifiable public health activities	118	0	1480	107	162

Table 2.1: Number of activities covered by EIE. Source: EMT survey.

We can see that the number of activities covered by EIE varies greatly between municipalities where, for example, the number of other U-activities varies between 3 and 1521.

As there is no easy way for operational EIE authorities to get a picture of the number of other U-activities, this statistic must be considered to be relatively uncertain. As expected, the table confirms that there are relatively few A- and B-activities, while the number of C-activities, U-activities and notifiable public health activities are significantly greater. In addition to the number of respondents, the table also shows min, max, and mean values standard deviation. Standard deviation is a statistical measure (the average deviation of an observation from the mean of all observations) where a high value indicates a large variation among the observations and vice versa. Below we can see how the sum of the above types of activities are divided between the different municipality categories:

[4]The wording of the survey is unfortunate as the aim of the question was to see how many different kinds of activities were covered by EIE within the municipality. The way in which the question is phrased, there is a risk that respondents included activities that are under inspection by the county administrative board. For obvious reasons, this risk is greatest in terms of A and B activities. However, comments in the surveys indicate that most respondents have interpreted the question as if it applies to the activities for which the municipal committee has EIE responsibility.

Municipality category	Respondents	Min	Max	Mean	Standard deviation
Suburban municipalities to major cities	18	33	903	285	207
Large cities	12	292	3815	1310	947
Suburban municipalities to large cities	10	43	1170	337	325
Commuter municipalities	21	58	1778	370	479
Tourism and visitor trade municipalities	11	50	800	328	280
Manufacturing municipalities	22	74	1055	368	307
Rural municipalities	10	25	670	211	187
Municipalities in densely populated regions	17	202	1169	427	262
Municipalities in sparsely populated regions	9	90	598	292	182

Table 2.2: Number of activities covered by the Environmental Code per municipality category. Source: EMT survey.

Not surprisingly, the table shows that large cities on average have the largest number of activities that require EIE while rural municipalities have the least.

Moreover, different municipality categories can be assumed to have a different number of activities per capita. For example, it is possible to envisage that larger cities have relatively more activities that are considered not to require recurring inspections, such as administrative activities in the private and public sectors, than e.g. rural municipalities. Let us see how the number of activities covered by EIE per 1 000 residents differs between different municipality categories:

Municipality category	Respondents	Min	Max	Mean	Standard deviation
Suburban municipalities to major cities	18	2.1	12	7.5	3.2
Large cities	12	4.7	34	12	8.3
Suburban municipalities to large cities	10	2.4	38	18	12
Commuter municipalities	21	2.3	40	16	11
Tourism and visitor trade municipalities	11	4.0	75	32	27
Manufacturing municipalities	22	3.8	57	22	17
Rural municipalities	10	3.6	96	29	27
Municipalities in densely populated regions	17	6.5	30	16	7.6
Municipalities in sparsely populated regions	9	4.8	31	12	8.1

Table 2.3: Sum of activities subject to EIE per 1000 inhabitants. Source: EMT survey and SKL.

As we suspected, the table shows that e.g. tourism and visitor trade municipalities, rural municipalities and manufacturing municipalities tend to, on average, have a higher presence of activities covered by EIE per 1000 inhabitants. Obviously, this can have implications for the funding of EIE, especially if it comes from municipal taxes.

The number of activities or activities per 1000 inhabitants, as previously mentioned, is not a perfect measure of a municipality's EIE needs but should provide a rough estimate. Naturally, other circumstances such as the EIE requirements of individual activities, the vulnerability of the local environment etc. affect the individual municipality's EIE requirements. For example, a geographical concentration of a certain type of industry increases a municipality's EIE requirement without necessarily being reflected in the number of activities under EIE. For future research, such statistics should be systematically collected in order to produce a coordinated overview of the Swedish environmental inspection needs.

2.2.3 Available resources

According to SEPA (2001, p.13), resources for the operational EIE authority should *"...be of such a size that the authority, through inspections and informative work, can enforce compliance with the law to such an extent that it becomes possible to promote sustainable development."* According to chapter 1. § 11, the Ordinance on Environmental Inspection and Enforcement, it is the committee that decides on both an investigation of the need for EIE and a plan for implementing EIE where the former constitutes the basis

for the committee's application for funds at the municipal council. Apparently, there are evaluations both from the committee and from the municipal council, which may vary across municipalities. This is, of course, reasonable if these differences are due to actual facts, but more doubtful if they are due to differences in e.g. the committee's and/or the municipal assembly's expertise, environmental ambitions, industry considerations, etc.

A measure of how much resources that are available for EIE on a municipal level is the number of actual full time annual environmental and public health inspectors. It should be noted that the statistics also include annual workers who work with EIE in the other sections of the law, for example, the Food Act. The measurement is therefore not ideal for solely measuring resources for EIE. The table below shows the average number of actual full time annual workers per municipality category (note that this is not data from the EMT survey).

Municipality category	Respondents	Min	Max	Mean	Standard deviation
Suburban municipalities to major cities	32	1.0	21	8.5	4.8
Large cities	32	12	101	25	18
Suburban municipalities to large cities	17	1.5	8.4	4.1	2.0
Commuter municipalities	37	1.0	15	4.4	3.4
Tourism and visitor trade municipalities	20	1.5	24	5.9	5.4
Manufacturing municipalities	41	1.6	18	5.4	3.4
Rural municipalities	18	0.5	5.0	2.3	1.3
Municipalities in densely populated regions	26	2.0	21	8.1	4.8
Municipalities in sparsely populated regions	14	1.8	9.0	5.1	2.2

Table 2.4: The number of actual annual full time environmental and public health inspectors. Source: SKL's personnel and wage statistics with respect to 2010.

The table illustrates the large variation in the actual number of full time annual workers between municipality categories where, for example, large cities have an average of about 25 annual workers while rural municipalities have an average of only 2.3. This is, of course, not surprising, as the need for EIE in a large city is far greater than in a sparsely populated municipality. However, the small scale on which the environmental department in a rural municipality operates can be a problem in itself. This can manifest itself in that the department can be very sensitive to disruption (e.g., due to illness and parental leave)

and that each inspector must have an extensive knowledge in order to maintain a good quality of EIE.

Besides the fact that small scale operations are susceptible to disruptions and their personnel cannot be specialised, the size of the workforce does not say so much in itself, but must be set in relation to the EIE requirement (which happens in the inspection plans). A rough measure of the EIE requirement is the number of activities that the municipal committee inspects (see question 12 of the EMT survey), another is the population of the municipality. Let us first see how the actual number of full time annual workers per 1000 inhabitants is distributed among the different municipality categories:

Municipality category	Respondents	Min	Max	Mean	Standard deviation
Suburban municipalities to major cities	32	0.05	0.39	0.24	0.08
Large cities	32	0.12	0.34	0.23	0.06
Suburban municipalities to large cities	17	0.13	0.58	0.27	0.11
Commuter municipalities	37	0.18	0.76	0.31	0.12
Tourism and visitor trade municipalities	20	0.27	0.69	0.44	0.12
Manufacturing municipalities	41	0.17	1.37	0.34	0.21
Rural municipalities	18	0.07	0.53	0.28	0.11
Municipalities in densely populated regions	26	0.09	0.68	0.31	0.11
Municipalities in sparsely populated regions	14	0.21	0.42	0.28	0.06

Table 2.5: The number of actual full time annual environmental and public health inspectors per 1000 inhabitants.
Source: SKL's personnel and wage statistics with respect to 2010.

We can see that larger cities have the lowest average with 0.23 ± 0.02 (mean ± 95% confidence interval[5]) actual full time annual workers per 1000 inhabitants, while tourism and visitor trade municipalities have the highest average of 0.44 ± 0.05. Thus, tourism and visitor trade municipalities do, on average, have significantly more (at a 5% confidence level) actual annual full time workers in relation to their population than larger cities. Here it seems likely that this relationship is driven by extreme differences in

[5]The interpretation of a confidence interval in this context is that the "true" value lies within the confidence interval with a probability of 95%.

population size rather than larger cities investing relatively less in EIE. Another possible explanation for this is that tourism and visitor trade municipalities have a great need for food inspections. The number of activities covered by EIE per capita is generally higher in rural and tourism and visitor trade municipalities than in larger cities according to table 2.3. Let us see how the ratio between actual annual workers and the number of activities that require EIE is[6] distributed between different municipality categories:

Municipality category	Respondents	Min	Max	Mean	Standard deviation
Suburban municipalities to major cities	17	0.01	0.14	0.038	0.032
Large cities	12	0.01	0.05	0.025	0.012
Suburban municipalities to large cities	9	0.01	0.13	0.031	0.040
Commuter municipalities	18	0.01	0.18	0.041	0.042
Tourism and visitor trade municipalities	11	0.01	0.09	0.029	0.028
Manufacturing municipalities	20	0	0.07	0.023	0.019
Rural municipalities	10	0	0.06	0.019	0.017
Municipalities in densely populated regions	16	0	0.05	0.022	0.013
Municipalities in sparsely populated regions	8	0.01	0.06	0.029	0.017

Table 2.6: The number of actual full time annual environmental and public health inspectors per activity under the Environmental Code. Source: SKL's personnel and wage statistics with respect to 2010 and EMT survey.

We can note that the difference between major large cities and the tourism and visitor trade municipalities almost completely disappears. On the other hand, commuter municipalities now have the highest mean value of 0.04 and rural municipalities the lowest at 0.02. When we use the measure actual full time annual worker per activity, we see a tendency that larger municipalities have higher mean values than when we use the measure actual full time annual workers per 1000 inhabitants. A possible explanation for this is that there are more activities per capita in thinly populated municipalities than in densely populated municipalities (see table 2.3). Another possible explanation is that larger municipalities could have more activities that require inspection. In an analysis of the relationship between the total number of activities per 1000 inhabitants and the actual number of full time annual workers per 1000 inhabitants, we found a weak correlation of 0.153 that was significant at the 10% level. Consequently, there is a weak relationship between the number of activities per 1000 inhabitants and the actual number of annual

[6]The total number of reported activities from question 12 in the EMT survey.

full time inspectors per 1000 inhabitants. This is not surprising as the sum of activities does not take into account the degree of EIE that the different types of activities require. In the future, it would be interesting to be able to investigate the amount of EIE resources that the different types of activities actually require.

2.2.4 Cost recovery requirements for EIE

The municipal EIE has two possible sources of funding, municipal taxes provided by the municipal council and/or EIE fees paid by the operators. If funding is provided through taxes, this naturally burdens all members of the municipality via their taxes while EIE fees only affect operators that are being inspected. An obvious advantage of financing via EIE fees is that the EIE budget, at best, adapts automatically to the EIE requirement. Another advantage is that the cost of inspection is covered by the operator causing the requirement for an inspection in line with the polluter pays principle. One possible disadvantage is that if there are political (or other) demands for a high degree of fee funding of EIE, EIE operations may be guided toward activities that generate monetary income rather than environmental benefits, which goes against the objective of the Environmental Code. In order to get a clearer picture of the above problems, we asked the following question in the survey:

7. IS THERE A POLITICALLY EXPRESSED REQUIREMENT/OBJECTIVE OF COST RECOVERY FOR EXERCISING AUTHORITY WITHIN THE AREAS OF ENVIRONMENTAL AND PUBLIC HEALTH PROTECTION?

	Respondents	Percentage of respondents (%)
Yes	39	28.1
No	100	71.9

Table 2.7: Policy objective for cost recovery. Source: EMT survey.

Table 2.7 shows that just under a third of the respondents have a political objective for cost recovery of EIE. For the municipalities that have responded and that have a political objective of cost recovery, the level is on average about 65% and the median value is 62.5%. There is no clear pattern for how the politically set target of cost recovery is distributed between different committee types. Nor can we see any patterns in the distribution between different municipality categories. This could possibly be a consequence of the relatively few respondents who answered this question (for obvious reasons, as only about 30% of all municipalities even have politically set targets on cost recovery). SKL (2011) asked the question of how large a cost recovery the municipalities themselves estimate that they reached in 2010 in the areas of environmental protection, health protection, and food protection. For obvious reasons (all municipalities can estimate their cost recovery, without necessarily having a political requirement), the response frequency here is higher, but even here it is not possible to see any clear patterns in the degree of cost recovery between different municipality categories. In summary, there are no strong indications of any clear pattern in the relationship between municipality categories or committee types and cost recovery for EIE.

We can conclude that most municipalities do not have a political target for cost recovery and for those who do, the level of ambition for these varies. The question now is whether, and if so, this target variation for cost recovery correlates with the implementation of EIE. Thus, the following question was asked:

8A. IF THE ANSWER TO QUESTION 7 WAS YES (REQUIREMENTS FOR COST RECOVERY), DOES THE REQUIREMENT/TARGET OF COST RECOVERY AFFECT EIE ACTIVITIES UNDER THE ENVIRONMENTAL CODE IN TERMS OF: THE POSSIBILITY TO WORK TOWARDS THE OBJECTIVE OF THE EC, I.E.THE ENVIRONMENTAL OBJECTIVES?

	Respondents	Percentage of respondents (%)
Yes, positive	6	16.2
Yes, negative	13	35.1
No	18	48.6

Table 2.8: The impact of the political cost recovery requirement on the ability to work towards the environmental objectives.
Source: EMT survey.

49% (±16%) of the respondents (confidence intervals in brackets) believe that cost recovery requirements will not affect the work towards the objectives set out in the EC while 35% (± 15%) believe that they does so in a negative way and the remaining 16% (± 12 %) believe that they have a positive impact. Thus, there is a statistically significant difference (confidence intervals do not overlap) between the size of the share of those who answered “no” and those who answered “yes, positively”; other differences are not statistically significant. Below we see some comments from respondents:

> *“Demands on high cost recovery could have an impact on the possibility of working towards environmental goals.”*
>
> *“One downside is that too much of our time is spent calculating rates, discussing fees and the per cent of cost recovery. The risk is that we end up not discussing the important strategic environmental issues.”*
>
> *“Only targeting operations which entail a fee, nothing else.”*

The comments indicate that on account of cost recovery requirements, EIE may be driven by budgetary rather than environmental concerns. As mentioned earlier, a system of solely tax-funded EIE should not have this problem. A definition of efficient EIE could be to conduct EIE that provides the greatest environmental impact per monetary unit, tax or fee. If only the cost is taken into account and no environmental benefit, there is a risk of the EIE being ineffective. Accordingly, this problem is in conflict with the principle that the operator shall bear the costs of inspection (the polluter pays principle). At the same time, we should remember that a majority of the respondents believe that the cost recovery requirements do not affect the work towards the environmental objectives, which is why we should be careful not to jump to any clear-cut conclusions about the

possible effects of the requirements. Furthermore, we asked how the requirement for cost recovery affects:

8B. THE POSSIBILITY OF IMPLEMENTING PLANNED EIE ACTIVITIES?

	Respondents	Percentage of respondents (%)
Yes, positive	16	43.2
Yes, negative	3	8.1
No	18	48.6

Table 2.9: The effect of a political cost recovery requirements on the possibility of implementing planned EIE activities. Source: EMT survey.

Once more, we see that almost half of the respondents do not consider the requirements to have an effect. Among respondents who believe that the requirements have an effect, we see that the demands for cost recovery are considered as favourable for the opportunity of implementing planned EIE activities, which is not surprising as the revenues and costs are relatively predictable. In order to get a picture of the effect on event-driven EIE, we asked the following question:

8C. THE POSSIBILITY TO IMPLEMENT EVENT-DRIVEN EIE ACTIVITIES?

	Respondents	Number of total respondents (%)
Yes, positive	4	10.8
Yes, negative	14	37.8
No	19	51.4

Table 2.10: The effect of a political cost recovery requirement on the possibility of implementing event-driven EIE activities. Source: EMT survey.

Just over half of the respondents believe that political requirements do not have any effect. Among the other respondents, a majority believe that the opportunities to conduct event-driven activities are adversely affected by the cost recovery claim. This result is in contrast to the previous table, which showed a more positive effect of the requirements on the opportunity to conduct planned activities. It is likely that the possibilities of charging fees from event-driven inspection are more uncertain than for planned inspection activities and also usually require more time to administer.

8D. THE POSSIBILITY TO CHOOSE THE BEST POSSIBLE EIE METHOD?

	Respondents	Percentage of respondents (%)
Yes, positive	5	13.5
Yes, negative	10	27.0
No	22	59.5

Table 2.11: The effect of a the political cost recovery requirement on the opportunity to choose the best possible EIE method. Source: EMT survey.

The above table shows that 60% of the respondents do not believe that the political cost recovery requirement affects the opportunity to choose the best possible EIE method. Among the other respondents, the table indicates that municipalities believe that cost recovery requirements have a more negative than positive impact on the possibilities of choosing the best EIE method. When political cost coverage is considered to affect how the EIE is carried out, it is usually then perceived as favourable for planning but reduces the possibility of event-driven activities.

Other comments on the effects of political requirements for cost recovery of EIE:

> *"With demands for an increased self-financing ratio, [there] can be a risk that some inspection types are given a low priority."*
>
> *"Nothing definite has been said about cost recovery. However, in 2010 (and to some extent still) we had so few resources that we must prioritise what we can charge."*
>
> *"In order to get as efficient an organisation and activities as possible, it is necessary to analyse concepts such as assignment, risk, ... etc. Cost coverage is a requirement for efficient inspection."*
>
> *"All issues are affected by the total available resources. The more resources, the more positive – of course. The higher the target for the degree of cost recovery, the more negative it is for the work."*
>
> *"When work is to be done for cost recovery, this may result in these issues being prioritised, regardless of events or plans. Planning activities cannot take place when work needs to be done for cost recovery."*
>
> *"The demand for cost recovery can take over as a priority criterion in a situation where the forecasted outcome does not mean budget fulfilment."*

The above comments enhance the perception that even if more resources are good for EIE activities, there is a risk that the concentration on EIE is too much governed by the income possibility rather than EIE needs. It should be noted that the number of responses to question eight was small, which means that the results should be interpreted with care. However, the conclusions are partly strengthened by the comments to the question and the discussions that have been held by EMT, among others, with our reference group and other officials involved in environmental inspections. Operators subjected to annual fees also expect something in return from the EIE authority, which also affects the focus of the EIE.

2.2.5 Professional experience (competence)

It came to light during EMT's work that some municipalities find it difficult to retain experienced environmental inspectors. The figure below shows how the average professional experience (the number of active years in the profession) among personnel

who work with EIE according to the Environmental Code is divided between municipal administrations.

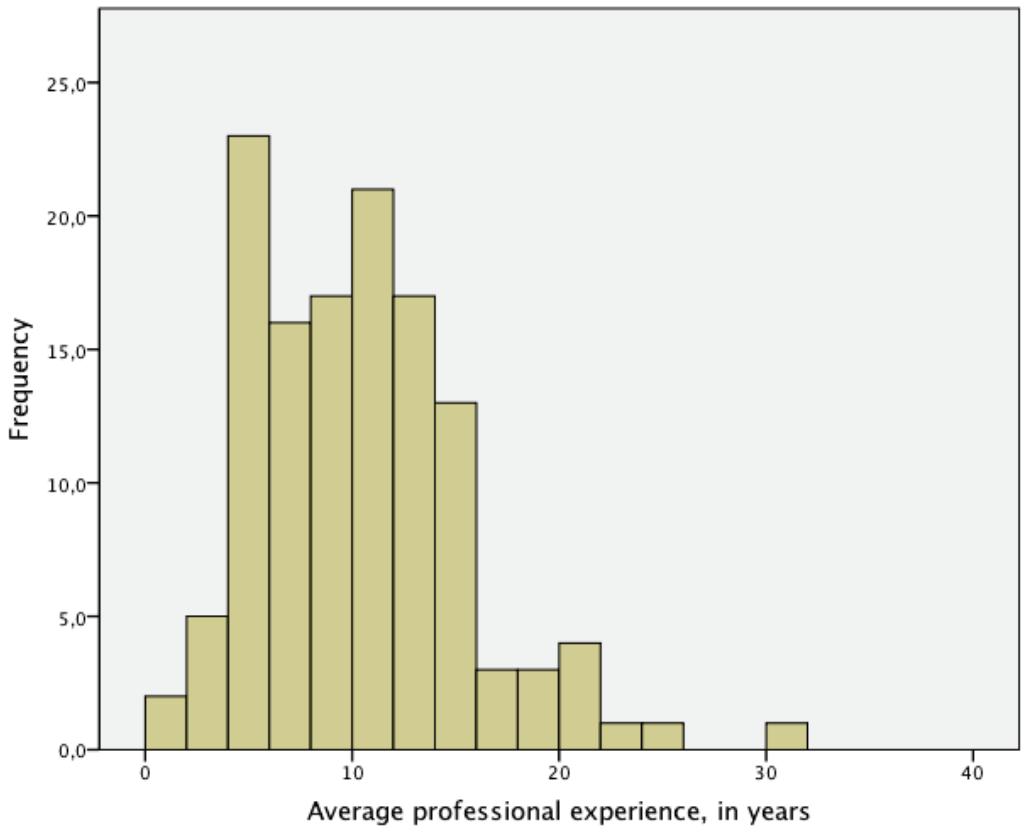

Figure 2.1: Average professional experience. Source: EMT survey.

The average inspector in Sweden has about 10 years of professional experience, yet the figure also shows a wide range between the municipality with the least (one year) and the most (31 years) average professional experience among inspectors. The municipal environmental managers have told EMT that it may be problematic to retain environmental inspectors. In cases where the turnover of inspectors is high, it takes a great deal of time to constantly train new inspectors. Therefore, it would be interesting with data for the turnover rate of environmental inspectors; however, we do not know whether such data currently exists. In the table below we can see how the average professional experience is divided between different municipality categories.

Municipality category	Respondents	Min	Max	Mean	Standard deviation
Suburban municipalities to major cities	18	5.0	14	9.7	2.9
Large cities	11	4.0	15	10	3.2
Suburban municipalities to large cities	11	2.0	14	7.8	4.0
Commuter municipalities	19	4.0	16	10	3.9
Tourism and visitor trade municipalities	11	2.0	19	6.2	4.7
Manufacturing municipalities	22	1.0	20	8.4	4.6
Rural municipalities	10	1.5	31	15	9.2
Municipalities in densely populated regions	16	3.0	20	9.8	4.7
Municipalities in sparsely populated regions	9	8.0	22	14	5.2

Table 2.12: Average professional experience per municipality category. Source: EMT survey.

Tourism and visitor trade municipalities have the lowest mean value of 6.2 years, while rural municipalities have the highest of 15 years, and municipalities in sparsely populated regions have the second highest of 14 years. Other municipality categories lie around 10 years. We can note that the standard deviation of the average professional experience is highest among the rural communities and lowest in suburban municipalities of large cities and larger cities. This is not surprising since the larger municipalities, with more inspectors, are better prerequisites and are in a better situation to have a more stable personnel supply situation than smaller municipalities with few inspectors. This illustrates the problem with small EIE authorities. Even if the mean value for a municipality category is relatively high and the standard deviation is relatively low, such as in larger cities and suburban municipalities, this does not necessarily mean a simple staff-supply situation. It is perfectly possible to have a high mean value and a low standard deviation, and at the same time have a high turnover of personnel which has negative effects when employees must constantly be trained. In a discussion with a municipal environmental manager in a commuter municipality, the manager said that personnel turnover was high when the inspectors were often “on their way somewhere else”, for example to a major city.

Another way of illustrating the distribution of professional experience among municipality categories is to calculate the ratio between the municipality categories’ mean value and standard deviation. A high value can be interpreted as favourable (high mean

value and a low variance). Another way of illustrating the distribution is to calculate the percentage of municipalities with a mean value lower or equal to e.g. five years of professional experience per municipality category where a large concentration of relatively inexperienced inspectors would probably be problematic. Table 2.13 shows the distribution of these two alternative measures between municipality categories:

Municipality category	Respondents	Mean value divided by standard deviation	Share of municipalities with a mean value ≤ 5 years (%)
Suburban municipalities to major cities	18	3.3	11
Large cities	11	3.1	9
Suburban municipalities to large cities	11	2.0	27
Commuter municipalities	19	2.6	16
Tourism and visitor trade municipalities	11	1.3	64
Manufacturing municipalities	22	1.8	32
Rural municipalities	10	1.6	20
Municipalities in densely populated regions	16	2.1	25
Municipalities in sparsely populated regions	9	2.7	0

Table 2.13: Alternative measures of distribution of professional experience. Source: EMT survey.

We can, for example, see that larger cities and suburban municipalities to large cities have advantageous values in both measures (a high value in the first measure and a low value in the other). At the other end of the distribution, we have the tourism and visitor trade municipalities, rural municipalities and manufacturing municipalities. Johannesson & Johansson (2000, p 130) asked in their survey directed to municipal officials, “Is it a difficult problem to maintain a high level of expertise in all EIE areas?”. The responses gave a similar picture as that received by EMT, namely that about 70% of the respondents replied to the question in the affirmative and that the problem is more common in small municipalities.

2.3 EIE implementation

In addition to the amount of resources invested in EIE, the way in which the EIE authority uses the resources is also important for the implementation and outcome of the EIE. First, we are interested to see where, i.e. the types of activities supervised. Then, we analyse in which way the EIE is conducted, for example, in terms of the share of unannounced inspections. Finally, we look at how the municipal administrations measure

the outcome of the EIE and to what degree they use a formal follow-up of non-conformity with the Environmental Code.

2.3.1 Where are inspection resources used?

One aspect of EIE implementation is the EIE authority's choice of which activities are to be inspected. There are both self-initiated EIE where the EIE authority takes the initiative to carry out EIE in different forms and event-driven EIE where external factors, such as reported cases, that control the EIE authority's choice of EIE object. In order to gain an initial general overview of how the environmental administrations' EIE work is distributed between different types of activities, we asked the following question in the survey:

13. "HOW MANY [OF YOUR] ACTIVITIES WERE SUBJECTED TO EIE (ACTIVE CONTACT WITH THE OPERATOR THROUGH E.G. TELEPHONE CALLS, READING OF TEST RESULTS, ENVIRONMENTAL REPORTS, INSPECTION VISITS, ETC.) IN ACCORDANCE WITH THE ENVIRONMENTAL CODE IN 2010?"

Type of activity	Respondents	Min	Max	Mean	Standard deviation
A-activities	30	0	9	2.1	2.3
B-activities	88	0	120	19	20
C-activities	108	3	294	44	48
U-activities with a fixed annual fee	63	0	289	38	53
Other U-activities	78	0	600	69	111
Notifiable health protection activities	91	0	1310	53	146

Table 2.14: Performed EIE. Source: EMT survey.[7]

Even here, we see a large variation between municipalities. In order to clarify the environmental administrations' inclination to perform EIE per activity type group, table 2.15 shows the ratio between the number of activities that have been subjected to EIE (question 13) and the number of activities that are covered by EIE (question 12). Here the distribution is very skewed where a few municipalities do a great deal of EIE and the majority a little.

[7] Environmentally hazardous activities are classified according to The Ordinance concerning Environmentally Hazardous Activities and Public Health (1998:899) where the ranking in terms of potential environmental impact corresponds to the scale A-U where A-activities have the greatest impact.

Type of activity	Respondents	Min	Max	Mean	Standard deviation
A-activities	21	0.33	1.0	0.94	0.16
B-activities	76	0.0	1.0	0.84	0.28
C-activities	92	0.08	1.0	0.58	0.26
U-activities with a fixed annual fee	46	0.14	1.0	0.53	0.30
Other U-activities	57	0	1.0	0.27	0.24
Notifiable public health activities	75	0.02	1.0	0.36	0.26

Table 2.15: Performed EIE divided by the number of activities. Source: EMT survey.

Table 2.15 above shows that the average values for EIE, in principle, are falling from A-activities down to other U-activities (where notifiable public health activities are second last). Broadly, it appears that the frequency of EIE follows the classification of environmentally hazardous activities under the Ordinance (1998:899) concerning Environmentally Hazardous Activities and Public Health.

Note, however, that the standard deviations are relatively large, which means that we cannot draw any clear-cut conclusions about the frequency of the inspections. Here the distribution is also very skewed where a few municipalities perform a great amount of inspections while the majority only perform a few.

In our data file, we observed that eight municipalities had values above one in at least one of the categories in tables 2.15 and/or 2.17. This indicates that these municipalities may have misunderstood questions 13 and 14 and stated the number of EIE efforts and the number of inspections instead of the number of activities that received EIE/inspection. In order to correct this, we have removed these municipalities from the analysis in tables 2.14-2.17. Naturally, there still exists a risk that there are municipalities that have misunderstood the questions, but still have not received a value above one and therefore have not been removed from the analysis. For this reason, the reader should interpret the results in paragraph 2.3.1 with caution.

Furthermore, we want to know how frequent the actual site inspections were in 2010. Question 14 examines:

14. HOW MANY ACTIVITIES (UNDER THE ENVIRONMENTAL CODE INSPECTION) DID YOU INSPECT ON SITE IN 2010?

Type of activity	Respondents	Min	Max	Mean	Standard deviation
A-activities	25	0	51	4.3	11
B-activities	84	0	82	13	15
C-activities	111	2.0	105	27	23
U-activities with a fixed annual fee	62	0	372	32	61
Other U-activities	81	0	238	32	41
Notifiable public health activities	97	0	264	26	47

Table 2.16: Number of activities inspected on site. Source: EMT survey.

We can note fewer inspections in categories A and B. In order to get an idea of the types of objects that were given priority in terms of inspections, we have drawn up a table with the ratio between the number of inspections and the number of activities.

Business group	Respondents	Min	Max	Mean	Standard deviation
A-activities	17	0.00	1.0	0.88	0.28
B-activities	73	0.00	1.0	0.63	0.32
C-activities	97	0.06	1.0	0.42	0.23
U-activities with fixed annual fee	46	0.00	1.0	0.38	0.26
Other U-activities	61	0.00	0.77	0.19	0.18
Notifiable public health activities	81	0.01	1.0	0.28	0.22

Table 2.17: The number of activities inspected on-site divided by the total number of activities per activity group. Source: EMT survey.

The above table indicates that A-activities on average receive visits almost once every year, B-activities receive visits about two out of three years, C-activities and U-activities with a fixed annual fee receive visits at least every third year, other U-activities receive visits every fifth year and notifiable health activities are visited almost every third year. Broadly, it appears that the inspection tendency, exactly as the EIE tendency, follows the classification of environmentally hazardous activities under the Ordinance (1998:899) concerning Environmentally Hazardous Activities and Public Health.

Once again, we can observe very large variations between municipalities. This indicates that there is great variation in the way in which EIE is carried out in Sweden. It would be interesting to understand the reason for the instances where the inspection frequency is so

extremely low. We have analysed whether there are any clear patterns between the type of committee or municipality category and the inspection frequency but did not find anything significant.

2.3.2 How is EIE conducted? – EIE methods

PLANNED INSPECTIONS OR EVENT-DRIVEN?

Inspection visits can be either planned or event-driven. Question 16 examines the distribution between these two inspection types:

16. ESTIMATE THE SHARE OF UNPLANNED (EVENT-DRIVEN) VISITS OF ALL INSPECTIONS CARRIED OUT

Respondents	Minimum	Maximum	Mean	Standard dev.
112	1	90	29.27	23.556

Table 2.18: The share of unplanned visits (%). Source: EMT survey.

The table shows that on average 29% of all inspections were event-driven although the variation is quite substantial. Johannesson & Johansson (2000, p 152) had a corresponding average share of 21%, i.e. slightly lower and also found a large variation between municipalities. The below figure shows the distribution of the share of unplanned visits between municipalities:

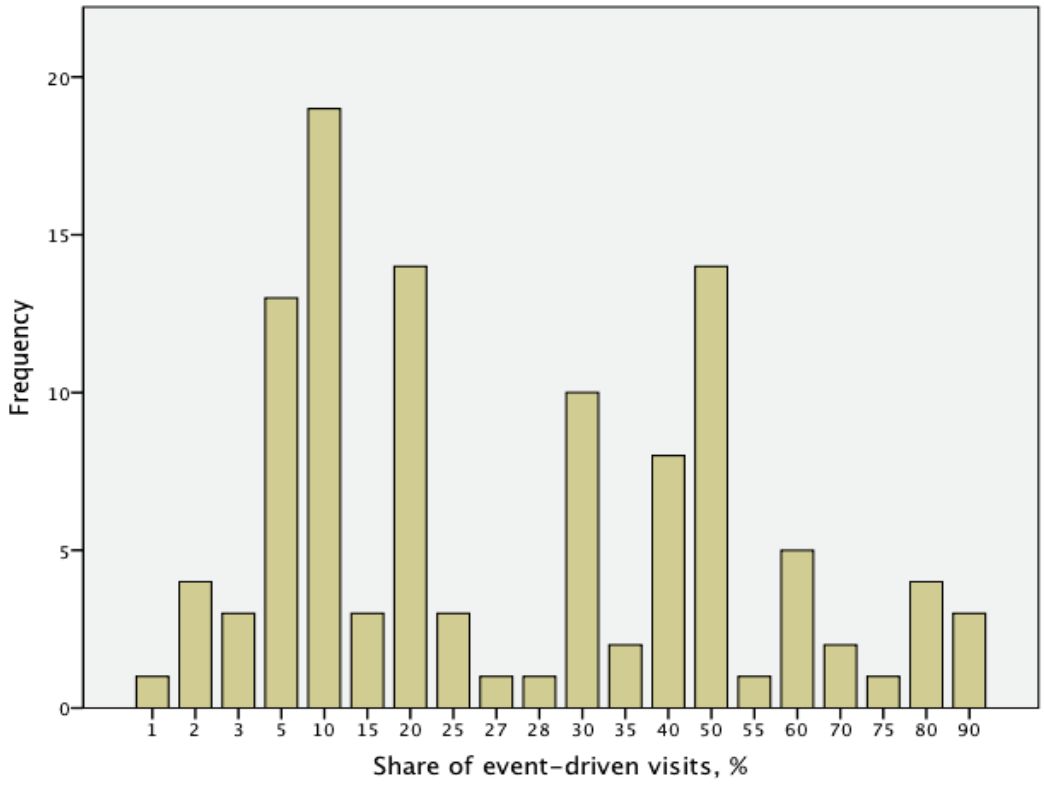

Figure 2.2: Share of event-driven visits (%). Source: EMT survey.

The distribution of the share of event-driven visits seems to be bimodal (two peaks in the distribution) with a concentration around 10 per cent and around 50 per cent. How does the share of event-driven visits differ between different municipality categories?

Municipality category	Respondents	Min	Max	Mean	Standard deviation
Suburban municipalities to major cities	14	5.0	70	29	19
Large cities	9	5.0	60	22	20
Suburban municipalities to large cities	11	5.0	80	33	24
Commuter municipalities	18	2.0	60	24	18
Tourism and visitor trade municipalities	8	5.0	90	49	34
Manufacturing municipalities	18	2.0	90	20	21
Rural municipalities	9	1.0	80	44	30
Municipalities in densely populated regions	16	5.0	80	28	20
Municipalities in sparsely populated regions	8	2.0	75	35	25

Table 2.19: The share of event-driven inspection visits per municipality category (%). Source: EMT survey.

For example, the estimate of the share of event-driven visits is , on average, smaller in larger cities compared to the tourism and visitor trade municipalities and rural municipalities. In addition, the variation is generally greater in smaller than in larger municipalities. Both these inspection characteristics agree well with Johannesson & Johansson (2000). As also mentioned in the study, procedures are required to ensure that planned activities should not be forced out by emergency, unplanned events.

PREARRANGED OR UNANNOUNCED INSPECTIONS

Although the procedures may affect the ratio of planned to unplanned inspections, it is natural to assume that the EIE authority can more easily influence the share of unannounced inspections than the share of event-driven visits. Accordingly, the share of unannounced inspections is more an expression of the inspection strategy used by the EIE authority, where a high share indicates a “tougher” strategy. A prearranged visit has the advantage that it is easier to meet the right people at the operator's business, for example, the environmental manager. An obvious disadvantage of a prearranged visit is that the operator, in appropriate cases, has time to “clean up” before the visit by the

environmental administration. The below table shows the allocation of the share of preannounced visits in relation to all planned visits, which corresponds to question 17 in our survey:

17. ESTIMATE THE UNANNOUNCED VISIT SHARE IN RELATION TOALL PLANNED IMPLEMENTED INSPECTIONS?

Respondents	Minimum	Maximum	Mean	Standard dev.
93	0	70	15.59	15.059

Table 2.20: The share of unannounced visits (%). Source: EMT survey.

We can see that the variation between municipalities is large and that the average share of unannounced visits in relation to all planned visits is quite low at 16%. This shows a clear tendency towards preannounced visits. Figure 3 illustrates the distribution of the share of unannounced visits between municipalities.

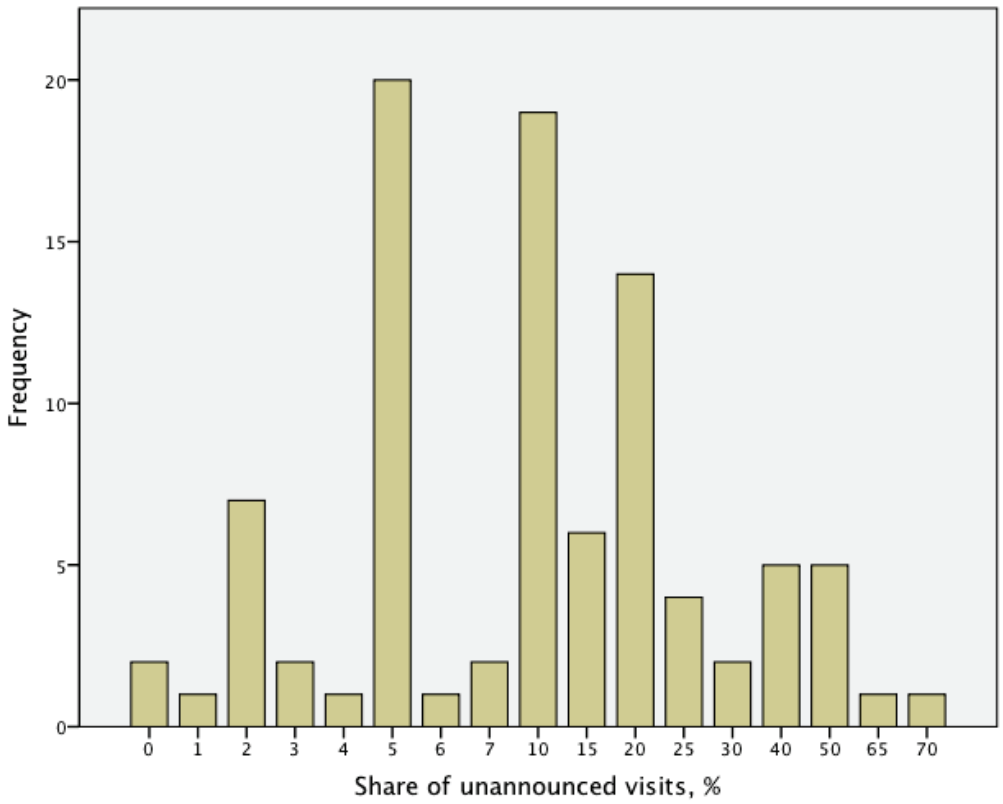

Figure 2.3: Share of unannounced visits (%). Source: EMT survey.

The figure shows that numerous municipalities have a low share of unannounced inspections, while a few have a significantly higher share. In their investigation, Johannesson & Johansson (2000, p.156) found an average share of unannounced inspections amounting to 34 %, i.e. more than twice as many as today. The same study also found that smaller municipalities had a tendency to have a higher share of

unannounced visits, while the opposite was true for large municipalities. Let us see whether this pattern remains today.

Municipality category	Respondents	Min	Max	Mean	Standard deviation
Suburban municipalities to major cities	10	5.0	50	17	14
Large cities	8	5.0	50	14	16
Suburban municipalities to large cities	9	0	20	9.1	7.6
Commuter municipalities	16	0	40	12	13
Tourism and visitor trade municipalities	5	10	50	26	18
Manufacturing municipalities	15	2.0	50	15	12
Rural municipalities	9	1.0	65	26	23
Municipalities in densely populated regions	15	2.0	25	12	8.2
Municipalities in sparsely populated regions	5	3.0	70	22	28

Table 2.21: Share of unannounced inspection visits in relation to all planned implemented inspections per municipality category (%). Source: EMT survey.

The table shows that the share of unannounced visits is the smallest in suburban municipalities in relation to major cities, municipalities in densely populated regions and major cities. However, there is no clear pattern indicating that the smaller is the municipality, the greater is the share. The variance is so large that no certain interpretation can be given. In summary, there are some similarities to the pattern in Johannesson & Johansson (2000). However, there seems to be a general trend today to make fewer unannounced visits as compared to 12 years ago.

CAN WE THEN SEE ANY DIFFERENCES REGARDING THE SHARE OF UNANNOUNCED VISITS BETWEEN DIFFERENT COMMITTEE TYPES?

Political body	Respondents	Min	Max	Mean	Standard deviation
Committee in which building, environmental and/or planning matters are included	51	0	70	16.0	15.4
Environment and public health committee	19	0	50	11.6	11.8
Committee in which the environment is included together with rescue or property matters or engineering	4	7	50	23.0	18.8
Municipal executive board or municipal executive committee	4	5	50	21.2	20.2
Municipalities in sparsely populated regions	15	3	65	15.7	15.9

Table 2.22: Share of unannounced inspection visits from all planned implemented inspection visits per committee type (%). Source: EMT survey.

From the table, we can see that separate environmental and public health committees have the lowest average share of unannounced visits (11.6 ± 14%) while merged committees generally have a slightly higher share (16 ± 10%). This indicates that when only the share of unannounced visits is concerned, it appears that separate environmental and health committees conduct a "softer" inspection style. However, this difference is not statistically significant at the 5% level.

SYSTEM EIE, DETAILED EIE AND INFORMATION AND ADVICE

EIE can also be divided into the following types: *system EIE, detailed EIE, information and advice* (NV 120814).

The objective of *system EIE* is to control the operator's self-inspection. Self-inspection helps the operator understand how the business affects the environment and provides procedures to ensure legislative compliance.

Detailed EIE implies a review of the direct environmental impact of the business and its regulatory compliance. This type of EIE is also referred to as "traditional" EIE.

Information and advice can be given to facilitate legislative compliance. For example, information about a new law can be issued to one or more operators through, for example, addressed mailings or information meetings.

System and detailed EIE are largely controlling EIE, while information is not. Naturally, there can be informative elements in both system and detailed EIE. In order to get an idea of how municipal EIE is divided over these EIE types, we asked the following question:

9. ESTIMATE SHARE (IN TERMS OF TIME) OF THE ADMINISTRATION'S EIE THAT IS CARRIED OUT IN ACCORDANCE WITH THE ENVIRONMENTAL CODE (SUM MUST EQUAL 100%):
i system EIE (i.e., control of self-inspection of activities)
ii. detailed EIE
iii. targeted information/advice
iv. other, also state what

The answers were divided as presented in the table below:

Inspection type	Respondents	Min	Max	Mean	Standard deviation
System EIE	69	0	80	33.8	20.6
Detailed EIE	69	0	95	40.3	23.1
Targeted information/advice	69	0	85	14.7	12.1
Other	69	0	80	11.1	16.2

Table 2.23: Share of EIE time per inspection type (%). Source: EMT survey.

The above table shows that information is the least used EIE method while system and detailed EIE are used approximately twice as much. Johannesson & Johansson (2000, p 157) found that the share of system EIE in Swedish municipalities was, on average, 21%. Respondents in the latter study also indicated that they thought the share of system EIE would increase on account of the new self-inspection ordinance and that many operators are not yet ready for system EIE. As can be seen in the above table, this has occurred with a share of approx. 34%. It is worth noting that Johannesson & Johansson observed that a dozen or so respondents did not know what system EIE was, which indicates a lack of common nomenclature. It is remarkable that, twelve years later, even EMT encountered environmental managers with different perceptions of what this term meant, which suggests that there is still a need of a common "EIE language" among operational EIE authorities.

The table below shows the corresponding mean values divided by committee categories.

Political body	Type of EIE	Respondents	Min	Max	Mean	Std. dev..
Committee where building, environmental and/or planning matters are included.	System inspection	42	2.0	80	33	19
	Detailed Inspection	42	0	95	41	21
	Targeted information	42	0	40	15	9.4
	Miscellaneous	42	0	60	11	15
Environmental and health protection board.	System inspection	15	10	70	40	21
	Detailed inspection	15	0	80	43	22
	Targeted information	15	0	20	10	6.1
	Miscellaneous	15	0	25	6.7	9.0
Committee where environment is included along with rescue or property matters or engineering.	System inspection	3	0	50	18	28
	Detailed Inspection	3	5.0	15	8.3	5.8
	Targeted information	3	10	85	37	42
	Miscellaneous	3	10	80	37	38
Municipal executive board or municipal executive committee	System inspection	1	20	20	20	-
	Detailed inspection	1	20	20	20	-
	Targeted information	1	10	10	10	-
	Miscellaneous	1	50	50	50	-
Other board	System inspection	7	5.0	75	37	26
	Detailed inspection	7	10	85	42	29
	Targeted information	7	5.0	30	16	7.5
	Miscellaneous	7	0	20	4.29	7.9

Table 2.24: The proportion of EIE time for different types of EIE per municipality category (%). Source: EMT survey.

From table 2.24, we can initially see a large variation between minimum and maximum values, which further emphasises the variation in Swedish EIE. We can also see that the proportion of information is, on average, higher for merged committees than for separate environmental and public health committees. With a 95% confidence interval, the separate public health and environmental protection committees estimate that 10 (±15)% of the EIE is information while committees where the environment is included along with rescue, property matters or engineering estimate that 37 (±56)% of EIE consist of information. Where the environment is combined with building/planning, the information share is 15 (±11)%. On account of the wide spread of the figures, we cannot comment on any statistically significant differences. However, we can see a tendency that merged committees provide more information than control relative to the environmental and public health committees. Such a tendency is anticipated and discussed in chapter 4, section 4. A greater use of informative as compared to controlling EIE methods fits into the description of a "soft inspection" discussed earlier. However, earlier we saw an indication that the independent environment and public health committees have a lower willingness to make unannounced visits, suggesting a "softer" inspection" (even if the difference was not statistically significant). Up until now we cannot see any consistent

pattern that specific types of committees would have a softer or harder EIE style than other committees.

2.3.3 Measuring the outcome of EIE

According to chapter 1. § 12 Ordinance on Environmental Inspection and Enforcement, an operational EIE authority, "*...annually follows-up and evaluates its EIE work*", in order to ensure that inspection is performed efficiently and in compliance with the rule of law. According to our knowledge, how an operational EIE authority should follow up its inspection activities is not defined in a more tangible sense in laws, regulations or other key documents. Moreover, the concept of efficient EIE lacks a uniform national definition in Sweden. Chapter 12 of this report discusses in detail how the concept of efficiency can be interpreted in an EIE context. Rule of law is based on the principle of equality before the law and here, there is no established way of following up on this in the case of EIE. In order to get a picture of how municipal operational EIE authorities measure the outcome of their EIE – an essential prerequisite for following up efficiency – we asked the following question in the survey:

18. HOW DO YOU MEASURE THE OUTCOME OF YOUR EIE?

	Respondents	Share of total respondents (%)
Do not use any measurements/indicators	52	40.3
Use measurements/indicators	77	59.7

Table 2.25: How is the outcome of EIE measured? Source: EMT survey.

We can ascertain that 60% use some form of measure/indicator to measure the performance of their EIE. It is unclear what the remaining 40% do. Naturally, there may be other ways than creating measures/indicators to evaluate the outcome of the EIE. However, it becomes problematic to compare different operational EIE authorities if such measurements are not available, which is a fact for 40% of the cases. Another prerequisite in order to make a comparison between operational EIE authorities is that the measure used is the same, i.e. it is defined and collected in a consistent manner. If the measure is clearly defined and consistently collected within an operational EIE authority, the data can, of course, be useful for evaluating the authority's own EIE over time.

Let us see some examples of units given by respondents who indicated that they use measures/indicators:

- Time spent on planned and event-driven EIE
- Percentage of inspected firms
- Number of inspections
- The number of started/completed cases
- The number of appeals where we made the wrong decision
- Concentration of Cd, Cr, Cu, Hg in sewage sludge, etc.
- Customer satisfaction index

From the respondents' answers, we can first state that there is no consensus about which measure to use – most municipalities use their own particular method. Second, we can note that most of the measures account for the amount of resources spent on EIE (the activity) rather than the outcome of the same. Some examples of this include "share of inspected firms", "the number of inspections" etc. We can also find measures that relate to the result – or the outcome– of the inspection, for example, "the number of appeals where we made the wrong decision", "concentration of Cd, Cr, Cu, Hg in sewage sludge, etc.". In discussions with, among others, environmental managers, it has emerged that the case management systems used at the municipal environmental offices are not designed for analysis, which makes it difficult to produce inspection data that can be used for evaluation within a municipality. The fact that these systems are different in different municipal administrations and that they do not "speak to each other" makes data collection to compare municipalities a very laborious task. It is not possible to generate data by "pressing a button".

One way of measuring the outcome of EIE is to look at the amount of formal follow-ups of failures to comply with the Environmental Code, e.g. the number of injunctions, environmental sanction charges and prosecution filings.

An *environmental sanction* charge (ESC) shall, pursuant to chapter 30, Environmental Code, be imposed for violations and with the amount set out in the Ordinance on Environmental Sanction Charges (2012:259). It does not matter whether the violation was intentional or not and it is sufficient to objectively ascertain that a violation has occurred (NV 2001).

An *injunction* means that *"...the person/operation that the decision targets must take the specified measure, otherwise there will be a case of neglect"*[8]. It is important that an injunction exactly details what is expected. Furthermore, the injunction can be combined with a penalty where the aim is to make it financially beneficial for those subjected to the injunction to follow the same (NV, 2001, p. 98).

An EIE authority is according to chapter 26. § 2 of the Environmental Code duty bound to report violations to the police or the prosecutor's office, if there is suspicion of a crime. The authority shall only report the actual facts without making any assessment of the likelihood of conviction (NV, 2001).

In order to get an idea of how the above formal follow-up of non-compliance with the Environmental Code is used by municipal committees, we asked the following question:

[8]National Encyclopaedia.

15. HOW MANY INJUNCTIONS, ENVIRONMENTAL SANCTION CHARGES AND PROSECUTION FILINGS ACCORDING TO THE ENVIRONMENTAL CODE DID YOUR COMMITTEE MAKE IN 2010?

Follow up	Respondents	Min	Max	Mean	Standard deviation
Injunctions	67	1	949	96.7	183
Environmental sanction charges	75	0	147	10.8	19.3
Prosecutions	84	0	27	5.38	5.49

Table 2.26: Injunctions, Environmental sanction fees and prosecution filings. Source: EMT survey.

Thus, on average, 97 injunctions, 11 environmental sanction charges and 5.4 prosecution filings were issued per municipality in 2010. It is worth noting the extreme variation between municipalities.

The amount of formal sanctions is not an unproblematic measure in order to capture the outcome of the inspection. A low number of injunctions can, for example, mean one of two things: either the environmental administration is extremely inefficient and does not identify non-compliance with the Environmental Code, or the administration is very good at its preventive environmental work so that there is no need for injunctions as all activities are managed in a perfect way. Despite this methodological difficulty, consistently collected data can help identify trends and raise “red flags” as a starting point for a further, deeper analysis of the reasons for changes. For a discussion of the availability of such data today, see chapter 3 of this report.

In our cooperation with the reference group of the research programme, it has been pointed out that environmental sanction fees are a poor indicator to show the outcome of environmental inspection and enforcement, as these are typically issued for simple misdemeanours. However, the number of ESCs might be considered as a measure of an environmental administration’s efficiency and level of ambition, where a high level of ambition should, all things being equal, tend to generate more ESCs and vice versa. In order to test the information value of the number of ESCs, we have analysed how these correlate with other measures of formal sanctions, in this case injunctions and prosecutions filings. The following table shows the correlations between the three measures among our respondents:

		Quantity of injunctions	Quantity of ESCs	Quantity of prosecution filings
Quantity of injunctions	Correlation	1	0.704**	0.376**
	Significance		0.000	0.005
	Observations	67	47	54
Quantity of ESCs	Correlation	0.704 **	1	0.369 **
	Significance	0.000		0.002
	Observations	47	75	67
Quantity of prosecution findings	Correlation	0.376**	00.369**	1
	Significance	0.005	0.002	
	Observations	54	67	84

**= the correlation is significant at the 1% level (two-sided)

Table 2.27: Correlation between ESCs, injunctions and prosecutions filings. Source: EMT survey.

We can see a fairly strong correlation between these measures. The strongest of these correlations is the one between injunctions and ESC (injunctions account for 50%[9] of the variation of ESC and vice versa). The second strongest correlation is between prosecution filings and ESC (about 14% of the variance are accounted for by the other variable, and vice versa). This indicates that the municipalities that are active with one of the above measures is also active with the other measures. However, this correlation is at least partly explained by the size of the municipality, i.e. a small municipality naturally has a lower number of the above measures than a large municipality. Let us look at how the above result stands up when we control for the number of activities (from question 12).

		Quantity of injunctions, /activities	Quantity of ESCs /activities	Quantity of prosecution filings /activities
Quantity of injunctions /activities	Correlation	1	0.287	0.018
	Significance		0.059	0.901
	Observations	64	44	51
Quantity of ESC/act	Correlation	0.287	1	0.353 **
	Significance	0.059		0.005
	Observations	44	70	62
Quantity of prosecution findings /activities	Correlation	0.018	0.353 **	1
	Significance	0.901	0.005	
	Observations	51	62	79

**= the correlation is significant at the 1% level (two-sided)

Table 2.28: Correlation between ESCs, injunctions and prosecutions filings (divided by the total of activities). Source: EMT survey.

[9]The strength of the correlation can be expressed in terms of an explanatory coefficient calculated by squaring the correlation coefficient.

Here, we see that the correlations become weaker, yet remain between ESC and injunctions as well as between ESC and prosecution filings.[10] Note that injunctions now only account for 8% of the variation of ESC. We now see no correlation between prosecution filings and injunctions. All in all, this means that the frequency of ESC in a municipality probably contains interesting information about the outcome of the EIE despite ESC only being issued for relatively basic non-compliance with the Environmental Code.

We have already noted that the tendency to use the aforementioned formal sanctions varies heavily between municipalities. Can we see a pattern in the use of injunctions, ESC and prosecution filings per activity between different committee types?

Political body	Sanction	Respondents	Min	Max	Mean	Std. dev.
Committee where building, environ-mental and/or planning are included.	Injunction	33	0.00	1.0	0.15	0.20
	ESC	31	0.00	0.09	0.024	0.023
	Prosecution filings	36	0.00	0.13	0.020	0.025
Environment and public health committee	Injunction	15	0.03	2.28	0.51	0.64
	ESC	21	0.00	0.07	0.021	0.018
	Prosecution filings	22	0.00	0.05	0.012	0.012
Committee where environment is included with rescue or property matters or engineering.	Injunction	2	0.07	0.19	0.13	0.084
	ESC	3	0.00	0.01	0.004	0.003
	Prosecution filings	3	0.00	0.03	0.014	0.015
Municipal executive board or municipal executive committee	Injunction	1	-	-	0.32	-
	ESC	1	-	-	0.005	-
	Prosecution filings	2	0.00	0.02	0.012	0.01
Other committee	Injunction	11	0.01	0.93	0.21	0.27
	ESC	12	0.00	0.08	0.026	0.023
	Prosecution filings	15	0.00	0.05	0.021	0.016

Table 2.29: Number of formal sanctions divided by the number of activities per committee type. Source: EMT survey.

When it comes to injunctions, we can ascertain that among our respondents, the category environmental and public health committee has a higher average value, 0.51, than the categories: committees where building, environment and planning matters are included, 0.15, and other committees, 0.21. Independent environmental and public health

[10]The total number of activities is based on estimates, which makes table 4.28 less reliable than table 4.27.

committees (95% confidence interval 0.51 ±0.32) appear to make use of injunctions much more than committees where building, environment and planning are included (0.15 ±0.07) and committees where the environment is included together with rescue, property matters or engineering (0.13 ±0.11). However, the confidence intervals overlap at the 5% level so that no firm conclusions can be drawn. For ESC and prosecution filings, we cannot see any clear pattern.

2.4 State support, control and guidance

Previous studies have found that there is a strong interest in more state guidance where, for example, Johannesson & Johansson (2000) found that approximately one third of the respondents would like a nationalised EIE with respect to compliance. Our reference group has pointed out that there is always an interest in more guidance while the real problem is a lack of resources to assimilate all information that already exists. In order to see how the situation stands today in terms of a desire for more state guidance, we asked the following question:

22. IS A HIGHER DEGREE OF STATE GUIDANCE FOR INSPECTION ACCORDING TO THE ENVIRONMENTAL CODE DESIRABLE?

	Respondents	Percentage of respondents (%)
No	4	3
Yes	129	97

Table 2.30: Desirable with a higher degree of state guidance? Source: EMT survey.

As is clearly evident from table 2.30, there is an overwhelmingly clear desire (97%) for more state guidance. Part of state guidance could include centrally developed checklists and /or support for inspectors to draw up relevant inspection points (see chapter 10 for a further discussion), which is why we asked:

19. WOULD CENTRALLY PRODUCED CHECKLISTS BENEFIT EIE ACCORDING TO THE ENVIRONMENTAL CODE?

	Respondents	Percentage of respondents (%)
No	13	9.9
Yes	118	90.1

Table 2.31: Would centrally produced checklists benefit EIE? Source: EMT survey.

Once again, there is a widespread desire for more support. Our reference group has pointed out that the inspector needs a high level of expertise to use checklists effectively. At the same time, the inspectors believe that it is primarily when you are new as an environmental inspector that checklists are necessary as you need a great deal of support in order to carry out inspections.

Municipal self-government has a long tradition and is strong in Sweden and, as previously mentioned, the forms of municipal organisation are largely a matter for the municipalities to decide. As a result, it is a politically sensitive issue to discuss an increased degree of state control of municipal EIE, despite the fact that the Environmental Code is a law instituted by Swedish Parliament and not by the respective municipal councils. For this reason, among others, we wanted to get a picture of how environmental managers regarded this issue:

21. IS A HIGHER DEGREE OF STATE CONTROL FOR EIE ACCORDING TO THE ENVIRONMENTAL CODE DESIRABLE?

	Respondents	Percentage of respondents (%)
No	70	55.6
Yes	56	44.4

Table 2.32: Desirable with a higher degree of state control? Source: EMT survey.

Here we see more than 44% of the respondents want a higher level of state control, despite the strong tradition of municipal self-government in Sweden. In the next section, we will return to the question of which municipalities, to a greater extent than others, have this preference. We can note clear differences between tables 2.30, 2.31 and 2.32 where state guidance and centrally developed checklists are significantly more desirable than state control.

2.5 Political influence

> "No agency, not even Parliament or a municipality's governing body may determine how an administrative authority in a specific matter shall decide in a case involving the exercise of public authority against an individual or against a municipality or which relates to the application of the law."
>
> Chapter 12, § 2 The Instrument of Government.

The above quoted section of law implies: among other things, that there shall be no political influence on the environmental administration's EIE of regulatory compliance in individual cases in a municipality. However, in previous studies, it has been ascertained that this occurs, often in the form of municipal politicians wishing that the environmental administration shall treat local firms "with kid gloves". For example, Johannesson & Johansson (2000) found that in about one third of the municipalities, political consideration influences the EIE concerning regulatory compliance. The proportion which indicated that political consideration occurs was 41% in municipalities where the environmental and public health committee and/or administration are merged with another committee/administration, compared to 23% in municipalities with their own environmental committee or environmental administration. From a political quarter, signals are given that the inspectors should tread softly and not take "unnecessary"

actions. Examples of undue political influence can be that politicians avoid deciding on sanction fees. These authors believe that in cases of political influence, it is often the case that politicians, especially in small municipalities, know the company leaders, and that they wish to safeguard jobs and the business climate. Johannesson & Johansson (2000) also found in their survey study that the proportion of respondents who wish to demunicipalise EIE related to regulatory compliance is twice as large in municipalities that responded that political considerations affect EIE as compared to municipalities where this is not the case.

Since 12 years have passed since Johannesson & Johansson wrote their report, it would be of interest to see whether any change has occurred in terms of political influence on the EIE of regulatory compliance. For this reason, we asked exactly the same question in our survey as Johannesson & Johansson, namely:

23. DOES IT HAPPEN IN YOUR MUNICIPALITY THAT POLITICAL CONSIDERATIONS INFLUENCE EIE CONCERNING REGULATORY COMPLIANCE?

	Respondents	Percentage of respondents (%)
No	95	73.6
Yes	34	26.4

Table 2.33: Do political considerations influence EIE in terms of regulatory compliance?
Source: EMT survey.

Of the respondents, we noted that over a quarter answered in the affirmative, which represents a slight reduction as compared to Johannesson & Johansson (2000). At the same time, the decrease is relatively small and the share who experiences political consideration is still remarkably high. This implies that there is a risk of the conditions for activities being different in different municipalities, which gives a poor compliance with the rule of law. At a presentation[11] of the survey results, a municipal environmental manager commented on this by saying that the Planning and Building Act provides much greater scope for economic consideration than what the Environmental Code provides. In municipalities where building and environmental issues are dealt with by the same committee and/or administration, there is a risk that a "planning and building culture" infects environmental issues. If this claim is correct, this means that the existence of political influence can be believed to be greater in municipalities where environmental issues are dealt with together with the building and planning issues (in the same committee). In order to see how the political influence varies between different committee types, we compiled the table below:

[11]Presentation at Environment and Health Days in June 2012, Stockholm University.

			Political body					
			Committee where building, environmental and/or planning matters are included	Environ-mental and public health committee	Committee where environment is included together with rescue or property matters or engineering	Municipal executive board or municipal executive committee	Other commit tees	Total
Political considera-tions influence EIE in terms of regulatory compliance	*No*	Num-ber	46	26	4	4	13	93
		%	68.7 %	86.7 %	80.0 %	100 %	61.9 %	73.2 %
	Yes	Num-ber	21	4	1	0	8	34
		%	31.3 %	13.3 %	20.0 %	0 %	38.1 %	26.8 %
Total		**Quan-tity**	**67**	**30**	**5**	**4**	**21**	**127**
		%	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**

Table 2.34: The presence of political consideration among different committee types. Source: EMT survey.

The above table shows that there are only five and four respondents, respectively, in the categories "Committee where environment is included together with rescue or property matters or engineering" and "Municipal executive board or municipal executive committee". As it is difficult to draw conclusions from such a small base, we will ignore these categories. A 95% confidence interval shows that the category "Environmental and public health committee" only has 13.3% (±12%) that respond that political consideration has an influence, while the categories "Committee in which building, environmental and/or planning matters are included" and "Other committees" show 31.3% (±11%) and 38.1% (±21%), respectively. This reinforces what has been said above about the risks that the building and planning culture contaminates EIE. Naturally, there may be other explanations for these differences. The differences in the presence of political consideration in terms of regulatory compliance between committee types is not statistically significant (the confidence intervals overlap) which is why we must be cautious in drawing conclusions from this data.

The corresponding argument about intermixing environmental and building issues can be made with regard to municipalities' administrative organisation. Municipal environmental managers that EMT has been in contact with and our reference group have pointed out the importance of a strong manager for EIE at a municipal administration level who can mark a boundary between policy and governance under the Environmental Code. A contributing factor to a strong position for the environmental manager on environmental issues may be an independent environmental and public health administration. Let us see how the presence of political consideration is distributed between different types of administrative organisations:

			Administration type					
			Administration in which building, environmental and/or planning matters are included	Environmental and public health administration	Administration where the environment is included together with rescue or property matters or engineering	Municipal management	Other administration	Total
Political considerations influence EIE in terms of regulatory compliance	*No*	Number	31	21	7	2	18	79
		%	67.4 %	87.5 %	58.3 %	100 %	75.0 %	73.1 %
	Yes	Number	15	3	5	0	6	29
		%	32.6 %	12.5 %	41.7 %	0 %	25.0 %	26.9 %
Total		**Quantity**	**46**	**24**	**12**	**2**	**24**	**108**
		%	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**

Table 2.35: The presence of political consideration among different administration types. Source: EMT survey.

The above table does, in principle, show the same picture as the corresponding table of political organisation where a separate environmental and public health administration shows a lower tendency towards political consideration than other administration categories (except municipal management that we ignore because of the small number of respondents in this category). It should be pointed out that the direction of the causality between political influence and committee and administration type is not obvious. One alternative may be that municipalities with a culture that lacks political influence on the inspection of regulatory compliance tend to maintain a separate environmental and public health committee (administration). Another alternative is that the municipalities with a separate environmental and public health committee (administration) develop a culture where this influence does not occur. This calls for more research.

In recent years, several environmental associations and a number of other formal collaborations in EIE between municipalities have been formed. One possible

consequence of such collaboration is that it becomes harder for politicians in a municipality to influence how the joint inspection of regulatory compliance is carried out in the common organisation. We cannot show any statistically significant difference in the frequency of political influence on EIE in terms of regulatory compliance between municipalities with and without a formal collaboration. This may be a consequence of a (too) small statistical base (of 18 identified formal collaborations only ten have responded to the survey).

We have received indications during the research programme that some municipal environmental managers feel a strong sense of frustration over political interference in EIE activities. We have previously shown that 44% of our respondents would like a higher degree of state control. Theoretically, an increase in the state control of EIE would strengthen the local environmental manager's position in relation to the political municipal management. In order to examine whether a preference for more state control coincides with the presence of political influence, we constructed the following table:

			Preference of a higher degree of state control		
			Yes	No	Total
Political consideration influences EIE in terms of regulatory compliance	*No*	Number	30	56	86
		%	34.9 %	65.1 %	100 %
	Yes	Number	23	10	33
		%	69.7 %	30.3 %	100 %
Total		**Quantity**	**53**	**66**	**119**
		%	**44.5 %**	**55.5 %**	**100 %**

Table 2.36: Connection between the preference for a high degree of state control and political consideration in the EIE of regulatory compliance. Source: EMT survey.

Table 2.36 shows that of the municipalities which answered that political consideration does not influence inspection in terms of compliance, 35% would like to have a higher degree of state control, while the remaining 65% do not want it. Of the municipalities which answered that political consideration does influence inspection in terms of compliance, the ratio is, in principle, the opposite, i.e. 70% would like to have more control, while 30% do not want it. This ratio indicates a strong correlation between the occurrence of political control and a preference for more state control. This result reinforces Johannesson & Johansson's 2000 results on a corresponding relationship between political influence and a preference to demunicipalise EIE with regard to compliance.

Many of those who answered question 23 also submitted comments about how political influence was expressed (of those who left comments, some answered yes to question 23, while others answered no). We present some of these below:

"Different kinds of EIE projects initiated by politicians. When there is an opportunity for interpretation in the law, the ruling can vary depending on the position of the political majority."

"A lack of resources, some operators are to be 'treated the right way.'"

"Economic, commercial policy interests have an influence."

"Small municipality – 'everyone knows everyone'. Economic difficulties with perhaps a risk that the district's only employer is threatened, means politics that can give way."

"Strong discussions regarding agricultural EIE. No political ambitions to work on some things, for example, shore protection, they want to politically override the current regulation system."

"It happens that operators contact politicians or the trade and industry department to question the demands we have made or to try to circumvent demands or claim that we are not business friendly, which the local politicians want to be."

"The committee prioritises certain areas and deprioritises others (agriculture, etc.)."

"Yes, human resources are controlled by the municipal executive board's decision."

"The politicians want us to be more flexible and accommodating."

"A lack of resources means that we must prioritise EIE for which costs can be charged. Poor support for EIE of independent sewers. However, the policy is not allowed to influence the actual EIE, the environmental insp [ectors] have a high integrity."

"Close proximity to relevant colleagues. – Kinder requirements/time perspective to municipal operations."

"For certain 'sensitive' matters, which are decided at the committee level, a 'broader political assessment' can be made."

"It's very unusual. But it has happened that politically very important areas are more difficult to manage especially just before an election and just after an election."

"It is a small municipality, so some consideration (political) must always be taken into account."

"More difficult to have EIE on in-house operations such as property, water and sewage, sanitation, roads and park, building, planning, environment are all within the same department. Integrated."

"Politicians on the committee take a commercial policy perspective."

"Political consideration influences how quickly you move forward with demands for action. This delays the process. Can also contribute to a wording of decisions that is more permissive."

"Priorities and deprioritising for approval of the annual EIE plan."

"We frequently get (inspection side) control from politicians to 'turn a blind eye" -> we must not chase away firms (many of which are Opportunist)"

"The heads of the Municipal executive board determine our salaries and, at times, are dissatisfied with requirements, prosecution filings, bans, etc. and punish us with frozen wages! = Conflict of interest..."

As can be seen from the comments, it is relatively common for commercial considerations to clash with EIE. At the same time, there are some comments where the political influence concerns the structure of the EIE plan (e.g. priorities of different EIE areas) which, in itself, need not depart from the essence of chapter 12. § 32 the Instrument of Government. After all, the committee is the authority responsible for the structure of the municipal inspection under the Environmental Code.

2.6 Summary

This study aimed at providing a characterisation of the Swedish municipal committees' operational EIE under the Environment Code, focusing on certain economic and organisational conditions and management and working method issues.

The first part of the analysis focused on the EIE's prerequisites in terms of EIE need, availability of resources, cost recovery requirements and professional experience where we found the following:

- We can see that the number of activities embraced by EIE varies greatly between municipalities. Tourism and visitor trade municipalities, rural municipalities and manufacturing municipalities tend to, on average, have a higher occurrence of activities embraced by inspection per 1000 inhabitants. This can have implications for the funding of EIE, especially if it comes from municipal taxes.
- Furthermore, we can see a large variation in the size of municipal environmental offices in terms of the number of actual full-time environmental and public health inspectors of between 0.5 to 101. We cannot see any statistically significant differences between the average values of municipality categories for the number of actual annual environmental and public health inspectors per activity subjected to EIE. Accordingly, we find it difficult to explain why some municipalities have many inspectors per activity while others have fewer.
- In some cases, political cost recovery requirements appear to reduce the environmental administration's possibility of working towards environmental goals, using the best EIE method and performing event-driven EIE. On the other hand, the requirements increase the possibilities of performing scheduled EIE. Although about half of the respondents believe that the requirements do not affect their EIE work according to the above questions, it seems that the requirements have a certain control effect on EIE. This trend is in line with Johannesson & Johansson (2000, p. 108), which points out that poor municipalities may need to "...give a lower priority to such EIE that is hard to make self-sufficient."
- The average professional experience measured in the number of active years in the profession among personnel who work with EIE according to the

Environmental Code at a municipal EIE authority is about 10 years in Sweden. The variation between municipalities in terms of average work experience is greatest in the category rural municipalities.

The second part of the analysis dealt with the EIE performance in respect to where EIE resources are utilized, EIE methods and measures of the EIE outcome. Here we found that:

- EIE frequency broadly follows the ordinance (1998:899) concerning environmentally hazardous activities and health protection where A-activities receive a relatively large amount of inspection, B-activities somewhat less etc. based on the activities' environmental risk, extent, etc. Answers to the survey also show a wide variation in EIE frequencies between different municipalities.
- According to the survey data, the proportion of event-driven inspection visits is on average 29% while there is a very large variation between municipalities. Larger municipalities tend to have a smaller proportion of event-driven inspection visits. In terms of the proportion of unannounced visits, the survey answers give an average of 16% against the previous 34%, which indicates a trend towards fewer unannounced and more pre-announced visits – a softer inspection style. The survey responses also showed that the proportions (of total EIE) for system EIE, detailed EIE, information and advice as well as other EIE were 34%, 40%, 15% and 11%, respectively. Even here, the variation between municipalities was substantial. This indicates a trend towards more system EIE.
- 40% of the respondent municipalities indicated that they do not have any measure/indicator of the outcome of EIE. Among the remaining respondent municipalities, many different measures are represented and there is no common measure for comparisons between municipalities. Many of the measures are aimed towards measuring utilised EIE resources (activity measure) rather than the outcome of EIE. However, there are measures that reflect the EIE outcome. The case management systems used in municipal environmental offices are not suitable for analysis, which makes it difficult for the administrations to simply and economically generate appropriate key performance indicators. Furthermore, the municipal case management systems are different and do not communicate with each other, which prevents a consistent and efficient reporting of key performance indicators to the EIE guidance authorities.
- Our survey data shows that there is a very large spread between the different tendencies for municipal EIE authorities to use a formal follow up of non-compliance with the Environmental Code in the form of injunctions, ESCs and prosecution filings. Data also indicates that independent environmental and public health committees have a greater tendency to use injunctions than the other committee types.

The third and fourth parts of the study analysed state support, control and guidance as well as political influence. The main results here were as follows:

- Almost all of our respondents would like checklists and guidance from a central source, while nearly half would like a higher degree of state control of the EIE. This indicates that EIE is a difficult and problematic area.
- Our data indicates that the presence of political influence on the EIE of regulatory compliance is lower in municipalities with an independent environment and public health committee and a separate environmental and public health administration. There is a significantly greater proportion of environmental managers who want more state control in the municipalities where the political influence on the EIE of regulatory compliance is perceived to occur than in municipalities where such influence does not occur.

The conclusion of our study is that the variation in the scope, focus and performance of EIE is large between municipalities and that EIE is influenced by factors such as the municipality's location, structure, and lack of state guidance and follow-up. In addition, EIE is affected by economic and political priorities.

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Chapter 3
Statistical evaluation of environmental inspections and enforcement

Gebrenegus Ghilagaber, Mathias Herzing, Eric Sjöberg

In the report "Statistics for evaluation of environmental inspections and enforcement in Sweden. An overview of available data and its usefulness" (Ghilagaber et al., 2011), EMT described the availability of relevant data and the statistical methods that are applicable in this context. This work has now been continued using this report as a starting point,.

Statistically evaluating environmental inspections and enforcement (EIE) is difficult in several respects. On the one hand, there is a lack of availability of comparable data. On the other hand, there are problems associated with measuring the inspection result. Consequently, there are obstacles to meaningfully evaluating EIE. This does not mean that it is impossible to try. The focus of this chapter is therefore on the analyses that can currently be carried out. A more thorough discussion of EIE efficiency is included in the final chapter of this report.

This chapter is structured as follows: Section 3.1 provides a brief presentation of the data that is currently available. Sections 3.2-3.5 present the results of studies that are examples of how the application of statistical methods to consistently collected time-series data can be used to follow up decentralized operational EIE. The final section summarises this chapter.

3.1 Existing statistics

Due to the accounting requirements imposed on county administrative boards, municipalities and other EIE authorities, raw data and in some cases also indicators for EIE activities can be found at the authorities. However, the structure and accessibility of such data differ. Efforts are also made in different environmental collaboration projects to increase the comparability between EIE authorities by using so-called key figures that attempt to measure the EIE work. Nevertheless, as pointed out by Nordin (2008), the information regarding the operational EIE that is available at municipalities, county administrative boards and other EIE authorities can be classified as statistics concerning EIE activities rather than statistics concerning EIE outcomes.

Access to nationally collected consistent (comparable) data related to EIE is poor, as previously mentioned. What is currently available and relevant can be divided into two

categories: descriptive statistics at a municipal and county administrative board level, and other data concerning the outcome of EIE.

3.1.1 Descriptive statistics

Statistics Sweden ("Statistiska Centralbyrån", SCB) provides demographic data as well as data concerning political conditions in municipalities and regions. SCB also compiles corporate statistics on existence and SIC code (Swedish Standard Industrial Classification). The Swedish Association of Local Authorities and Regions ("Sveriges Kommuner och Landsting", SKL) collects statistics on the number of hours worked for each environmental inspector for every municipality every year. SKL also has data on how EIE cooperation between municipalities is structured. This data is useful as background variables, or possibly as input variables if you wish to measure the effect and outcome of EIE. Some data, such as hours worked, could also be seen as a measure of the outcome of the inspection, but should rather be interpreted as a measure of on-going activity.

3.1.2 Statistics concerning the outcome of EIE

Since 2000, the Enforcement and Regulations Council ("Kammarkollegiet") has compiled statistics on the number of environmental sanction charges (ESC) and their size per decision authority, i.e. municipal committees, county administrative boards and central authorities such as the Swedish Chemicals Agency, the Swedish Environmental Protection Agency and the Swedish Board of Agriculture. For the country as a whole, data is also provided on ESC decisions regarding motive and category (e.g. concerning waste or electrical goods). On its website, the Environmental Protection Agency summarises these statistics in tables and diagrams showing the number and percentage of cases and the charges by type of EIE authority, motive etc. The available ESC data to some extent reflects the EIE activities of the different county administrative boards and municipalities.

For every ESC, there are details about the operator's corporate identification number, the size of the ESC, the authority issuing the ESC, the date of decision on the ESC, and also the cause of the ESC. This makes it possible to use the corporate identification numbers in the data to track a specific operator after the first ESC which, in turn, provides information about the scope and timeframe for a possible relapse, i.e. how likely it is that an operator who once paid an ESC in a given period is charged again, and how soon this happens. Currently, no more background information about operators is available, but such information can be extracted from other sources.

There is a number of other measures that can potentially be related to EIE activities. The Swedish National Council for Crime Prevention ("Brotssförebyggande Rådet", BRÅ) provides statistics on a regional level for different offence categories, including violations of the Environmental Code, specified according to the different paragraphs included in the Code. These statistics include the number of reported offences, cleared offences, decision types, prosecution decisions, summary impositions of fines or abstentions from prosecution, and clearance rates. There also exist time series of cleared offences, as well

as clearance rates and person-based clearance rates for the whole country since 2000, where offences against the Environmental Code are divided into 15 categories. BRÅ also has information on the number of reported crimes on a regional and municipal level regarding the number of environmental offences and different sub-classifications in this category, such as “offences against permits/ terms/ information” and “obstruction of environmental control”. However, BRÅ does not have any information about who reported the crime. Hence, it is unclear whether it is possible to link some of these categories directly to EIE activities, thereby obtaining an outcome measure, or if these variables are only a weak proxy.[12]

At the Unit for Environmental and Working Environment Lawsuits at the Swedish Prosecution Authority (“Riksenheten för miljö- och arbetsmiljömål”, REMA), which was established on January 1, 2009, it is possible to transcribe data concerning all environmental crimes in Sweden since 2006. In addition, a unit at the prosecutor's office in Gothenburg has data on all penal and prosecutional injunctions regarding environmental crimes.

Despite the above mentioned scarcity of data, we can still try to take maximum advantage of available statistics. The following sections present the results of data analyses conducted within the framework of EMT.

3.2 Survival analysis of relapse – a measure of ESC's preventive effect

The purpose of the study (Ghilagaber, 2012a) is to measure the effect of ESC on relapse. Effect is defined as a change that has occurred as a result of an action – which would not otherwise have occurred or would have occurred later in time. It is clearly no simple task to measure the ‘real effect’ as it can take time between action and behavioural change and, in the meantime, other factors may affect the operator's behaviour, regardless of the actions taken.

The EIE authorities use different indicators for the environment and the effect of actions on behaviour (compliance of regulations). A measure that has attracted international attention is recidivism or the degree of relapse – the proportion of operators that repeat environmental offences after being fined and the time it takes until a relapse occurs (INECE, 2008). However, currently, there is a lack of empirical studies on the effect of ESC on relapse, in particular studies using advanced statistical methods to analyse such relationships. Our hope is that this study contributes to fill this gap in the literature. We have applied statistical models and methods on data for relapse concerning about 11500 Swedish operators that were issued an ESC at least once between January 2002 and December 2011.

[12] A proxy is a variable that is not of interest in itself, but through which the variable of interest can be derived. For this to be possible, it has to be closely correlated with the proxy (however not necessarily positive).

Since 2000, the Swedish Environmental Protection Agency has compiled the statistics over ESC issued provided by the Enforcement and Regulations Council. An ESC is an administrative fee accruing to the government and it can vary between SEK 1000 and SEK 1000000. The Enforcement and Regulations Council has given us access to data since 2002, where each ESC can be linked to a corporate identification number.

The data material analysed in this study consists of 11492 cases (ESC decisions) between January 2002 and December 2011. Of these, 3498 decisions concerned operators that were once more issued an ESC (that is, relapsed) before December 2011. A summary of the data is shown in the table below.

ESC – amount	No. of activities	No. of relapses	% relapse	Relative risk
< SEK 5000	6021	1885	31.31	1
SEK 5000 – 10000	4153	1266	30.48	0.97
SEK > 10000	1318	347	26.33	0.85
Total	11492	3498	30.44	

Table 3.1: Distribution of analysed operators.

The table shows that of the 11492 cases (ESC decisions), 6021 (52.39%) were operators who were charged less than SEK 5000 for a previous offense, 4153 (36.12%) were operators who were charged between SEK 5000 and SEK 10,000 for a previous offense, while the remaining 1318 (11.47%) were operators who were charged more than SEK 10000 for a previous offense.

At the end of the follow-up period (December 2011), 3498 operators (30.44%) had relapsed. Of the 3498 relapses, 1885 (53.89 %) were from operators that had previously been issued an ESC lower than SEK 5000, 1266 (11.02 %) were from operators that had previously been charged between SEK 5000 and SEK 10000, while the remaining 347 (3.02 %) consisted of operators that had previously been charged more than SEK 10000. This gives us a first impression that the size of the ESC has a negative effect on the tendency to relapse. Thus, it appears that higher ESC lead to fewer relapses. Using statistical models and methods, it is possible to calculate the tendency to relapse and test whether the differences are statistically significant.

In order to model the relationship between ESC and the risk of relapse, we start by estimating survival functions (the probability of not relapsing within a specific time period after the ESC decision). The figure below shows *Kaplan-Meier* estimates of survival functions (Kaplan and Meier, 1958) across the size of the previous ESC. Once again, we see that the smaller the ESC, the higher is the likelihood of a relapse. A formal statistical test shows that the difference in survival curves is statistically significant, particularly the difference between the group with the lowest ESC (less than SEK 5000) and the group with the highest ESC (above SEK 10000). Other statistical models such as *Cox Proportional Hazards Models* and *Accelerating Failure Time Models* show a strong correlation between the size of the ESC and the tendency to relapse.

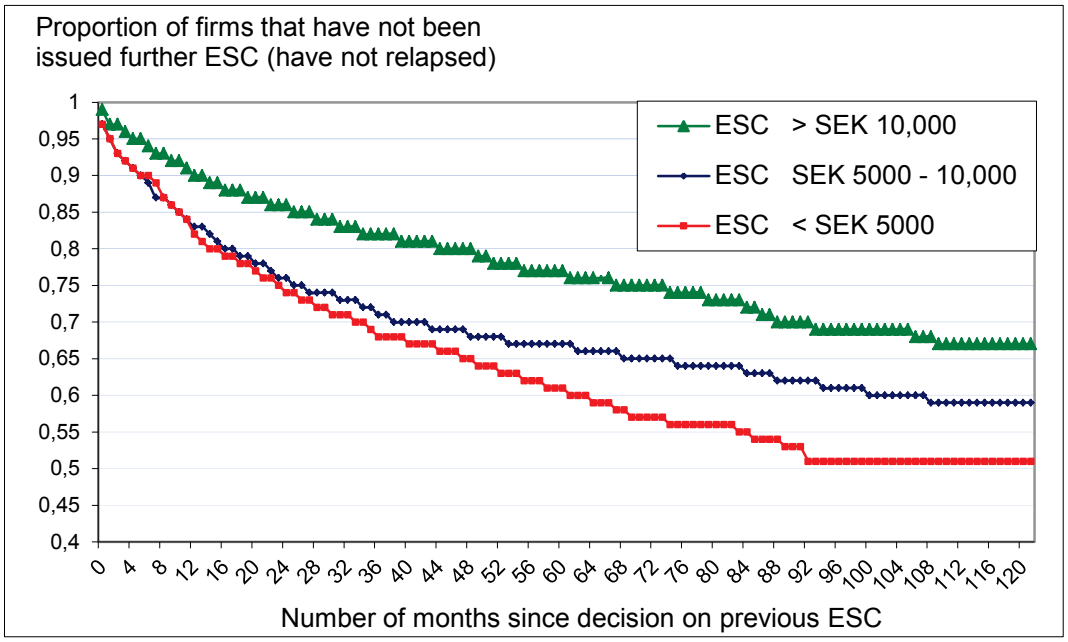

Figure 3.1: Survival functions for recidivism (relapse), by size of previous ESC, 2002-2011.

3.3 Bayesian analysis of recidivism with grouped data

A disadvantage of the aforementioned analysis is that the date in the data represents the authority's decision date (not the date of the operator's violation). Consequently, the time analysed above is the time between the two decision dates and not the time between the two violation dates. This does not cause any problem as long as we can assume that the time between the violation and the decision does not differ between cases. However, as this assumption cannot be guaranteed, this study (Ghilagaber, 2012b) groups time exposure into four groups – less than 2 years, 2-4 years, 4-6 years and 6-10 years – and then adapts a Bayesian grouped data version of the survival models.

ESC amount	< SEK 5000		SEK 5000 – 10000		SEK > 10000	
Exposure time (i)	(D_{i1})	(T_{i1})	(D_{i2})	(T_{i2})	(D_{i3})	(T_{i3})
< 2 years	1309	65,860	890	45,838	180	15,337
2-4 years	361	51,892	215	35,285	75	16,381
4-6 years	184	48,643	78	30,561	49	15,750
6-10 years	31	36,665	83	78,471	43	36,808

Table 3.2: Recidivism case (D_{ij}) and exposure time (T_{ij}), based on the size of the previous ESC; total: D_{++} =3498, T_{++} = 477491.

The results (see the figure below) show that the risk of recidivism decreases with time. The difference between the groups is largest within 2 years and lowest in the range 6-10 years.

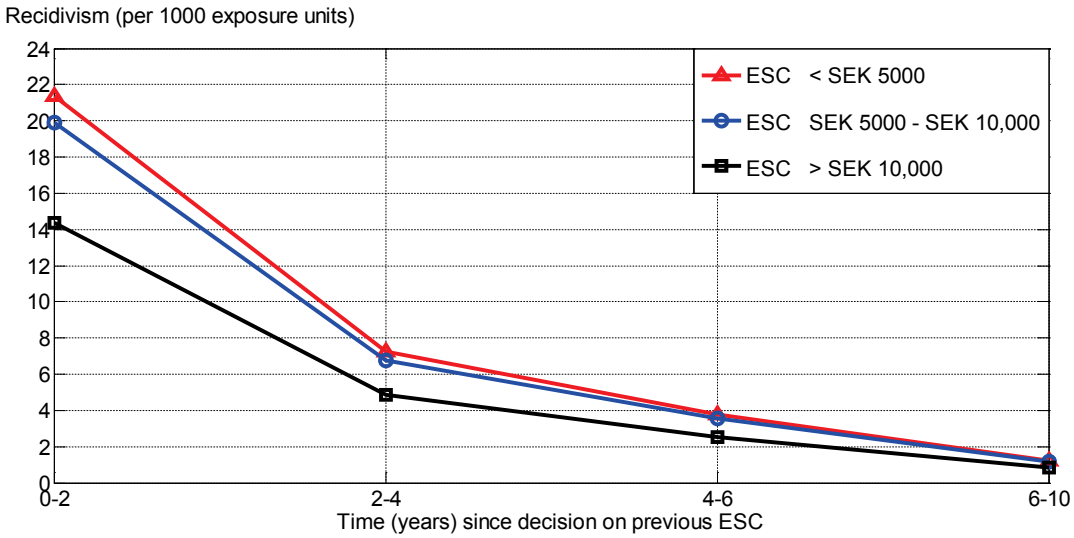

Figure 3.2: Basline hazards of relapse (per 1000 exposure units), by size of the previous ESC.

The below figure shows the distribution of the relative risks of recidivism according to the size of the previous ESC. The reference level is the category of operators issued an ESC above SEK 10000.

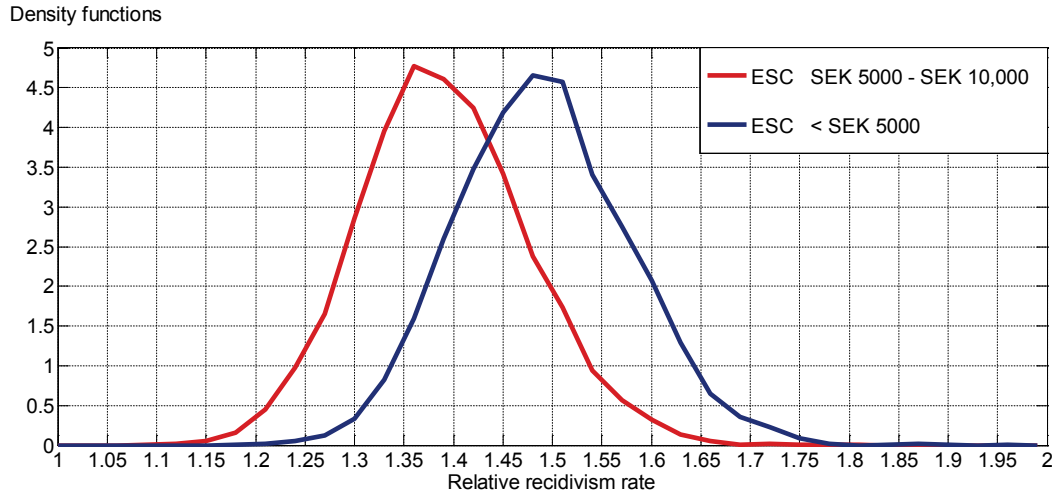

Figure 3.3: Posterior distribution of relative recidivism rates, across the size of the previous ESC (the reference group comprises operators previously charged more than SEK 10000).

Figure 3.3 shows that operators who were charged a lower sanction – between SEK 5000 and SEK 10000 (red curve) or below SEK 5000 (blue curve) – have a far greater relative risk (greater than 1) to relapse than those operators levied an ESC above SEK 10000. On average, the relative risk is approximately 1.35 (i.e. 35% greater) for operators issued an ESC between SEK 5000 and SEK 10000 and about 1.5 (i.e. 50% greater) for operators charged less than SEK 5000. Hence, there is no doubt that the size of the previous ESC is strongly correlated with the tendency to relapse. Therefore, we can conclude that the size of ESC has a strong preventive effect on the recidivism rate.

3.4 Measuring municipal disparities in EIE: Sweden 2000-2009

This study (Ghilagaber, 2012c) attempts to measure municipal differences in EIE in Sweden during the period 2000-2009 using different measures. Preliminary results based on CV (coefficient of variation, which is the ratio of the standard deviation and the mean value) are shown in the figure below, with respect to the total amount of ESC and the total number of ESC.

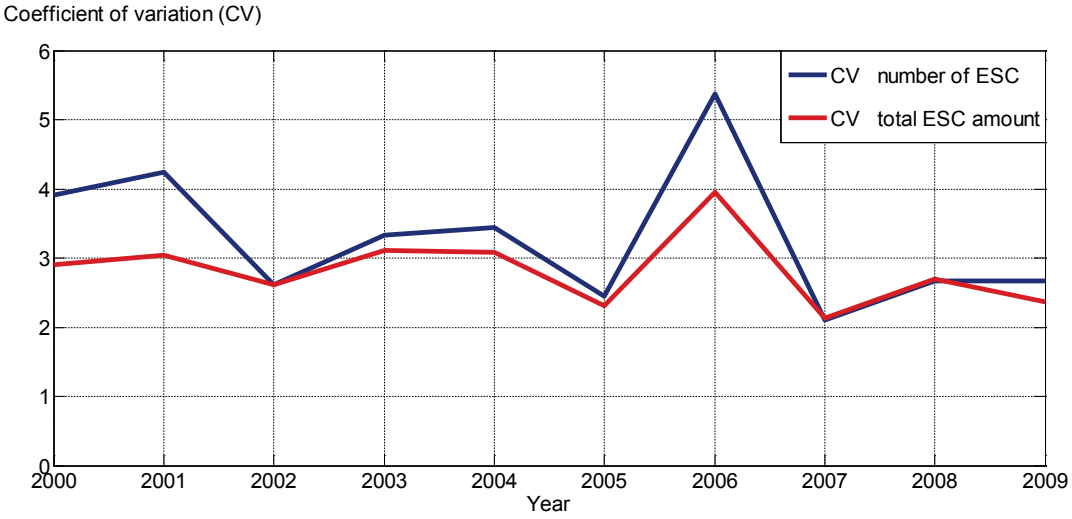

Figure 3.4: Municipal differences regarding the number of ESC and the total ESC amount.

The figure illustrates how both measures (the number of ESC and the total ESC amount) display similar trends, but that there has been some variability, especially in 2006, which needs to be further explored.

3.5 Political influence on ESC

The study "Political Influence on Environmental Sanction Charges in Swedish Municipalities" (Sjöberg, 2012) examines whether the political governance in a municipality can partially explain the enforcement of the Environmental Code. Naturally, political influence is only one variable that can help explain variation in EIE. However, given the available historical data associated with EIE, it is difficult to investigate other explanations for variations, for example, the merger of environmental and local building committees. Despite the fact that this study does not provide any significant methodological contribution, it can still be considered as a proposal for an easily implemented method to evaluate different outcome measures and explanations of EIE if the data supply were to be improved.

The number of environmental sanction charges (ESC), issued in Swedish municipalities during 2003-2010, was used as a measure for how the Environmental Code is applied. As the Green Party is the party in Sweden that is most strongly associated with environmental issues, political influence is defined as the Green Party's potential impact

on ESC when it has a strong political position in a municipality. The question can therefore be summarised as follows. “Is the number of environmental sanction charges in a municipality affected by the Green Party being a member of the governing coalition?”.

It should be emphasised that issuing ESC is only one of many possible consequences of EIE. However, it has been shown that the number of ESC correlates strongly and positively with other measures such as prosecutional notifications, which is noted in the survey presented in chapter 2. Hence, it cannot be claimed that ESC are completely meaningless as a measure for how the Environmental Code is applied. Nor does it seem to be the case that ESC are irrelevant from a political perspective. For example, politicians in Enköping and Filipstad were fined in court for failing to issue ESC. Other examples of politicians' direct and indirect influence can be found in Johannesson & Johansson (2000).

The statistical method used in this study is known as “Difference in Differences” (DiD). This is a panel data method[13] where changes within units over time are studied. In this case, municipalities that changed political majority after the 2006 election are used to see how the number of ESC changed at the same time. The variation in ESC comes from within a municipality and hence, it is not the variation between municipalities that is used to identify a potential impact. The advantage of this method is that other explanatory variables, which are static or change slowly within a municipality and which may affect the number of ESC as well as correlate with the explanatory variable, do not affect the estimate of the effect. In DiD, everything within municipalities that does not change over time (or changes very slowly) is “kept constant”. Hence, it is not problematic if, for example, the Green Party has a higher representation in municipalities with an industrial structure that automatically generates more ESC, as the industrial structure is a factor that changes slowly over time.

What can possibly interfere with the estimates of the effect are things that change within a municipality while a change in power takes place, and that also affect the ESC. It is difficult to imagine what these variables could be, but if changes in attitude regarding the environment occur at the same time as an election, it could be problematic. An example could be if environmental awareness is strengthened in a municipality while, at the same time, the Green Party becomes represented in the governing political majority. However, this would shift the effects towards zero and hence, the estimated effects can be seen as a lower limit for the true effect.

The results of this analysis are demonstrated in the graphs below. Figure 3.5 compares the average number of ESC in municipalities, in which the Green Party was represented in the governing coalition during the first term (2003-2006), but not during the second term (2007-2010) of office, with the average number of ESC in municipalities where the Green

[13] Panel data is a collection of statistics where a group of individuals has been observed over time. Data for the same individual, or, as in this case, the same municipality, is available at several different points in time.

Party was not represented during any term. In figure 3.6, municipalities where the Green Party was represented in the governing majority in the first but not in the second term of office are compared to municipalities where the Green Party was represented in the governing majority in both periods. Figure 3.7 shows the size of the effect estimated with DiD, where the years after the election have been added cumulatively over time. The number of ESC has been normalized in the graph to 10000 firms per municipality. This normalization has been done in several different ways (e.g. the number of firms in different industry sectors) without changing the results.

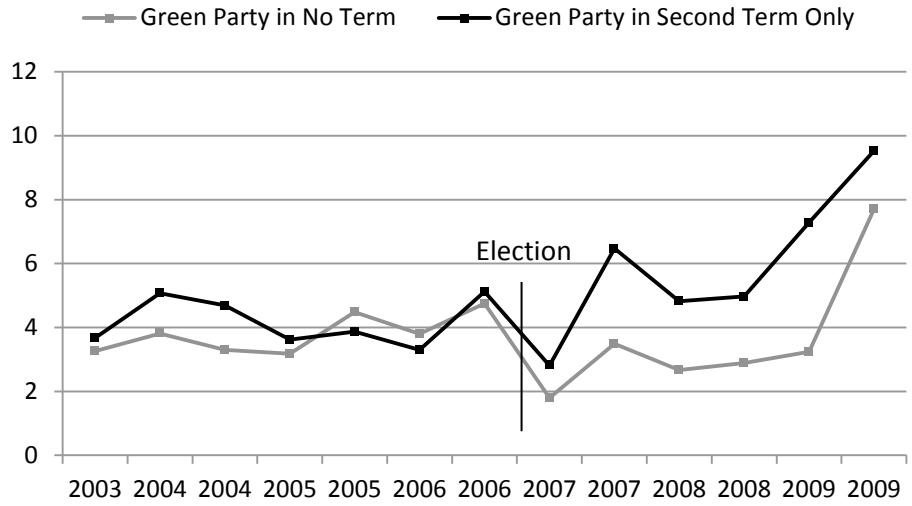

Figure 3.5: Number of ESC per municipality, where the Green Party has not been represented in the governing coalition before the elections in 2006.

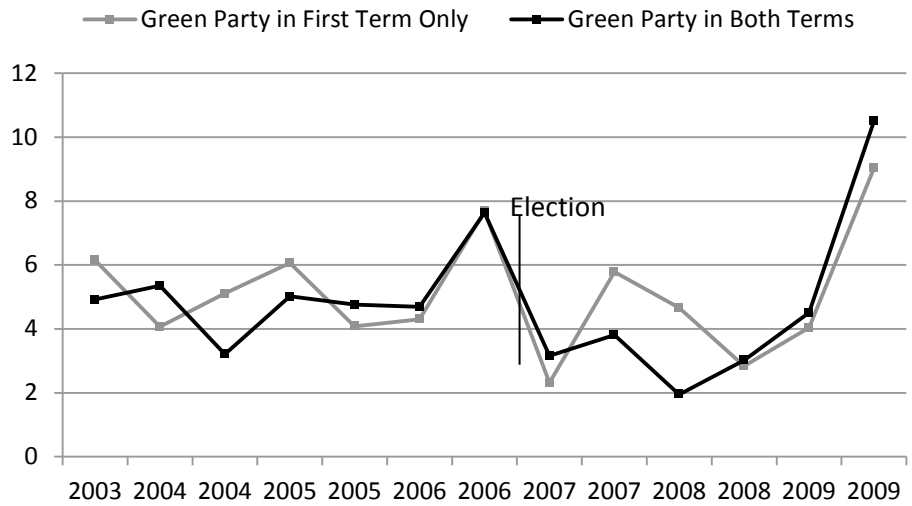

Figure 3.6: Number of ESC per municipality, where the Green Party has been represented in the governing coalition before the elections in 2006.

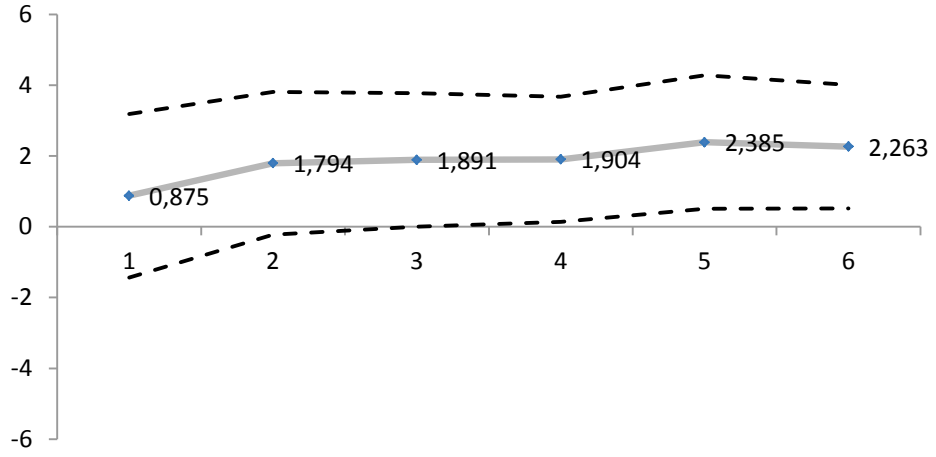

Figure 3.7: Size of the effect of the Green Party in the 2006 election going from not being represented to being represented in the governing coalition (estimated using the DiD).

In figure 3.5, it is shown how the average number of ESC rises relatively sharply with a shift in the political majority where the Green Party becomes represented in the governing majority. In figure 3.6, we see that the Green Party leaving the governing coalition has an effect that is slightly positive, but hard to distinguish from zero, which it must therefore be assumed to be. There are numerous possible explanations for why the results show an effect when the Green Party becomes represented in the governing coalition, but not when it leaves it. When the Green Party joins the governing majority, the consequence may be that established, bad procedures are discontinued, and that there is also a greater resistance against too lenient EIE. If the Green Party leaves a majority coalition, it may be the case that there are already well-functioning routines, which are harder to break.

Figure 3.7 shows the quantitative effect of the first graph estimated with DiD (the dotted lines represent a 90% confidence interval), where a large amount of control variables is added, such as industrial structure and population characteristics. The graph shows that the effect appears to be stronger over time. More specifically, it is a significant effect of approximately a 0.23 standard deviation and almost half of the mean value. Judging from these figures, it seems that the Green Party has a relatively large impact on the implementation of the Environmental Code in terms of issuing ESC.

Other identification strategies, model specifications and sample groups are used to study the sensitivity of the estimates. The results are remarkably stable in all different models which reinforces the probability of a Green Party effect on the implementation of the Environmental Code.

As ESC also correlate with other measures, such as prosecutional notifications, it would be of interest to have a statistical database with simple quantitative measures to study the correlations in detail and possibly also causal effects. However, it is important to not only care about the hard data in the evaluation of EIE. It is no end in itself for a municipality to have a high or a low number of ESC. What is useful from an evaluation perspective are

the systematic differences in changes or levels in terms of the expected and unexpected explanatory variables such, as in this case, political governance.

The danger of using these hard measures is that other important aspects of EIE, such as preventive actions and advice, may become secondary if EIE offices believe that they are only evaluated on the basis of hard measures. Nevertheless, when used correctly, a database containing hard measures on the performance and outcome of EIE (for example, the number of inspections, the number of annual full-time positions, injunctions, fines and criminal charges) is desirable, as discussed in more detail in chapter 12. Another reason to establish such a database is to facilitate future research. However, this must be balanced against the cost of maintaining and sending information to such a database for individual EIE offices.

The conclusion from this study is that politics seem to play a part in the enforcement of the Environmental Code in terms of issuing ESC. As ESC also correlates with other measures, this could be a larger problem than what is indicated here. From an impartiality and efficiency perspective, this is problematic. If the law is applied with different stringency in different municipalities, this implies legal uncertainty and different conditions for businesses.

Relatively basic, if not necessarily desirable, actions to prevent this could be a higher degree of centralised EIE or regional collaborations where inspectors cross municipal boundaries. You could also imagine the separation of a tougher EIE part that occurs more centrally and a softer advisory part that still has a strong local presence in the municipalities. However, all these proposals must be set against the benefits of having local EIE with local inspectors who are familiar with local industries and conditions, and the benefits of repeated and close contacts between EIE staff and operators. These benefits of local EIE are difficult to quantify in a statistical analysis which makes it difficult to compare them directly to the problem of political influence on EIE.

3.6 Summary

The lack of nationally gathered EIE data over time makes it difficult to measure the current outcome of EIE. However, EMT has demonstrated that it is possible to carry out statistical analyses given the available data. A recidivism analysis of data relating to ESC shows that higher fines reduce the risk of activities once more being issued a charge. Recidivism (relapse) is therefore a possible measure for evaluating the outcome of EIE.

An analysis of ESC data has also shown that there are political factors that affect the performance of EIE. The number of ESC increased significantly in municipalities where the Green Party went from having no representation before the election in 2006 to being represented in the governing coalition.

3.7 References

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Chapter 4
Incentives of operators

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4.1 Introduction

This chapter provides an overview of the theoretical models developed with the objective of deepening the understanding of how operators' environmental behaviour is affected by the interaction with the environmental inspections and enforcement (EIE) authority and other stakeholders. A model is a simplification of reality. The aim of models is to make it possible to analyse the relationships between different variables such as cost, profit and environmental risk, and to ask questions such as: what happens to the environmental risk if we increase the controlling part of inspections at the expense of the informative part? By producing a logical, consistent conceptual model, the theory of how different stakeholders choose between different options is created and developed. All variables that might affect e.g. environmental risks are not contained in a model. The analysis will, out of necessity, be simplified and therefore, it is important to clearly demonstrate the assumptions made and discuss how different assumptions would affect the results of the model. The objective of the following models is to form a starting point for further work to develop a relevant theory with the aim of increasing the understanding of the prerequisites for EIE activities.

A fundamental behavioural assumption within the social sciences in general and economics in particular is that individuals and firms are affected by motives or incentives. Game theory is useful to illustrate the interaction between operators and the EIE authority. In the below figure, which is based on a model in Becker (1968), a game tree is used to show how operators (OP) first consider making an environmental investment to achieve compliance with the legislation. The EIE authority (EA) then decides whether this particular operation needs to be controlled (e.g. through inspections), where the EIE authority is initially assumed to be unaware of the choices that the operator has made (which is indicated by the dashed line between the authority's two nodes) .

In its simplest form, the model ignores a number of other factors that might affect both the operator and the authority (more about this later on) and that the game is only played once. For simplicity, it is assumed that the operator either makes an investment that is sufficient or refrains from doing so and is fully aware of the possible consequences of the choices made. Similar simplifying assumptions can then be weakened and analysed yet, for clarity, we here stick to the simplified benchmark model.

The assumed effect of an environmental investment is that the operator thereby achieves legal compliance or contributes to environmental quality targets. When this decision has made, there is uncertainty about whether an inspection (or any other type of control) will take place (or whether insufficient environmental investments will be detected).

Consequently, the choice of forgoing an investment implies a (short-term) cost saving but, at the same time, also a risk of being detected during inspection and the cost this entails. Note that the operator only takes into account the direct costs incurred. Obviously, the choices made also lead to consequences for, e.g., the environment or the economy, but in the simplest possible case these are assumed not to affect the operator. However, they are certainly relevant for the decisions made by the EIE authority and for the legislation.

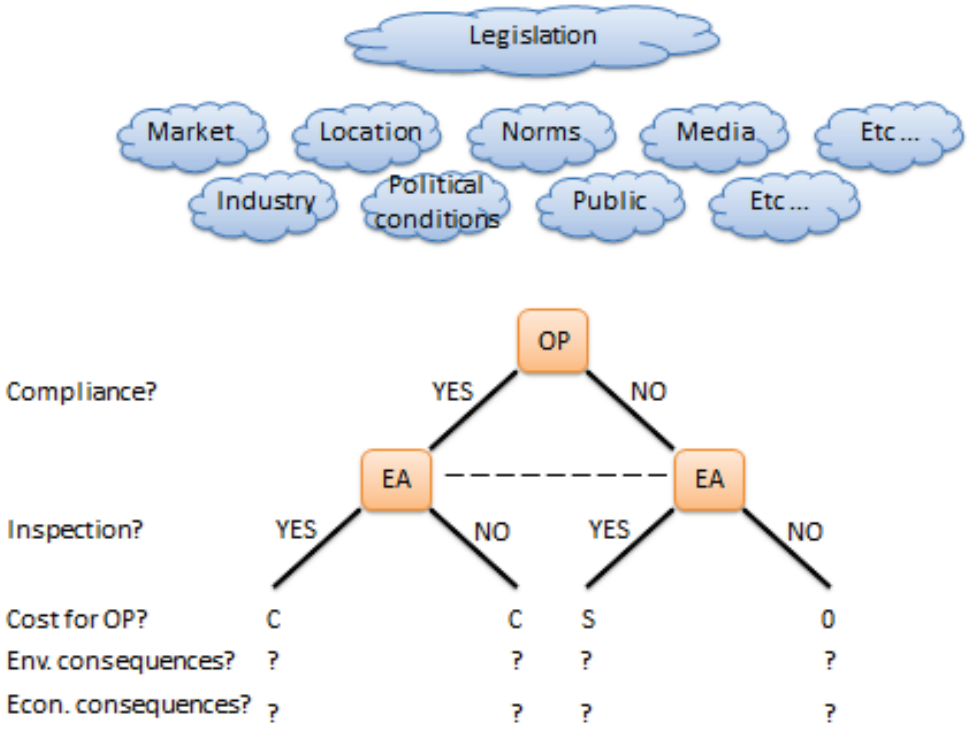

Figure 4.1: A game tree that illustrates the interaction between operators and the EIE authority.

In this simple game tree, there are three different outcomes: the investment is made and the associated cost C is incurred (whether an inspection takes place does not matter as we assume that the inspection itself does not involve a cost for the operator), or the operator refrains from making the investment and is not inspected, which means that no costs are incurred, or the operator does not make the investment and is inspected, which results in a cost S (a sanction or some other cost that arises when the law is not adhered to[14]). Whether the investment is made depends on the investment cost C, the probability of non-compliance being detected P and the cost of having violated legislation S. It is easy to see that C must not be too large and that S and P must not be too low for an investment to be made.

[14] In addition to a sanction charge, the cost S can also consist of the cost of making the necessary investment to achieve legislative compliance.

The reality is, of course, more complex than that. There is a number of factors that affect the operator, for example: the content of legislation and information concerning this, industry affiliation and prevailing market conditions, location and political conditions, prevailing norms regarding environmental behaviour, the public and the media. Naturally, also the inspector's communication and professional judgements are essential for the operator and for the outcome of the inspection, but this is not directly addressed in this chapter (see instead chapter 6).

Section 2 starts with the model described above and presents an overview of a number of modifications, focusing on how EIE and sanctions for violations of the law affect the operator's incentives, while section 3 analyses how these depend on industry affiliation, market structure and mode of competition. In section 4, the focus is partly on the operator's incentives and partly on the EIE authority's choice between control and informative actions. Section 5 takes the fact that there are both mobile and immobile operations (i.e. those that can easily move to another municipality and those that do not have that option) as its starting point and examines the effects of local budgeting on EIE.

4.2 The incentives of operators to comply with environmental legislation – an overview

The purpose of this section (based on Herzing, 2012) is to highlight different aspects that can conceivably affect the operators' incentives to achieve legislative compliance and reduce the environmental impact. The starting point is the game theoretical model presented above, where both the operators' incentives and the EIE authorities' opportunities are affected by the legislation and the interaction that occurs between these two parties.

The *EIE authorities* are responsible for ensuring that operators comply with the environmental legislation and also ensuring that the environmental quality targets are realised. As it is not clear which objective – compliance with legislation or promoting environmental quality –that should be prioritised, both objectives are taken into account. Usually, a specific action is positive for both legislative compliance and the environment, but it is conceivable that these two objectives conflict with each other in certain situations.[15] The means available to the EIE authorities are partly inspections in order to identify whether the activities comply with the law, and partly information and advice with the aim of supporting the operators in their environmental work. Based on their limited resources and existing legislation, the EIE authorities need to make priorities and interpretations.

[15] In chapter 7, there is an example where several small firms had their activities in a commercial property and did not handle their waste management in a satisfactory manner because the property owner did not implement good waste management. Each injunction to each of the operators was correct under the law, yet if they followed the injunction, i.e. that each operator should take its waste to the municipal landfill, it would probably result in a worse environment and therefore go against the environmental objectives.

The *operators* make decisions, given (their knowledge) concerning existing laws, regulations and efforts of the EIE authorities, which have ramifications for legislative compliance and environmental impact. There may be numerous different types of costs for operators, for example, to avoid detection when violating the legislation or to have a poor public image, as well as potential rewards for successful environmental work. Nevertheless, as in the game tree presented above, the starting point of the model is a situation where the only variables that operators take into account are the cost of environmental investments, the probability of being inspected and the sanctions in case of non-compliance.

While the inspection probability and the sanctions are the same for all operators, the cost of environmental investments is assumed to vary. Thus, operators differ with respect to the incentive to comply with the law. The point of this is to achieve a certain degree of heterogeneity among operators, where one group is almost always compliant as the investment costs are sufficiently low, while another group rarely achieves compliance because the costs are too high. The basic model is modified step by step considering various types of costs, penalties and administrative actions, and the consequences of these modifications are analysed. Below follows a summary of the conclusions generated by the model under different assumptions. Although the focus is on operators, conclusions are also presented with respect to the EIE, as well as the legislation.

(1) FIXED SANCTIONS

In the simplest possible case, where an offense has been detected, an inspection results in a sanction that is independent of the extent of the violation, i.e. what matters is whether and not to what extent the legislation has been violated. A higher inspection frequency as well as tougher sanctions strengthen the incentives to comply with the law. More inspections and tough sanctions are therefore good both for compliance and for the environment. However, they can also strengthen the incentives to conceal violations and contest the EIE authorities' decision.

The consequences of tougher legislation (or narrower interpretations of the law) are not clear-cut. The positive effect of a possible reduction in environmental impact among operators that comply with the legislation needs to be weighed against the negative effect of fewer operators achieving compliance with the law as the cost of this increases. A possible implication is therefore that too restrictive interpretations of the law can have negative consequences not only for the degree of compliance, but also for environmental quality.

The follow-up of cases where a violation has occurred is obviously positive, both for compliance with legislation and for the environment. For an EIE authority with limited resources, it is therefore important to find a balance between inspections and follow-up activities to ensure compliance among operators that have violated the legislation.

(2) DIFFERENTIATED SANCTIONS

Differentiated sanctions that reflect the degree of the violation have the positive effect of reinforcing the incentives to reduce the environmental impact even among activities that fail to achieve legislative compliance. This can result in a tougher legislation (or a stricter interpretation of it) having positive effects on environmental quality, although fewer activities can achieve legislative compliance. This positive effect has to be weighed against more differentiation requiring greater precision and hence, more resources.

(3) VARYING INSPECTION PROBABILITIES

If the probability of being inspected is dependent on the operation's degree of environmental impact, the incentive to reduce the environmental impact among the operators that do not achieve legislative compliance is also strengthened. At an aggregated level, different equilibria[16] can emerge if the EIE authority has a limited budget and, therefore, is only able to perform a specific number of inspections per year. In a good equilibrium, operators expect that most operators comply with the legislation, whereby the incentive to reduce the environmental impact is strengthened for each individual operator, because the probability of being inspected is high when the violations are rare. In a bad equilibrium, it is expected that many operators do not comply with the law, which weakens the incentives for each individual operator to reduce its environmental impact as the probability of being inspected is low when violations are common.

Expectations about operators' environmental behaviour thus become self-fulfilling. One possible conclusion from this is that it may be worthwhile to allocate more resources to industries with a low degree of legislative compliance, until a new equilibrium with a high degree of compliance has been established; when this has happened, it is possible to divert EIE resources to another industry without this having too big consequences.

(4) INCORRECT INSPECTION OUTCOME

Naturally, the occurrence of errors during inspections leads to disruptions. If operators that do not meet the requirements of the law are considered to follow the law (type 1 error), while operators that comply with the law are considered to be violators (type 2 error), the incentives for legislative compliance are weakened. This negative effect must be weighed against the fact that activities in compliance with the law have a stronger incentive to exceed the legislative requirements in order to reduce the risk of type 2 errors. Hence, some uncertainty may have positive environmental effects, but will lead to additional costs for operators.

[16] Equilibrium here refers to a situation where no single agent wins by altering its choice, given that all other agents do not alter their choice. This type of equilibrium is usually referred to as a Nash equilibrium.

(5) INCOMPLETE INFORMATION

If the operators do not have complete information about the legislation, more information leads to a higher degree of legislative compliance. However, it is possible that the effect on environmental quality is negative as operators, which we previously incorrectly assumed to be compliant, may find it more profitable not to reduce their environmental impact at all. Obviously, it is better with well-informed operators; however, sometimes it may be advantageous to take a more pragmatic approach and not provide so much information that legal compliance is perceived as something unattainable. This especially applies to cases where there is some room for interpretation. By giving priority to the most important measures and gradually increasing the operators' knowledge and awareness, the effect should be better than if the regulatory authority were to have a more dogmatic and strict attitude.

(6) RISK AVERSION

The degree of risk aversion also affects operators. It may influence the incentives to achieve legislative compliance, while also strengthening the incentives to reduce the environmental impact even at operations that do not conform to the legislative requirements. The more risk averse operators are, the stronger these incentives become. It may be difficult to determine which type of operator is more risk averse. However, it could be argued that a self-employed person is more risk averse than the manager of a plant that is part of a large corporation, which would imply that large enterprises have less incentives to reduce the environmental impact and should therefore be more closely inspected. Against this, one has to weigh the fact that the risk of negative publicity for larger operations in the event of breaking the law is greater, and that small-scale operators generally have a lower level of knowledge and thus a greater need for inspection and other EIE activities.

(7) NORMS

Operators are also affected by current norms in society, in the sense that the cost of a violation (or the reward for compliance) is dependent on the environmental behaviour of other operators. A norm can be related either to the degree of legislative compliance or to the extent of actions to reduce the environmental impact among all operators. Also in this case, different equilibria may arise as expectations about the behaviour of others affect the individual operator's incentives and thus become self-fulfilling. If a “good norm” is established, the cost of inadequate environmental efforts is higher and hence, the incentives for undertaking measures is greater than when the prevailing norm is bad. Through special inspection or information efforts, it is possible to establish a good norm for what is acceptable environmental behaviour, whereby the incentives for legislative compliance or actions to reduce environmental impact are strengthened. The conditions for a good norm are better if the inspection intensity increases or the sanctions become tougher, but are negatively affected if the legislation is tightened (or its interpretation becomes tougher). In the latter case, the increased cost for realising legislative compliance implies that expectations about the behaviour of others are adversely affected, which further weakens the incentives to comply with the legislation.

(8) RISK OF INCIDENTS

In addition to the incentive to achieve compliance through environmental investments, there may be other motives for operators to undertake such investments, if these are linked to the risk of incidents. In this case, there are two types of consequences: environmental efforts do not only influence whether compliance with legislation is achieved, which possibly leads to a sanction if this is not the case, but also the risks associated with the activity. If the risk of incidents is also taken into consideration, the analysis generates qualitatively similar results. A significant difference, however, is that operators might want to undertake investments in order to reduce risks, regardless of whether legislative compliance is achieved. Thus, there might be an incentive to exceed the legislative requirements to reduce the risk of incidents. Similarly, even operators that fail to achieve legislative compliance have an incentive to reduce risks.

4.3 How are the operators' incentives affected by short-term economic prospects, industry affiliation, market conditions and the mode of competition?

The study that constitutes the basis for this section (Häckner and Herzing, 2012) is an attempt to systematically study the firm and market characteristics that determine the incentives to violate different laws. The purpose of this section is to investigate whether there are any strong general conclusions that can be drawn and which are useful for an EIE authority. No EIE authority has unlimited resources and therefore, it seems reasonable to focus on areas where the risk of violations is greatest. Thus, it is important to investigate if there are certain firm and market characteristics that give rise to extra strong economic incentives to violate the law.

An important starting point is that firms are assumed to be able to reduce their variable production costs by violating the law, but different firms have varying incentives to do so, depending on their characteristics and the markets where they operate. Our framework is theoretical and can be applied to a number of different scenarios apart from violating the environmental legislation. VAT fraud and violations of various types of import restrictions, for example, can also be expected to reduce a company's costs for selling its product on the market.

The study is based on a model of a market developed in Häckner (2000). We initially assume that all firms in a given market have the same costs. Then, the increase in profit is calculated for a company that reduces its production costs by violating the law. In other words, the incentive to violate the law is created by the increase in profit that follows from a reduction in costs.

The importance of various factors has been studied within the framework of the model: the degree of cost savings, business cycle effects, product differentiation, market

structure, and the mode of competition. Based on an understanding of how these factors affect incentives, conclusions can then be drawn regarding where and when inspection efforts should be concentrated.

(1) HOW DOES THE SIZE OF THE COST SAVINGS AFFECT THE PROFIT OF BREAKING THE LAW?

Firms, for which it is expensive to achieve compliance with the environmental requirements of the law should be monitored more stringently. This result is obvious. The more you can reduce production costs by violating the law, the greater the profit.

(2) WHAT IS THE SIGNIFICANCE OF THE BUSINESS CYCLE?

EIE activities should be intensified during booms. This result is also fairly obvious. Profits and prices are high during booms. If a single company can then reduce its production costs, it can also slightly reduce its price and thereby capture a large share of the high demand volumes and profits available in the market.[17]

(3) DOES IT MATTER IF THE FIRM IN QUESTION OPERATES IN A MARKET WITH STANDARDISED PRODUCTS OR IN A MARKET WITH DISTINCTIVE/DIFFERENTIATED PRODUCTS?

Firms that produce highly standardised or highly differentiated products win more by violating the law than other firms. This result requires a deeper explanation. When products are highly standardised (i.e. do not differ between different manufacturers), only a small price difference is required for a large number of consumers to switch suppliers. In combination with profit margins generally being low in markets with standardised products, this implies that the increase in profits for a firm that suddenly obtains a cost benefit becomes significant. If the products are instead distinctly differentiated (i.e., they differ greatly between different suppliers), each firm has a high degree of market power in relation to consumers. Consequently, they do not need to take the competitors' strategic action into consideration when exploiting a sudden cost reduction , but can choose a new price more or less freely. This also leads to a large increase in the firm's profits.

(4) DOES THE NUMBER OF COMPETITORS MATTER?

A rule of thumb should be that firms with few competitors should be supervised more stringently. This result is not as strong as the above results. There are extreme levels of cost savings for which the reverse applies, but for reasonable levels of cost savings, the profit gained by breaking the law is greater the smaller is the number of competitors. If there are only a few competitors, each company has a high degree of market power in relation to consumers. Profits and prices are initially high and hence, a sudden cost reduction can then be exploited by a firm suddenly reducing its prices somewhat. Thus, a

[17] It should be emphasised here that the possible long-term consequences of a violation have not been taken into account. It is conceivable that a firm can eliminate competitors during a recession by breaking the law and thus generate higher profits in the future, which would mean that the incentives to break the law may be stronger when the economy is bad.

relatively large part of the volumes for which there is demand on the market and high profits are transferred to the firm. If the number of competitors is large, then prices and profits are initially low and the opportunity to dramatically increase profits by attracting customers is thus smaller.

(5) DOES IT MATTER IF FIRMS COMPETE IN PRICES OR IN QUANTITIES?

A rule of thumb should be that firms that compete in quantities are more stringently supervised than firms competing in prices. This result is also not as strong as are the first three. There are extreme levels of cost savings for which the reverse applies, but for reasonable levels of cost savings and market structures (i.e. the number of competitors), the profit gained by violating the law is greater under quantity competition than under price competition. Normally, competition in quantities leads to higher profits and prices than competition in prices. A sudden cost reduction can then be exploited by a firm to shift a relatively large part of the volumes for which there is demand on the market and profits to the firm. Under price competition, prices and profits are usually lower and hence, the opportunity to dramatically increase profits by attracting customers is smaller.

Can these five results simply be translated into some kind of guidelines, which do not set unreasonably high information demands on the EIE authority? The results (1) and (2) and (4) should be possible to apply as stated above. Regarding result (3), it could be argued that high profits for violating the law constitute a greater problem when products are distinctly differentiated than if they are highly standardized. In the latter case, the profits available in the market are initially low. Regarding result (5), it could be said that it is more likely that firms with spare production capacity compete in prices than firms with full capacity utilisation. Generally, however, it seems to be a difficult task for an EIE authority to assess which mode of competition that dominates in a specific market. A somewhat simplified list of EIE advice could be as follows:

I. Firms that can attain large cost reductions by violating the environmental legislation should be more stringently supervised.
II EIE activities should be intensified during booms.
III. Firms subject to low levels of competition, either because there are few competitors or because products are highly distinctive/differentiated, should be more stringently supervised.

4.4 Selection and effects of different EIE methods on firms and environment risks

This section, based on Jacobsson (2012), aims at increasing the understanding of the mechanisms that could affect the choice and outcome of different EIE methods for different types of operators. In order to analyse the interaction between the EIE authority and an operator, we have constructed a game theory model. Theoretical EIE models can be broadly classified as two types where the first analyses the operator's choice of whether to knowingly violate the Environmental Code and, for example, make an environmentally hazardous discharge or not. The other class of models analyses the

different actions that the operator can employ to increase or decrease the probability of any type of environmentally harmful event, for example, to invest in safer technologies. This model belongs to the latter category where the operator chooses the production level and the level of environmental investments where the overall aim is to maximize profits. By profit, we mean the monetary gains made by an operator. A higher level of production is assumed to increase the risk of an environmentally harmful accident, while environmental investments reduce the same. If an accident then occurs, this is discovered with a probability that increases the more resources the EIE authority spends on control activities (for example, inspections). If the accident is discovered, the operator receives a penalty. We define an environmentally harmful accident as a discharge in excess of the permitted levels that has an adverse impact on the environment. Naturally, different types of accidents can be more or less easy to discover, yet in the model we make the simplified assumption that the probability of detection only depends on how much resources the EIE authority spends on control activities.

In the model, the EIE authority has a choice between allocating a given budget either to controlling measures or informative measures. Controls increase the probability of detecting accidents, while information makes it easier (less expensive) for the operator to make environmental investments. More controls then work as a deterrent as the expected penalty increases, while information serves as a carrot to increase environmental investments. The EIE authority wants to find the optimal mix of control and information to minimise the environmental risk.

The results of the analysis indicate that the share of each EIE method should be adapted to the different properties of the operators. These properties are: production technology risk – the risk of accidents for a particular production technology; discoverability of accidents – how easy it is to discover an environmentally harmful accident of the operator; the operator's environmental skills – how well the operator understands the environmental impact/risks of the firm’s activities; as well as the penalty level – how severe the penalty is when an accident is detected. It is conceivable that different branches have different combinations of the properties set out above. Note that we focus on the mix of EIE actions given a certain earmarked budget. Therefore, we do not currently comment on whether the EIE authority should spend more or less resources on an operator based on its properties.

Prior to presenting the results, it may be useful to discuss some properties of the model in general and the two EIE methods in particular. Generally, information has a stimulating effect on the operator's production as it reduces the cost of (new) environmental investments which, in turn, keeps down the risk of accidents, which facilitates a high level of production. The effect of information on environmental risk is, however, more complex. The environmental risk decreases as environmental investment increases, but is affected in the other direction by increasing production. It is difficult to clearly comment on the net effect. However, it can generally be said that information, for obvious reasons, is a business-friendly enforcement method.

Controlling measures also stimulate environmental investment, although by means of a different mechanism. The mechanism here is that control makes environmental investments more profitable as it reduces the greater expected cost of an accident. But more control implies a higher production cost (the greater expected cost in the event of an accident), which leads to a lower production level and also a lower profit for the operator. Accordingly, control decreases the environmental risk as it stimulates environmental investments and also reduces the level of production.

Based on the above reasoning, one might wonder why not all EIE resources are devoted to information as it stimulates environmental investments while the operator's profit is enhanced (even if it is difficult to comment on the effect on the environmental risk). If we exclude controlling in the model, the probability of being punished for an environmentally harmful accident would be zero for the operator. There is no reason to invest in environmental technologies under these conditions, as they only represent a cost without reducing the expected cost of an accident. Accordingly, the model has the property that the two EIE methods complement each other; control provides strong incentives to avoid accidents while information facilitates this work.

The main results of this section are presented below, under the assumption of "ceteris paribus", i.e. everything in the model is held constant except the parameter that represents the property we are analysing.

(1) HOW DOES INCREASED PRODUCTION TECHNOLOGY RISK AFFECT EIE?

If an operation is exposed to an increased production technology risk, supervision should be more controlling and less informative. There is an increase in the environmental risk. When an operation is exposed to an increased production technology risk for a given level of production, the deterrent effect of controlling increases as inspections now have a higher probability of discovering environmentally harmful accidents.

(2) HOW DOES INCREASED ENVIRONMENTAL EXPERTISE AFFECT EIE?

If the operator improves his/her environmental expertise, EIE should be more controlling and less informative. The environmental risk decreases. If the operator's environmental expertise increases, the need for information naturally decreases. Another way of expressing this is that the marginal benefit of information decreases as the effect of information on the well-informed operator is small. Controls then have a relatively stronger effect.

(3) HOW DO MORE STRINGENT PENALTIES AFFECT EIE?

If penalties become tough, EIE should be more controlling and less informative. The environmental risk decreases. If penalties become tougher, the marginal effect of more control on the expected penalty (detection probability multiplied by the penalty) becomes stronger, which makes it a more effective enforcement method.

The above three results are based on the characteristics of the operation/operator and on the EIE authority wishing to minimise the environmental risk. Previous research on Swedish EIE has indicated that different operational EIE authorities sometimes take commercial policy considerations at the expense of environmental interests. Our model can also analyse what happens if we assume that the EIE authority, in addition to wanting to minimise the environmental risk, also wants the operator to have a high level of production.

(4) HOW DO COMMERCIAL INTERESTS AFFECT EIE?

The more an EIE authority cares about the operator's level of production (commercial interest), the greater the share of EIE devoted to information will be. The environmental risk increases. Since information is a more business-friendly enforcement method than control, the EIE authorities, which want to support the (local) industry, will prefer information to control. This has the consequence of environmental risk increasing as the mix of enforcement methods is not optimised to minimise this risk.

Note here that in the analysis, we only look at the mix of enforcement methods and not at the amount of EIE resources. Should we expand the model and take into account the relative allocation of EIE resources between different activities, an exogenous change (a change in any of the parameters of the model, i.e. a change outside of the model) that reduces an individual operator’s environmental risk would very likely imply that EIE resources would be transferred from one operation to another with a greater environmental risk (see the previous discussion in sections 2 and 3). For example, the above change in environmental expertise (result 2) would very likely lead to EIE resources being diverted from this operator to another operator with e.g. less environmental expertise.

The model is obviously a simplification of reality with the aim of creating an analytical framework to better understand some basic mechanisms in the interaction between an operational EIE authority and an operator. In the model, we assume that the operator only cares about profits and disregard the fact that he/she may possibly care about the environment, be sensitive to norms (see section 2, policy implication 7) and in general want to “do the right thing”. These characteristics might affect the results of the model, but probably not overturn them. For example, if we assume that an operator cares both about the environment and profits, we can imagine that such a person might invest more in environmental technology as compared to a person without environmental concerns. At the same time, an operator will never completely ignore the profit as he/she must support himself/herself and his/her family. Moreover, a social norm may make it socially unacceptable not to invest in environmental technology, which could potentially decrease the need for EIE. However, previous research has shown that norms can quickly deteriorate unless they are supported by, for example, EIE activities that signal the expectations of society on environmental behaviour.

4.5 Delegated EIE with local budgeting

This section is based on Muren (2012) who examines the effects of local budgeting on EIE. A theoretical analysis provides hypotheses that are examined empirically using available data for EIE in Sweden. In the data, there is a large variation in inspection intensity between municipalities. Moreover, there is a correlation between this variation and employment in different industries in the municipalities, suggesting that more EIE activities take place in municipalities with a high proportion of business or municipal activities which, in practice, must be conducted locally (e.g. building and healthcare), while fewer enforcement activities occur in municipalities with a lower share of such immobile establishments. These tendencies are consistent with the predictions of the model.

A summary of the arguments provided in the theoretical analysis follows below. The model assumes two municipalities which we call Northtown and Southtown. In the basic version of the model, these municipalities have the same number of inhabitants. Citizens all have the same preferences over two goods: consumption of a private good and the budget for EIE in the municipality. For both goods, higher incomes imply increased consumption. Citizens receive their income from work and they either work locally in their own municipality or commute to a job in the other municipality. The wage is the same in both municipalities, but those who commute to the other municipality have a lower net income due to the commuting cost.

Three firms operate in the two municipalities: Firm A, which is always located in Northtown, Firm B which is always located in Southtown and Firm C that initially has its activities in Northtown, but could relocate to Southtown. In the event of a move, firm C would incur a relocation cost, and the firm will only move if the benefits of the move outweigh this cost.

In each municipality, EIE are financed by a flat tax rate which is determined in a municipal election. The residents of each of the municipalities vote for their "favourite tax rate", and the median voter's preferred tax rate wins the vote. Those residents who commute and thus have a lower net income will vote for a lower tax rate. Since everyone is assumed to have the same gross wage, there are two possible tax rates, a lower rate if the median voter is a commuter, and a higher rate if the median voter is not a commuter. A municipality where the median voter is a commuter or, in other words, a municipality where more than half of the residents commute to work, will therefore choose the lower tax rate. This results in a lower tax revenue and thus, a smaller budget for EIE, compared to a municipality where the median voter is not a commuter, i.e. a municipality where less than half (or even none) of the residents commute to work.

It is assumed in the model that each local EIE authority has the objective of minimizing pollution in its own municipality. The means at its disposal are inspections of one or both companies operating in the municipality. It is assumed that these inspections are not only costly for the EIE authority, but also for the companies subjected to the inspection

activities. On account of this cost, the mobile firm (i.e. Firm C) may consider relocating from Northtown to Southtown. This would be in the firm's interest if EIE activities are so much lower in Southtown that the reduced inspection costs will compensate for the relocation cost.

From the point of view of the EIE authority in Northtown, a relocation implies a reduction in the budget for EIE. On the other hand, a relocation means that the number of companies to be inspected decreases, which means that Northtown can allocate all of its inspection resources to "its" company (Firm A). The EIE authority in Southtown must then use its EIE resources to cover both the local company (Firm B) and Firm C. (In case inspections are partially self-financed, the significance of these budgetary effects decreases, but they do not disappear as long as the self-financing rate is less than 100 per cent.) Both EIE authorities might prefer that Firm C had its activities in the other municipality, or vice versa, and they could adapt their EIE activities in order to achieve the desired result (i.e., the lowest possible pollution in their own municipality). In order to structure the different possibilities, the analysis is divided into several cases.

Case 1 deals with the situation when Firm C employs fewer than half the residents in Northtown and Southtown. This means that regardless of in which municipality Firm C is located, the median voter in both municipalities will be a non-commuter. Accordingly, the level of the tax and the EIE budget will be the same for the municipalities. In this case, the EIE authority in Northtown would prefer to "scare away" Firm C by allocating more EIE resources to that firm. However, Southtown will want to counteract this. Due to the relocation cost, Southtown will always be able to threaten with a sufficiently high inspection intensity for Firm C if it relocates so that the cost of relocation will never be viable for Firm C. Thus, Firm C remains in Northtown and enterprise mobility does not affect the inspection intensity in any of the municipalities.

In *Case 2*, Firm C is so large that the median voter in Southtown (i.e., where Firm C is not located) is a commuter. Consequently, the tax rate and the EIE budget is higher in Northtown, where Firm C has its activities. On the other hand, the budget there is used to inspect two firms. The net effect can be an increased or decreased level of pollution in the municipality where Firm C is located (the company's cost for reducing pollution plays an important role here).

In *Case 2a*, the budget difference is not large enough to counteract the increase in pollution and the environmental committee in Northtown would prefer Firm C to relocate. We have now returned to *Case 1* where it was shown that this is not possible, i.e. Firm C remains in Northtown and the inspection intensity is not affected.

Finally, in *Case 2b*, the budget increase for the environmental committee is large enough to counteract the disadvantages of needing to inspect the two firms if Firm C remains in the municipality. Both municipalities would then like to have Firm C located in their municipality. Given that Firm C has no very significant relocation costs, Northtown will

then adapt a level of inspection intensity so that Firm C has fewer inspections while Firm A receives the remainder of the inspections permitted by the budget.

In summary, the analysis illustrates that local budgeting of EIE can put local environmental committees in a situation where they adapt the inspection intensity according to enterprise mobility, so that firms that can relatively easily relocate from the municipality are inspected less, while firms or activities that find it difficult to relocate are inspected more.

4.6 Summary

This chapter has illustrated how the interaction between the operator and the EIE authority can be analysed using formal economic models. The focus has been on how the operator adjusts his/her environmental behaviour according to different factors such as production technology, market conditions and differentiated enforcement methods.

Based on the understanding of the operators' incentives, it is possible to draw some conclusions about the structure of EIE. To improve its effectiveness and efficiency, it is necessary to both make the right priorities (effectiveness) and use resources optimally (efficiency). An increased understanding of the factors (market, industry, etc.) that affect the operator's incentives facilitates the efforts to identify sectors where EIE are most effective. Likewise, an understanding of the effect of different enforcement instruments (inspections, follow-up, advice and support, etc.) contributes to a more efficient use of the limited resources of the EIE authorities. Chapter 12 discusses the efficiency of EIE in a wider perspective.

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Chapter 5
Case management and analysis support

Henrik Artman, Joel Brynielsson

The EMT research programme has aimed at supporting possibilities to create indicators of local and national environmental inspection and enforcement (EIE) efficiency. From the outset, it has been obvious that there does not exist any all-encompassing efficiency indicator. Rather, efficiency is about making it possible to develop the indicators that best suit the different types of more or less long-term environmental interests at different abstraction levels. Furthermore, the purpose of the programme was not to create yet another case management system or a central national database with existing data. As mentioned earlier in the report (see Chapter 3), integrated EIE data does not exist at the national level in Sweden and thus, the programme has focused on the possibilities of providing the government agencies concerned with access to relevant data.

5.1 Existing systems and database inventory

The following provides a brief overview of the computer systems currently used by municipalities and county administrative boards in their EIE work. Related systems and the market in which these systems are developed and procured are also discussed to some extent.

The market in Sweden can best be described as a duopoly, where two major actors supply entire software suites that are suitable for many different purposes at the local municipal level. There are also one or two smaller suppliers, and some municipalities have opted to maintain their registers using standard Office products, such as customized spread sheets or various database applications. This latter observation, that relatively common desktop applications can actually be used and are sometimes even preferred to custom solutions, is an example of the existing systems primarily serving as a means of supporting the more general case management process that constitutes the basis of much of the authority's work. This case management typically means registering incoming documents, compiling different types of case-specific documentation, registering outgoing documents and maintaining a register of ongoing and closed cases. However, in itself, case management is not about the actual factual matter regarding, for example, providing support in a decision process.

Another factor that reinforces this case management perspective is that the business strategy of the two market actors is to bring out an entire suite of computer support systems built from the same basic components and database systems to be used for a string of relatively different types of tasks at the authority. This way of reusing software components and widening the range of software products in order to come up with all-embracing solutions for individual municipalities is a commercially sound business

strategy. However, this broadening towards a holistic view of municipalities brings the generic perspectives and case management in particular further into focus, something which must be placed in contrast to the characteristics of the individual tasks. For example, focusing on the environment and creating solutions that make statistical analysis, decision support or other innovative types of information management possible requires width to be replaced (or at least supplemented) with depth, where the solution is primarily adapted to overarching national environmental objectives rather than to a multitude of local applications.

5.2 Case management

The daily routines of inspectors are currently governed by the cases with which they are allocated. The cases are planned on an annual basis by the municipality (Environment Committee) using an EIE plan. The plan contains the tasks scheduled to be undertaken in the municipality. This planning constitutes the basis for both capacity calculations and the implementation of EIE and its effects. If this planning is to be plausible, the municipality has to prioritise inspections in relation to personnel, but also in terms of risk classification of the relevant facilities [inte säker på att jag tycker att “facilitites” är det bästa ordet här – vad tror ni om “establishments” eller “works”? Se genomgående] and, of course, in relation to the budget. The planning requires documentation regarding which facilities (including information regarding size, activities, impact etc.) that exist within the municipality, previous inspections, the results of these inspections as well as a risk assessment. This documentation is usually compiled on basis of protocols and interviews with the inspectors.

That case management is of crucial importance for the inspectors becomes apparent when considering how they reason about their work in terms of the execution and structure of EIE. The work process is cyclic, covering planning, implementation/inspection, follow-up and evaluation. Planning partly consists of overall planning and partly of the inspector's own planning for an inspection. Municipal planning provides the basis for the daily work, but prior to a specific inspection, there is need for both general documentation of the activities to be inspected in relation to the legislation and regulations and historical information about the inspection object in question.

However, as previously mentioned, current case management systems are more akin to a register function that cannot analyse the individual inspection relative to other inspections. This means that current planning and follow-up are largely based on the inspector’s personal experience. The inspector's experience and knowledge thus become an important component for the system to work. This resonates with the initial problem description of EIE. It has been found to be difficult to create traceability between different inspection objects, but it is also difficult to create transparency and rule of law across municipalities because there are currently no simple means of accessing data. Thus, in order to achieve more stable priorities, the inspectors would like to have documentation that is to a greater extent based on information from similar cases deriving from national data and information from relevant databases (industry databases,

geographical databases, data regarding remediation of contaminated sites, EIE cases governed by the Seveso regulations, property databases).

Consequently, the research programme has taken the existing case management process into account even though the focus has been more concentrated on analysis for creating consensus, traceability and rule of law. The case management process has consequences for the inspector because it is linked to the municipal EIE planning and ultimately also to the overall supervision by the Environmental Protection Agency. Case management also constitutes the basis of the quality assurance of all information entering the system.

Inspectors, and to an even greater extent personnel within municipal leadership and at the Environmental Protection Agency, consider that an analytical instrument is needed to create analyses of how they have dealt with various tasks and how these relate to environmental objectives and environmental laws. Everyone we have spoken to agrees that the current case management systems do not allow any such support, even though they in some sense contain the necessary datasets.

5.3 The EIE process

Inspectors describe the overall EIE process in terms of a diagram as shown in Figure 5.1. The figure illustrates the planning that precedes every inspection, where the inspector reviews the case and its history. This often involves having to read the application/complaint, previous decisions or documentation in folders or other media. The actual inspection usually consists of an interview where the inspector makes an on-site assessment of the activity and whether it obeys the law. The subsequent duties at the office include an inspection report, an assessment and the writing of an explanatory statement for the decision. Where necessary, cases are followed up, which might mean anything from conducting a new inspection to reviewing new information received from the operator. The evaluation is carried out in different ways depending on the inspector, interest, needs and the procedures of the operational EIE agency.

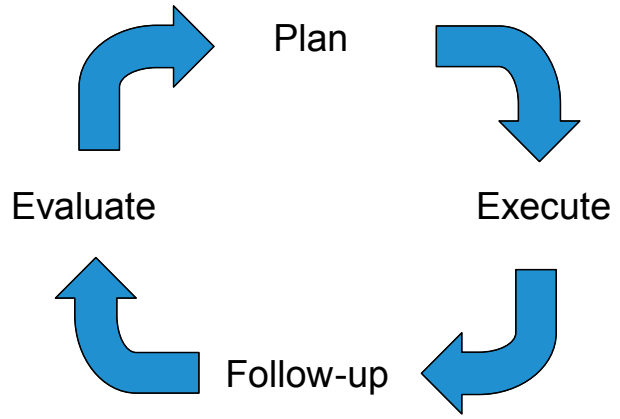

Figure 5.1: An overview of the EIE process. This model can both describe the inspector's work, where this specifically concerns inspection planning and implementation, and the process of the municipality, where this is carried out on an annual basis.

This overall process is similar for the operational EIE agency and from the national perspective (Environmental Protection Agency etc.) even if this concerns EIE planning over the year or EIE guidance that has an inter-municipal and multi-year perspective.

5.4 Risk for inconsistent data

A picture of the entire EIE process with embedded sub-processes can take the schematic form of Figure 5.2. This shows how the municipality/inspector acts within the framework of the green arrows, while the Environmental Protection Agency (blue arrows) requests information from the municipalities and acts on basis of the information received. The red arrow illustrates the fact that not all municipalities provide this information and that the information submitted is not always consistent with the purpose of the question. This generally means that the system does not work properly – is inconsistent – since the guidance of the Environmental Protection Agency's is not based on quality-assured information.

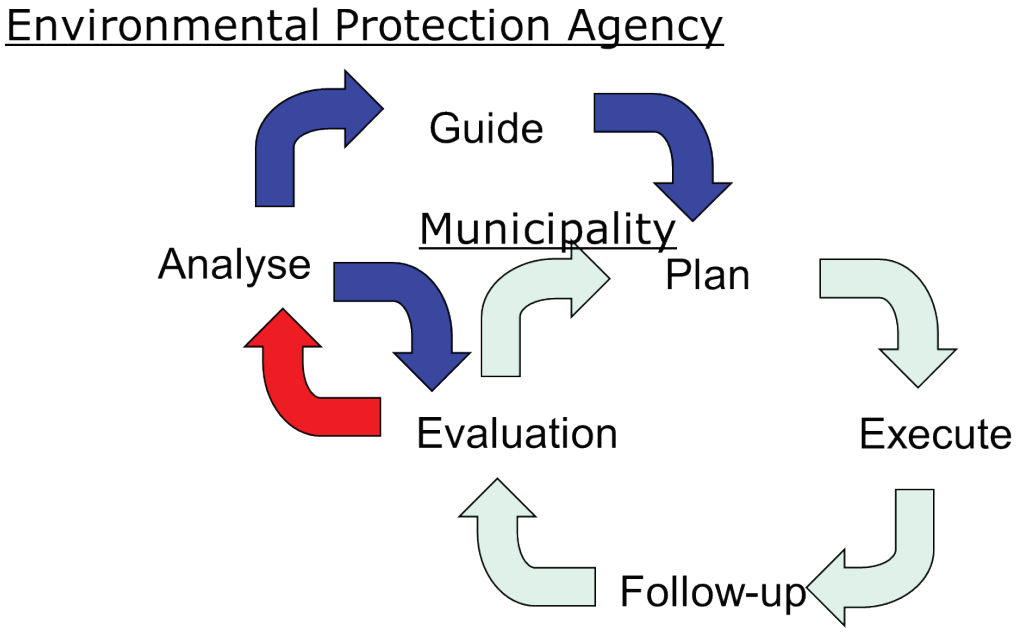

Figure 5.2: A description of the relationship between an operational EIE agency (green arrows) and the Environmental Protection Agency (blue arrows). The picture shows how the Environmental Protection Agency asks for information from a municipality and then provides guidance to the operational EIE agencies. The red arrow symbolises the fact that not all questions are answered by the operational EIE agencies, or that the responses are based on other source data than what was targeted in the request. The system is inconsistent because the various actors do not act on basis of the same information.

To be able to create consistency in the system, all levels must be based on the same EIE source data. It is crucial for the Environmental Protection Agency's ability to produce EIE guidance for specific or general cases that the analysis is preceded by a processing of actual inspections and their outcomes. For this purpose, the Environmental Protection Agency must have access to data from the municipalities. Here, access to secondary data will not suffice. Currently, the Environmental Protection Agency may request data, but it

is not always the case that the municipalities submit the requested data (which means that the basic data is not good) or the data submitted is calculated in different ways in different municipalities (which means that the basic data is not reliable) or data is submitted in different formats (which means that the information must to be transposed). Thus, there are many possible sources of error, which means that given instructions may very well be based on incorrect information. According to what has emerged from discussions with inspectors, it appears that the three levels – inspector, municipality, Environmental Protection Agency/equivalent – live and act somewhat differently depending on the data, the rules, the beliefs and the interests to which the level in question has access. In short, there is no real analysis support at none of these levels simply because there is insufficient reliable data.

In the following, we make the assumption that in the future, it will be possible to link the various databases in order to create a common national data warehouse as shown in Figure 5.3. Here, we have started from the motto that *data quality (the principles for collection and labelling) must be secured at the local level to ensure efficiency at that and other levels*. Here, we do not take into account where the data is stored and who owns it, but principles of integrity are treated as this is considered to be of importance for both inspectors and operators.

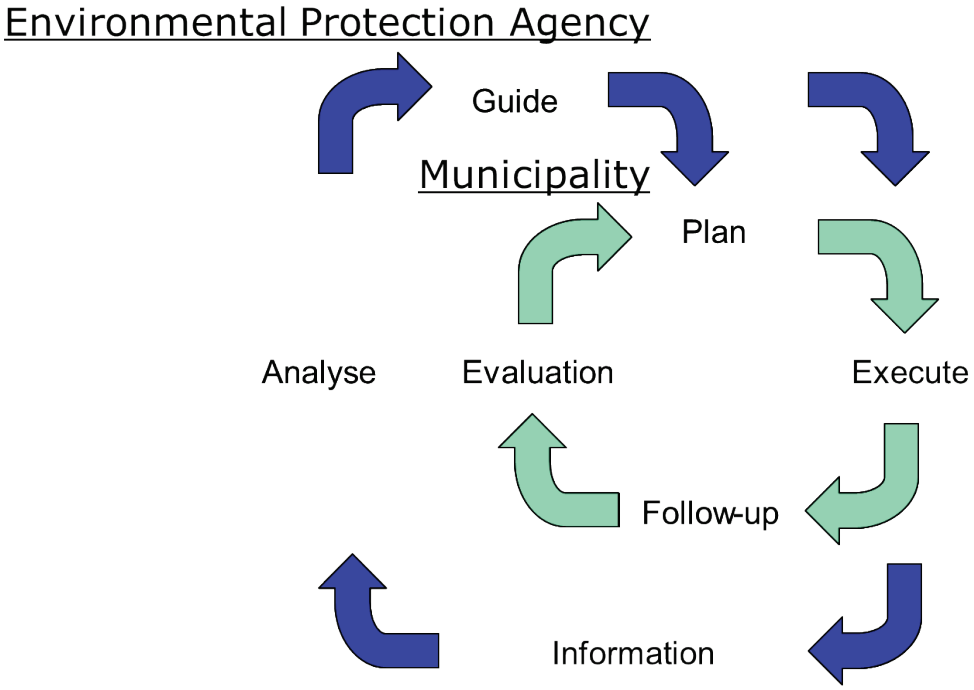

Figure 5.3: The figure illustrates the objectives of the programme where all parties share the same information, but evaluate different parts/levels of the system.

The survey presented in Chapter 2 may serve as a simple example of certain data that could be routinely collected through a common data warehouse. Such data could be used by the Environmental Protection Agency (and/or the county administrative boards) at a national/regional level for a more efficient EIE guidance. Unlike surveys, a quality-assured national data warehouse would be less of a problem with regard to such matters as loss, inconsistent responses etc. and would also have the great advantage of being able to capture changes over time. Another great advantage of a data warehouse is that it provides possibilities to analyse EIE at the operator level. For surveys, data is usually collected with the individual operational EIE agency as the unit of analysis, as in the case described in Figure 5.2. This means, for example, that this analysis does not capture the effects of specific EIE practices on specific types of activity.

Chapter 10 will present the solution for how data could be shared and operated at all levels of the system. Before this, in Chapter 9, we will introduce the scenario that has been developed and validated with and by inspectors and that is also expected to constitute the basis for the analyses and the guidance which the Environmental Protection Agency will be able to develop on the basis of the collected inspection data.

5.5 Inspection items as facilitators of efficient information management

Modern information management in support of analysis and decision-making is today largely data-driven and is very much about the very *ability* to collect, maintain and organise various types of knowledge. If used in a correct way, the collected information can be used both to identify new opportunities and take advantage of these opportunities. At a company, for example, this information management might be a matter of *business intelligence*, i.e. the matching of the company's different data sets to gain new insights to support strategic decision-making. A related concept is the data warehouse, which constitutes a central link among the company's various data sources. The internet offers other, more open services that are also data-driven in the form of, e.g. search engines, recommendation systems linked to online stores that sell books etc. Common to both company-internal datawarehousing and the data processing of open sources and internet user behaviour is that raw data is used for hitherto unknown purposes. In other words, it is when the data points are considered outside their context and compared to data sets from other databases that the major gains are obtained. Similarly, for EIE, EIE data must be seen as facilitators from a greater perspective and be considered outside their context in order to achieve higher objectives.

EIE often has local checklists that differ depending on the type of activity. In line with the above reasoning, the data points in this case consist of the individual points on the list to be inspected, whereas the total object assessment (which is derived from underlying data) does not constitute a data point in itself. These inspection items make it possible to perform analyses independent of object type and, for example, obtain statistics relating to a certain type of chemicals management completely irrespective of whether the data comes from a petrol station or a maintenance training school that are functionally

different beyond the chemicals management in question. For EIE, the inspection items constitute the “raw data component” that may be used for it to be possible to create different types of data-driven solutions for analysis, decision data and follow-up. As we shall see in Chapter 10, it is, for example, possible to develop intelligent functionality to efficiently produce inspection lists from a database with national data (i.e. support to quickly produce a relevant checklist for a given inspection) and make comparisons of completed inspection lists in order to obtain decision data and support for producing relevant explanatory statements for those decisions.

5.6 Scenario and prototype development

As we have seen above, it is important to have national access to inspection items that are kept consistent across the different databases in which they are represented. This also constitutes the basis of the scenario presented in Chapter 9. In this respect, it should be noted that it is *access* to centralised and consistent data that is important, but that this is not necessarily associated with ownership of the inspection items. Hence, the scenario and the prototype development in Chapters 9 and 10 do not take any standpoint on the issue of ownership and municipal autonomy. Instead, it is the *opportunity for information management* that is central, serving as the basis for an efficient EIE that, rather than being measured with specific indicators, is about the *possibility* to produce relevant indicators and further analyse the data they reflect.

A further aspect that is related to the inspection items is, as previously stated, that the data quality is assured at the local level. This means that it should be the inspector's measurement or professional judgement that constitutes the basis of the database content, rather than the data being a synthesis or interpretation of data points. This quality aspect is important because a data analysis can never be better than its underlying data. Rather than, as now, collecting central information by sending out surveys (on paper) to the municipalities, it would thus be better if data compilations were based on actual data retrieved directly from the source and that can be traced back to it. This will yield a certainty that analysed data is based on the municipal inspector's expertise in the area and professionalism and that the survey question has been interpreted in a nation-wide consistent manner.

5.7 Summary

The autonomous position of the operational EIE agencies has led to the emergence of a market that focuses on local-specific case management. The related computer systems thus concentrate on the exercise of municipal authority rather than on what is essential from the environmental perspective. The environmental assessments are instead dependent on the inspector's competence and professionalism. Since central agencies request information from sources such as municipalities, there is a risk that the inspector's actual assessments and explanatory statements are neglected in the forms used for data collection. This increases the risk of inconsistency between the municipality's actual data and the data collected by the central authority. Moreover, central access to inspection data would allow for statistical analyses and the production of analysis support for the

inspector. This chapter has laid the foundation for a consistent system where all actors from authorities involved act on basis of the same underlying data using inspection items. Chapters 9 and 10 develop these ideas further in terms of process and systems.

THEME B

THE INSPECTOR'S ROLE AND FUNCTION

Introduction Theme B

The individual inspector is the one who performs the day-to-day work of pursuing Swedish environmental inspection and enforcement. In the following three chapters, we intend to apply different perspectives to illustrate the complexity of the inspector's work situation and the heterogeneous nature of the conditions for inspectors in different municipalities. Here, we will only briefly mention a few factors that affect the work of inspectors.

Inspectors face different conditions for their work depending on where in the country they work and on whether they work in a large or small municipality. In a small municipality the inspector needs to know a lot over a wide range of issues, because inspection and enforcement have to carried out on e.g. restaurants, petrol stations, nurseries and sawmills. In a larger municipality it is possible to focus on one of the three main areas: environmental inspection and enforcement, food safety and public health.

The inspector's work is to a large extent governed by a number of **laws and ordinances**, not least by the Swedish Environmental Code. The Environmental Code constitutes a legislative framework with a specific purpose, *"to promote sustainable development which will assure a healthy and good environment for present and future generations"* (Swedish Environmental Code, Chapter 1, Section 1). This purpose is to be achieved both through inspection and enforcement and guidance, which in itself might create an internal conflict that the individual inspector has to handle when communicating with inspectees. The inspector has to provide guidance, but in such a way that the operator or his/her representative understands that it is of a general nature and that the inspector will inspect the operator's measures to see if these comply with the law. Advice must not be expressed as a promise, like "if you only do this your measure will be approved". The inspector has to strike a well-balanced mix of two, not always easily compatible, goals. On the one hand, the inspector has to bring about a trustful dialogue in which inspectees not only embrace what is communicated, but feel sufficiently strengthened by the dialogue to dare to propose measures for their own activities. On the other hand, the inspector has to be a person in authority who exercises inspection and enforcement and demands compliance from the inspectee. Moreover, laws and ordinances can be contradictory. Since matters are usually more complicated than whether legislation is adhered to or not, the consequence might be that the inspector, alone or together with colleagues and the head of the office, has to make an assessment of what is reasonable to demand from a specific operator. In addition, an interpretation of the actual text of legislation has to be made. For example, how a watercourse is defined may be different in Central Sweden and in the mountain regions.

Another factor that contributes to the inspectors' complex daily routines is their having to accommodate **different worldviews**. A worldview is a conception of the nature of being and the structure of the universe, tied to a certain historical phase. The worldview of the Middle Ages was not the same as the one prevailing today. A worldview also

encompasses the role of humans in the world. In this context, a worldview refers to what people find most important from their perspectives and how they therefore choose to perceive the world. Inspectees have their perception of what is most important to do and their role in this. Those representing inspectees in meetings with the inspector have yet another worldview. It is the inspector's task to balance this against the legislator's worldview. In addition, inspectors might also have to relate to and handle the worldview of their own municipal politicians. On top of everything comes the inspector's own worldview. It need not at all be the case that these worldviews differ from each other in all respects. It is enough for them to differ on a few points of vital importance to the inspector's work. This creates a dynamic that an inspector must be able to manage in order to identify navigable routes for avoiding deadlock in the communication.

A third factor that increases the complexity of the inspector's work are the **different objectives** that environmental inspection and enforcement have to manage. The inspector may need to relate to these different objectives. Is the overall objective strict compliance or the fulfilment of environmental quality norms or the promotion of sustainable development? There may be other interests, such as consideration of the local business community. This is something that inspectors are not really supposed to take into account, but there may sometimes exist a political desire for mild inspection and enforcement. The objectives that in a given situation actually become the guiding principle have implications for the approach selected and the interpretations made. Two statements from the survey that EMT conducted among Sweden's heads of municipal environmental offices may serve as examples of the inspectors' daily work.

> *"Lack of resources, some inspectees have to be 'rubbed the right way'."*
>
> *"Economic and business interests influence."*

An inspector needs to be able to manage these factors and their associated complexity. The factors have to be coordinated with each other; reasonableness has to be assessed with respect to which measure carries most weight in a given situation; and the inspector must be able to handle situations where there is a conflict between worldviews, policy objectives and legislative requirements. The following three chapters illustrate, in various ways, the complexity of EIE from the perspective of the inspector.

Chapter 6 Professional judgements – tools when exercising public authority

Lena Edlund

An important building block in the inspectors' exercise of authority is their professional judgements. These are multifaceted judgements made over several stages that ultimately lead to an official decision which will then have consequences for people's lives. These may be consequences for the individual operator, for the people living near a factory or for users of the municipal water supply system. Hence, making these professional judgements is an advanced task.

The chapter begins with a presentation of the interview and workshop study performed on environmental inspectors' professional judgements. We will then deepen the understanding of environmental inspectors' work, highlighting their professional judgements by means of three different perspectives.

The first perspective is based on research focusing on professional judgements, in particular the branch known as naturalistic decision making (NDM). It studies the ways in which decision-making takes place in real-world situations. Previous research has chosen to study decision-making situations staged by the researchers themselves. These will not be as complex as decision-making in real-world situations. NDM was thus developed in order to better examine decision-making in the real world. It is exactly this complexity in the inspectors' decision-making that is illustrated in this chapter.

The second perspective is professional vision, that is, the focus of an occupational group when exercising its profession. Environmental inspectors develop their professional vision both through theory and practice in their initial training and through experience from their working lives.

The third perspective addresses the nature of objectivity. Everyone – operator, inspectors and the general public – knows that officials must be objective in their inspection and their decisions. The difficulty is to describe what objectivity is. Moreover, it is not uncommon for inspectors to be accused of not being objective. For this reason, we want to provide scope for a bit of an explanation of the concept of objectivity.

6.1 Environmental inspectors' description of professional judgements

What characterises the environmental inspector's work are, among other things, the judgements to be made prior to official decisions. These require specific knowledge of

legislation and specialist expertise in the complex and extensive field of the environment and public health. Environmental inspectors need to know what constitutes dangers to the environment and how, for example, different chemical substances affect water and land. They also need to have good social skills and the ability to deal with people and evaluate them. They should be familiar with previous decisions in similar cases so that similar activities are given equitable judgements. They should be able to express themselves intelligibly in speech and especially in writing. The written formulations must also stand up to scrutiny in court and in a judicial review (see also Chapter 7 which deals with roles and competence). In other words, environmental inspectors must possess advanced skills. This chapter discusses their competence by focusing on all different judgement dimensions that inspectors themselves highlight as important for their professional judgements.

This study of professional judgements takes as its starting point that there are different judgement dimensions in different occupational categories. Doctors have theirs, as do social workers. Carpenters renovating an old house make their professional judgements before commencing their work. The carpenter's judgement dimensions are not the same as those of the crime investigator. The examples are numerous. Every profession requires specialised expertise. For a skilled individual to make a professional judgement, certain measures must be taken, such as studying the case, taking samples, conducting interviews or making a visual inspection. The different measures of every profession constitute judgement dimensions needed by the individual to be able to make a professional judgement. A *judgement dimension* is an aspect applied in the judgement, and multiple judgement dimensions can be used in one and the same situation. The *interpretive framework* provides the framework within which to view a phenomenon. This interpretive framework is used to select specific items on which to focus. For an environmental inspector, it is important to note the slope of a floor with a floor drain, but it is irrelevant what particular colour the building has or what make of car the owner of the building drives. The interpretive frameworks of inspectors include such things as the slope of the floor and how environmentally hazardous are paints, but not the makes of cars and shades of colour.

To make a reasonable judgement, those making that judgement need to make use of certain dimensions that are relevant to their particular profession. For this reason, our first interviews with environmental inspectors studied which judgement dimensions that are relevant for them.

Generally speaking, the inspector's judgement work as concerns inspections is divided into three components: preparation, the inspection itself and final revision. Naturally, the inspector's role covers much more than inspections, but here we choose to focus on inspections and their related work. The aim of this study is to dig somewhat deeper into these three components. Using the concept of judgement dimensions, we present eight different dimensions that are important for the inspector's judgement. The eight dimensions are presented in no specific chronological order.

- Studying the specific case, the type of objects to be visited and the history of the individual object
- Inspection
- Communication with the operator
- Communication with colleagues
- Studying previous decisions
- Examination of relevant law sections
- Rule of law and objectivity
- Appraisal and reasonability check

The judgement dimensions have been identified and described by environmental inspectors. Later in this work, we also asked other inspectors to comment on the dimensions and their descriptions in order to gain additional perspectives of them. Something that is important to point out is the significance of experience for becoming adept at making professional judgements. This requires the inspector to practise making a large number of judgements and inspections, in many different types of environments, thereby meeting many different types of people. One inspector expressed it like this: "in order to be able to make your own judgements, you also have to *gain* your own experience. You cannot simply read the guidelines and make an official decision based on those."[18] Another said that making the right judgement is about developing an instinctive feeling.

It is obviously the case that the judgement skills of environmental inspectors require expertise. This is taken as an assumption in this report. The study has not focused on what kind of expertise the inspector's work requires. Instead, we have looked at the kinds of dimension that inspectors themselves think need to be in place to be able to make a reasonable judgement ahead of an official decision.

The below material is written in the first person, as if a single person had been interviewed, in order to facilitate the reading. Another reason for this way of conveying the results of the study is that we also wanted to give some idea of how inspectors think with regard to their work. Judgements are not only about carrying out certain duties, but are very much about how the individual thinks and the way in which he or she prepares himself/herself. This is best reflected through an inside perspective, that is, by allowing an individual to be the narrator. This is more difficult to capture through an outside perspective in that the narrator is then not the person concerned.

1. Studying the specific case

It's important that I'm clear on why I, the environmental inspector, carry out an inspection. There has to be a reason. The operator or someone else may have requested a

[18] Reference group meeting of the EMT research programme on January 26-2012. The material is kept by the authors.

visit, there may be an application lodged with the environment department or the inspection is part of a current enforcement plan. There are different types of inspections.

Depending on the purpose of the visit, I need to have a battery of questions that are right both for the purpose and the activity. Perhaps with the help of colleagues, I need to find out what is specific to the place I'm about to visit. I also need to know something about the activity's history and what kind of views our authority has had on its activities.

In addition, it may be important to check with colleagues about previous relations of the environment department with the activity to be inspected, check what has been recorded in the case management system, check the archive for old documents, ask colleagues, determine principles for what we as an authority will or will not accept.

For announced inspections, I contact the operator, seeking information on the activity and the industry to which it belongs. I need to have checklists, check current permits and conditions or subpoena, for the activity, check the legislation: Environmental Code, regulations, decrees, other authorities, control of codes according to the FMH appendix (Ordinance concerning Environmentally Hazardous Activities and Protection of Public Health), check addresses, possibly look up the person in charge, possibly request supplementary information for a new application and review drawings. I have to know things about the site itself; what we know about natural conditions, nature conservation, national interests, Natura 2000, water catchment-protected water catchment area (possible environmental quality norms and action plans for water and air), municipal comprehensive plans and sometimes regulations for local plans. I need to check completed analyses, sampling and thresholds. Moreover, I have to find my way to the site, so directions might be needed. I put together current information for the entrepreneur. I ensure that what emerges in e-mail exchanges etc. is entered in the case management system.

2. Inspection

Prior to the actual inspection, it is necessary that I have prepared a number of questions relevant to the inspection. These might be questions arising from previous inspections. There are also various checklists, the department's own or those that are common to large parts of Sweden, available for downloading from Environmental Collaboration Sweden (Miljösamverkan Sverige). In addition, there may, for example, be questions provided by colleagues at the department.

One very important part when preparing an inspection is finding out what kind of person the operator that I will be meeting is. How does he or she communicate? How should I ask my questions so that he or she will understand them and respond to the best of his/her ability? You have to somehow understand the individual to create good communication. It is important to have a good relationship with the operator. As an inspector, I have to understand that I should treat all people equally, but that I have to do different things with different people in order to reach that goal.

It may also be the case that I need to see some specific things in the activity, and I need to be prepared for that before making the inspection.

I try to be in mental balance and to recharge before every visit.

I always start by introducing myself and briefly saying why I have come to the site. I ask those I'm meeting who they are, their name and position (professional position, property owner of ..., chairman of the association etc.). I make a note of the date and name. Depending on how positive or negative the representative of the activity is, I often chat a little. It's good to become a little acquainted, so as not to be perceived as unamenable to reason if I later make requirements. You can chat about the weather, the location, other previous visits, local events, mutual acquaintances etc. If I see that they're not really keeping up with what I'm going to do, I then describe what I'm looking for (to receive an application, carry out an inspection according to a checklist, follow up on a previous decision/inspection). I ask them to talk about or show me what I will be inspecting. I ask them to tell me about the way they do things or how something works. I make a note of this. It often happens that I take pictures with my phone.

Then, I usually make some type of oral judgement on site (it looks good, something needs fixing etc.). If something is to be rectified, I usually ask how and when this can be done. With respect to the question of how, I like to discuss their options and serve as a sounding board for their ideas. With respect to the question of when, I'll normally always add a bit of time, since people get stressed by requirements; they often want to show that they are capable and are a bit optimistic timewise. If I give them more time than they themselves suggested, I'm also perceived as friendlier. I make a note of the time and the measure to be taken.

If I am faced with someone who doesn't want to make the change that I feel is needed, I talk (at length, if necessary!) about why I think it needs to be done. I think it is extremely important to motivate the person who will be carrying something out. I will never say the words section or paragraph in this context. It should be possible to justify the measures I require with factual arguments, not regulations. I know that I am solely an official and cannot say that about a regulation, but it's impossible to find the time for everything I have to do and this is a priority that I stand by! If I get into a situation where it is not possible to waive a minor requirement which, in the context, will give the case an incorrect focus, I will raise the issue with a manager/committee to get support for making a decision where we waive the minor requirement.

After the agreement on the judgement and the ensuing strategy, I conclude the inspection and inform them that they will receive a written inspection report.

In the written report, I describe what I have seen and describe what things should be like and explain why (here I can use ‘sections’, ‘paragraphs’ etc.). If there are any requirements that need to be implemented, I write an order, clearly stating what is to be rectified and at what point in time it must have been rectified. I also include the

judgement criteria and the reasons for the decision in the decree. It is very important that requirements have deadlines so that there can be a follow-up.

3. Communication with the operator

Communication with the operator is part of the work of acquiring a basis for taking a standpoint. It is important to point out that inspectors do not primarily go somewhere to assess whether something is right or wrong.. The operators themselves are to carry out the environmental work. As an inspector, I check whether they are on the right track. By asking "what is your own self-regulation programme like?", I get answers about how much they know about their own responsibility and environmental legislation. One insight that is useful to have as an inspector is that you actually act differently with different people. This insight is necessary to ensure that you ask all necessary questions and then make an objective judgement. This insight helps me as an inspector to ask myself the question: "Why am I doing something different with this particular person?"

Especially in the case of private individuals and the general public, I have to find out what prior knowledge the person has so that I can discuss things at the right level.

There are things I myself need to check that I bring up in the conversation: to inform, to find out what they know, history, local knowledge, gauge their expertise. I often have to make a bit of small talk about this and that to get the person on board. It is important to clarify our roles by clearly showing that "I can be a sounding board for your ideas, but it is you who submit a proposal that it is my task to accept or not."[19]

Every individual reacts differently, it is difficult to prepare for how an individual will react. This is especially important to bear in mind when meeting private individuals and the general public because they're not accustomed to officials or don't even understand that when they, for example, own a house, they also have a responsibility for the environment.

Before I inspect something, there must be a reason. How I then proceed depends somewhat on what has initiated the inspection. Either we have planned to inspect a number of activities during the year or they are event-driven inspections, that is, someone might have made a complaint or something particular might have occurred. Essentially, there are two main groups, announced inspections and unannounced inspections.

An important aspect of meeting the operator is that I have to ignore what I think of the operator as an individual. My profession does not include having an opinion on what the person looks like, how he/she behaves or dresses. I am to have a professional approach to all operators.

[19] Workshop *Avloppsguiden's* conference, Hudiksvall, September 302011. The source material is keptby the authors.

After the inspection, I am often happy but tired, with no more to say, somehow. You aim at listening, talking and motivating in a positive way, so it's as if you've given a part of your soul.

4. Communication with colleagues

In order to make a judgement, communication with other colleagues is an important part of the process. Sometimes I might call an inspector at the County Administrative Board, sometimes I try to contact an expert at the Environmental Protection Agency or some other central body. The most important colleagues are those nearby. Either they are at my own workplace or they work in neighbouring municipalities, for example. They may have other skills than me and have experience of the specific object or of the operator that may be valuable. They may have worked with similar issues in another municipality or another county, which may give me new perspectives that will be important for the final judgement. Do they make the same judgement as me? It is important to hear colleagues' reasoning and to also get to share mine with them.

5. Studying previous decisions

It is important to be well informed about the case when you make an inspection. My motto is that you can't know everything. But I should at least know something about the activity's history from the perspective of the environment department. It lends credibility to the inspection and increases the potential for a good relationship with the operator. By being well informed, I can also be more efficient when I'm on site. If I have knowledge of the industry, this is something very positive in the relationship with the operator, so I try to find time to become somewhat acquainted with the industry in question.

6. Examination of legal aspects

It is completely unrealistic to think that I as an inspector should be able to know whether everything in an activity is run according to the law. But when it comes to an individual judgement, it is my job to adhere to the law. As an environmental inspector, I assist in testing the law. Along with other inspectors, I interpret it and test it through our decisions. In this way, we and others become elucidated about what should apply. Then, someone can appeal and the Environmental Permits Board , the Land and Environment Court or the Land and Environment Court of Appeal shows how the law should be interpreted.

What I need to consider is that I have sufficient knowledge of the relevant sections of the Environmental Code. If, for example, the site has a great need of protection or special precautions and measures are necessary, I need legal support for this.

What I need to consider is, e.g. to weigh reasonableness, that I make a judgement in each case and that I am careful in wording decisions and conditions.

7. Judgement based on legal certainty and objectivity

The inspector's role is to make an objective judgement between two parties, that is, between the operator and the legislator and its legislation. Compliance with rule of law is

important. I must be just as careful in my work regardless of activity or operator. Compliance with rule of law also includes the aspect of its being possible to understand our decisions. I must write in such a way that it is possible to follow the line of reasoning behind them. My decisions must be motivated; the operator must be able to understand the criteria on basis of which the judgements are made.

The difficulty with objectivity is that what is objective can be perceived differently by different people. Judgements should also be equitable between similar objects. For this to be apparent, I need to work on how I write and explain my decisions.

With regard to rule of law and objectivity, communication with colleagues is extremely important in addition to my familiarity with current guidelines and policies beyond the legislation. Hearing a colleague's comments can sometimes be crucial to my making a correct judgement.

8. Total appraisal and assessment of what is reasonable

When the time to formulate my judgement is approaching, I need to have checked the following:
Is the case complete?
Have I received the information needed to be able to make the judgement?
What previous permits exist?

Different inspectors should make equal judgements. I want to act fairly, be precise and communicate with the people concerned. My decision should not be based on my own feelings, but should be supported by the law. In their contact with me in the capacity of agency representative, operators and the general public should have a sense of fairness, that is, the same requirements for all, preferably at the same time. This can be difficult to explain to the individual person, since the level of sensitivity varies with the local environment which means that we have different levels of requirements depending on where activities are located.

The subsequent work includes writing the report, as well as making a decision and possibly a classification decision depending on whether a decision on fee levels needs to be made. This only takes place after communication, often over the phone for additional clarification. I am sometimes also in contact with other agencies. I go through the case with a colleague and check written communications and wording with a colleague or manager. Then, I print copies and envelopes and submit these for registration to the administrator and for distribution to the committee. I upload pictures from the camera to the computer, ensure they are in the right place, maybe putting the images needed in documents with text on the property, date and activity. If necessary, I write a notification of the case to the committee and write decision proposals to the committee. I might also write a summary in the document with information about the company. I report the hours spent on the case, when the visit was made, calculate and add up all activities classified

according to the FMH appendix and also according to the rate including additional U-activities[20] with an annual fee. Then, I prepare pictures and a presentation for the committee. In connection with enforcement campaigns, I write a report or summary of several activities. If necessary, I also do work on environmental sanction charges for violations, make a police report for certain violations or impose a conditional fine.

General comments conveyed by interviewees

Individual inspectors' ability to make judgements is related to workload. For example, a great number of inspections saps their energy and impairs their imagination and power of insight. This has an adverse effect on judgement ability. It takes longer for them to study a case, they become less able to understand what people are saying in conversations, which ultimately has an adverse effect on judgement ability.

Judgements are largely related to an individual's own perception. It also means noting factors other than the activity itself or the event giving rise to the inspection, such as land use, surrounding development, behaviour and views of the people they meet in the case. Therefore, it is important how I as an individual think about my judgements and can describe them to the operator and highlight this in my written official decisions.

One needs to reflect on what a professional approach is, both by the individual and the organisation. Inspector training can provide this, so it is not just experience that can strengthen the individual, but also continued reflection throughout a career. It is of no importance how much experience you have if you do not also reflect on your professional identity and what this means in practice.

Making a professional judgement as an inspector requires many different kinds of knowledge and abilities. Examples of these are: knowledge specific to the profession of an environmental inspector, industry knowledge, environmental impact, the job itself: dealing with cases, intuitive feeling, knowledge of legislation, social competence, official demeanour, understanding a business concept and what drives the company, ability to understand a CEO's intentions, correctly evaluating meetings with the people involved, determining the operator's level of knowledge (do they understand the words I use?).

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We would like to highlight a comment that we subsequently received regarding the above eight dimensions because it brings up another aspect of inspectors' professional judgements: "It seems that the eight points primarily describe planned visits to a known object. What must an inspector know for unplanned visits to unknown objects, such as, a door-to-door campaign in an industrial area? How should we make judgements of such

[20] Environmentally hazardous activities are classified according to the Ordinance of environmentally hazardous activities and health protection (1998:899) where the ranking in terms potential environmental impact corresponds to the scale A-U where A-activities have the greatest impact.

cases?"[21] The comment illustrates something important since it is in such situations that the inspector's experience is both tested and the inspector does justice to himself/herself.

Ideals and reality

One question raised by the inspectors' responses and reflections on their work is to what extent that all these judgement dimensions with all their content are actually used in each case. Inspectors have a profound desire to do a good job, and many inspectors are driven by strong values. The question is thus not raised because we suspect that they are exaggerating their efforts. Many inspectors have a heavy workload. It is only in the larger municipalities that inspectors have the opportunity to specialise. If there are at least 10-15 inspectors at the same department, some of them can work with public health, others with food safety and some have the opportunity to specialise in EIE. In smaller municipalities, the inspectors need to have more than one area of specialisation. This means that they do not always have time to deepen their knowledge. A heavy workload can sometimes also mean that before an inspection, they virtually only have time to perform a mental run-through of the above judgement dimensions while driving to the meeting with the operator. When they arrive, they must rely on their own experience and ability to create a good climate for discussion with the operator or representative. By no means do we wish this example to detract from the inspectors' description of what they believe should be included to make a good judgement. Instead, we want to highlight the problems in their work.

Let us look at their description of the judgement dimensions on the basis of this being how they know that their work needs to be done for their professional judgements to be legally certain and equitable. To what degree are they able to live up to their own ideals? An all too heavy workload means that inspectors cannot be as precise as they would like in their judgement work. They might, for example, have a heavy workload at some environment departments because they are few in number and have to know a little of everything in the areas of EIE, food safety and public health. Another example of a heavy workload is that it takes time to find all information they need for the specific case and the administration is laborious (see Chapters 1 and 5). In geographically small municipalities, it may be easier to organise the work so that the inspector carries out the administrative work of a case immediately after an inspection. In municipalities that cover a very large area, the work cannot be organised in this way. There, an individual inspector can spend a few days on inspections and visiting activities, private sewage systems or development plots in order to form an on-site opinion of the geography. At the end of the week, the inspector will return to the department and then it is time for the administrative work of transferring all notes to, e.g. excel sheets, files on the computer and registering them in different parts of the data system. It is also then that the inspector will begin to word the written communications that will become official decisions, decisions that might be dealt with in court in the future. It is obvious that it is easier to

[21] Reference group meeting of the EMT research programme on January 26 2012. The material is kept by the authors.

remember wording, agreements and what quickly taken notes really meant if the inspection took place the same morning that the administrative work commences. It is much more demanding to remember all this if the inspection was performed on a Tuesday and the administrative work can begin on the Friday afternoon or on Monday the following week. For this reason, we would already here like to highlight the opportunities that a common data system for all inspectors could offer to facilitate their work (see also Chapter 9).

A common data system could also have other advantages when focusing on the individual inspectors. The data system could save time for them, time that they could use to produce even better documentation for their decisions. The time could be used to actually cover more of the many elements and judgement dimensions that they describe above. It would ultimately make it possible for the inspectors to become even better at making professional judgements, and they might also have more time to develop their ability to communicate with operators in a good way (see also Chapter 8: MI – interaction and communication).

Here, we will also briefly raise an issue that may increase the inspectors' workload. In some cases, the inspectors' work might suddenly completely change character due to political influence. Some examples are in order. For a few weeks, they must interrupt their work on environmental and public health because the political leadership has decided that they are to help, say, the planning department with its work that would otherwise be neglected and thus adversely affect the municipality's reputation. This is a direct influence from politicians. Another example is where inspectors and heads of EIE know that a decision would be dismissed by the municipality's political majority. This leads them to let the decision go via the committee even though they have been delegated the authority to make a decision on the matter. This, in turn, leads to more work for the inspector than what would otherwise be needed. The latter example can be seen as an indirect influence. In many cases, there is a functioning cooperation between politicians and heads of EIE, in other cases a measure of self-censorship by the head of EIE and the environment department, and in yet other cases cooperation is very poor. Political influence on EIE is further discussed in Chapters 2 and 3.

The inspectors themselves have highlighted communication with the operator as an important judgement dimension. This is where they find out how much operators and their staff know about their environmental responsibility. It is in this communication that they can find out how willing the operator is to try to fulfil the requirements of the law and how great resources the operators can invest in this work in terms of time, knowledge and money. It is also in communication with operators that the inspector can determine whether or not they will keep their promise. Therefore, good communication skills are of crucial significance for the judgement work that an inspector performs before making an official decision. A communication method called motivational interviewing has been tested among inspectors by the EMT research programme. The results are presented in Chapter 8: MI – interaction and communication.

As for the eighth and final judgement dimension – appraisal and assessing reasonableness – the inspectors have described what needs to be done in order to complete the case and what needs to be in place to reach a final judgement. From a research standpoint, the most interesting thing is exactly how this appraisal and assessment of what is reasonable is carried out, but it is also the most difficult thing to describe. This is nothing unique to inspectors, on the contrary. It is quite simply difficult to describe in words what you do when you are weighing up several, possibly conflicting, dimensions. For this reason, future research will need to develop interview questions and analysis tools for an in-depth study of what happens in the occasionally slow process of making judgements. So far, we can conclude that there is an appraisal and assessment of what is reasonable on basis of the other seven dimensions.

To further illustrate and deepen our study of decision-making and professional judgements, the rest of the chapter will discuss the inspectors' descriptions of their judgement dimensions from three aspects: professional judgements, professional vision and objectivity in exercising their profession.

6.2 Professional judgements – naturalistic decision making

The research field of judgements and decision-making is in many ways an interdisciplinary field. It attracts the interest of business economists and psychologists as well as philosophers and statisticians. Other researchers interested in the field are ethicists, marketing scientists, economists, medical scientists and organisational theorists (Andersson, 2001). This is not strange since decision-making takes place in many areas of society and in the lives of private individuals and all these daily judgements and decisions affect both people’s future and the current situation. This is why the field attracts researchers from many different disciplines.

These researchers contribute different perspectives on judgements and decision-making, and they ask different questions. Examples of these questions are how judgements are made in purely cognitive terms, what makes a decision rational, how judgements are best organised, what the difference is between making decisions in a group and as an individual and what ethical and intellectual positions need to be taken in making a decision.

Researchers in the field of naturalistic decision-making are trying to learn to understand how decision-making actually takes place for ordinary people in their daily lives and environments. To find out how decision-making is carried out, the researchers chose to study decision-making in occupational groups that often make crucial decisions, perhaps on a daily basis. Examples of these occupational groups are doctors, firefighters and professional soldiers. Thus, it is people who are skilled decision-makers in the sense that they have the relevant experience and knowledge for making decisions in their respective areas. No evaluation is made as to which decisions are better than others. In other words, the research is not normative. However, it does take the actual situation into account and

asks how the surrounding context affects the decision-making situation in which decision-makers find themselves. What affects decision-making and what decision-makers do not control might be varying, ill-defined or contradictory goals; time pressure, poorly structured problems, high stakes, many people involved, an uncertain and dynamic environment, the way the work is organised, organisational norms; that is, many things to evaluate simultaneously (Lipshitz et al, 2001, p. 334).

The decision-making situation of environmental inspectors is defined by some of the uncertainties mentioned above. They may face ill-defined or contradictory goals. The Swedish Environmental Code is ambiguous and requires interpretation from case to case. The inspectors may also face a situation in which the Environmental Code requires one thing of operators, while the municipality's development plans have other goals that go against the Environmental Code. Now and then, some municipalities want their inspectors to "see to the municipality's best interests and not be so inflexible" in their exercise of authority (for a more detailed analysis of political influence, see Chapters 2 and 3). Time pressure for environmental inspectors is not linked to immediate decisions such as for the surgical team in a major operation where the patient has an internal bleeding. However, time pressure for inspectors can consist of many inspections within a short timeframe, where it can be difficult for them to find the time to familiarise themselves with all cases or complicated judgements that require thorough consideration, even though time does not really allow for this. Inspectors sometimes face situations where the stakes are high. The most obvious of these is, of course, when an operator may have committed a more serious environmental crime. The inspector may not and should not take this into account, but it can still influence the inspector in that she or he has to keep her/his emotions and thoughts in check. In addition, the inspector's own prestige and professional pride may be put to the test. Another significant pressure on the inspector is the knowledge that "It is particularly important that this case is done properly so that no errors have sneaked in". If any error has sneaked in, or if anything is unclear, it is possible for a potential charge to be dismissed.

Very often, inspectors find themselves in a situation where a great deal can be at stake with respect to inspections of small business owners. Something that may seem like a trifling matter from the outside may entail a financial burden for the operator which means that she or he must consider whether it is at all possible to continue operating. This is also something that the inspector may not take into account (other than perhaps waiting a while before investigating whether the operator has fulfilled the requirement). It is nevertheless something that the inspector must deal with in order to fulfil the purpose of the inspection, namely, compliance and a sound environment. Every environment department has its own way of organising inspection work and also its own norms for what is a good way to make an inspection. Values regarding what constitutes satisfactory work (e.g. the number of inspections per week or well-formulated decisions) also contribute to the context in which individual inspectors make their judgements and their decisions. Either the organisational form, norms on how inspections should be done and values about good work are consistent with the individual inspector's own convictions or

the person concerned must deal with the discrepancy between how she or he would like to carry out the work and what the organisation stipulates.

6.2.1 The significance of recognisability in decision-making

In the late 1980s, a study was conducted to investigate how decisions under extreme pressure are made (Klein et al, 1989, pp. 462-472). The researchers wanted to know how experienced commanders in the fire service dealt with time pressure and uncertainty. Their hypothesis was that, under pressure, the commanders would not succeed in generating any great amount of possible options for action. Instead, they would only compare two options, one which was their own favourite plus one other. It turned out that the researchers' assumption was wrong. They interviewed more than 30 experienced leaders in the fire service about 156 extremely demanding events. It turned out that they did not compare options with each other at all. When under pressure, they searched for the first recognisable task to perform. They asked themselves "What has to be done?", looked for what they could do and did it (Lipshitz et al, 2001, p. 336).

This led researchers to ask new questions of the material: 'How were the commanders able to rely on the first option they thought of?' and 'How were they able to evaluate a single option for action without having anything else to compare it with?' By aggregating the commanders' own accounts about what was happening when they made decisions in these pressure situations, the researchers saw patterns which they then developed into a model. This model – called Recognition-Primed Decision-making (RPD) – now has three variants. The first model is the simplest form of decision-making. RPD 1 may be outlined as follows. A decision-maker assesses a situation and responds with the first option that comes into his/her mind. Experienced decision-makers perceive a given situation as a typical situation which, in turn, requires a certain type of action. Experienced decision-makers often make likely plans of action straight away. Their experience gives them prototypes or functional categories on which to base their decisions. This answers the first question above of how the commanders were able to rely on their first option, namely by perceiving the situation as a specific kind of situation. From that point, they were then able to choose which action was right. RPD 2 was developed by other researchers examining the decision-making of warship commanders. It describes what happens when a decision-making situation is uncertain (Kaempf et al, 1996). In uncertain situations, the experienced decision-maker constructs a kind of inner narrative that describes the events that may have led to the various characteristics of the current situation. The decision-maker runs a simulation. A decision is made on basis of this simulation. RPD 3 shows how a decision-maker is able to evaluate a possible action without comparing it to something else. A mental simulation is employed also in this case. The decision-maker mentally pictures how the proposed action could work in reality. In particular, he or she examines whether the simulation reveals undesirable consequences. This allows the decision-maker to evaluate an option for action without comparing it with other options (Lipshitz et al, 2001, p. 336).

This may seem far removed from decision-making in the daily routines of environmental inspectors, but we want to highlight some common points of contact. Our interviews have

shown that for inspectors, their relationship to the operator is crucial for their success in their work, that is, whether or not the inspector succeeds in convincing the operator to comply. It could be the case that the experienced inspector uses a kind of mental simulation in two situations with regard to the operator. The first situation is during the inspection itself and the meeting with the operator. The second situation is afterwards, when the inspector makes the final judgement. What we think we discern in the inspectors' accounts is that during communication with the operator, they quickly make a judgement of what is right to say and do during the conversation by considering three questions: “What happens if I do/say this? Will it have the right effect on the operator? Will he/she better understand what I'm trying to make him/her aware of?” An experienced inspector will probably make such momentary judgements several times during a conversation with the operator at an inspection. We would also like to argue that the outcome of that conversation, at least in part, determines what will eventually be stated in the inspector's official decision. Since communication with operators and thus the relationship with them are so important to the success of the mission, inspections are a demanding task for inspectors. Many inspections generating a great deal of experience for individual inspectors are necessary to allow them to smoothly make the judgements required and not freeze in mid-conversation. During the inspection, many quick decisions are required of the inspector to enable a well-functioning communication with the operator.

The second common point of contact is the importance of experience for decision-making. Decision research has shown that highly experienced decision-makers usually make use of what researchers call forward-chaining reasoning. This means that decision-makers work their way forward from the present situation and try to make the best of it. The inexperienced decision-maker instead tends to start from the set goal. On this basis, the decision-maker works backwards in backward-chaining reasoning. This may be one reason why experienced and inexperienced inspectors do not always agree on how the work is to be done. An inspector with little experience goes out on an inspection with a clear picture of what she or he should have achieved when the inspection is complete. The person in question goes through all the different components that she or he must finish before leaving. An experienced inspector goes out and makes an initial judgement of how far she or he will come in their communication with the operator. At that moment, she starts to imagine what she has to say and do to get as far as possible in the inspection.

6.2.2 Handling errors

Research on naturalistic decision making (NDM) has also examined when things go wrong in decision-making. It has not been enough to note that it was human error that was the cause of what went wrong. Instead, this research has continued its investigation to find out what caused the decision-maker's erroneous inference. An example of the common causes of incorrect decisions is that the requirements which the organisation places on the work to be performed do not filter through to those who are to do the job. Another example is that the decision-makers have received too little training and a third example is flaws in the design of technical support or computer support that forms part of the decision documentation. In other words, naturalistic decision-making tries to

understand errors in decision-making as part of a greater whole. This also includes lack of experience. With increasing experience, individuals develop richer mental models, they acquire the ability to anticipate problems and assess when a route needs to be taken that is different from those of official work practices (Lipshitz et al, 2001, pp. 339-340).

The factor of errors in judgements and decision-making is of great importance because the decisions made by inspectors form the basis of official decisions. An example of an area that might lead to uncertainty in inspectors' judgements is the data support available to them. Since all municipalities and county administrative boards have their own computer-based case management systems, it is currently difficult and very labour-intensive to make comparisons between decisions across the country. One of the difficulties for inspectors is to justify their decisions with regard to the operator when the latter challenges, for example, the quantity of emissions in relation to production. At an inspection of a crematorium in one municipality, the operator challenged the inspector's decision because he was aware of the neighbouring municipality's decision for its crematorium which had the same incinerator and the same capacity, but was allowed to use it more extensively. Had it been possible to compare data and decisions between municipalities (which do not usually have many crematoriums), the inspector would either have adjusted the decision or had arguments for the operator. For an in-depth analysis, see Chapter 5: Case management and analysis support, and Chapter 10: Information management in environmental inspections and enforcement.

Therefore, it is of interest for further research to investigate how, more precisely, environmental inspectors reason in their decision-making. Important components of this are how they think and assess during the actual inspection and how they sum up all the components prior to the formal official decision. It is quite obvious that they are not working under the time pressure and uncertainty of firefighters or naval commanders, but nonetheless, they operate under sometimes unclear or conflicting goals, with demanding communication and judgements that require several different types of skills. In this programme, we have begun the work of examining which judgement dimensions are part of their judgements. An important question to ask is what constitutes the professional domain of an environmental inspector. Part of that professional domain may be discerned in something researchers call professional vision.

6.3 Professional judgements – professional vision

Researchers have taken an interest in how a profession comes into being based on what it is that shapes its members' vision. The question they are attempting to answer is what a specific occupational group focuses on when viewing the world. The researchers make use of questions such as: Which phenomena do the members of a specific occupational group focus on as they view reality? What events in these phenomena are of significance to the occupational group's professional vision? What is the area of their specific field of activity like? What is the formation process of what constitutes their theories, artefacts and special expertise that distinguish them from other groups? (Goodwin, 1994, p. 606).

For many occupational groups, training and education constitute the foundation for creating what is called a professional vision. A police officer reads a situation based on training and experience, as do doctors and carpenters, for example. An uninitiated person usually completely fails to grasp the details the trained practitioner notes or what the practitioner needs to find out in order to make a professional judgement. What interests researchers from disciplines such as anthropology, ethnology and applied linguistics are the interpretive frameworks used by an occupational group, the phenomena it commonly singles out, and the interplay between written practices, interpersonal communication and the use of tools (Goodwin, 1994, pp. 606, 611). The occupational group of environmental inspectors also develops theories and objects that represent them. The following is a presentation of how environmental inspectors shape their interpretive framework, the ways in which they mark the phenomena important to their profession and how they express their occupation.

6.3.1 Interpretive frameworks

All occupational groups have interpretive frameworks that they use to interpret reality and, based on that interpretation, understand how to act in their work. Interpretive frameworks "are one systematic practice used to transform the world into the categories and events that are relevant to the work of the profession" (Goodwin, 1994, p. 608). This interpretive framework is yielded through training and developed through practising the profession. Every occupational group takes its starting point from its perspective and the particular practice of that community. The doctor arriving at the scene of an accident interprets what she or he sees differently to the way police officers do. They also notice different things even though they are at the same accident scene. The formation of a meaningful interpretation of an event and a scene is no transparent process that an outsider can easily understand. Every occupational group has its historically constituted practice. How to behave, what to look for and how to interpret and talk about what is seen are things that the occupational group develops together. This also constitutes a historical legacy and becomes its own discourse, i.e. its own interpretive framework that only the initiated ultimately understand. The philosopher Ludwig Wittgenstein called this a language-game. According to Wittgenstein, the language-game is "the whole, consisting of language and the actions into which it is woven" (Wittgenstein, 1996 (1992), §§ 7-9).

Environmental inspectors have also developed their own interpretive framework for their profession. They know what details to look for and examine during an inspection. To their aid, they have developed various checklists. If an inspection is performed at, e.g. a plate shop, the inspector will ensure that there is adequate ventilation in the workshop used for car spraying, and the operator must be able to present a certificate stating that the ventilation is working properly. When the inspector enters the spraying area, it is, among other things, the ventilation system to which he or she will be paying attention. The inspector selects the ventilation system as one of the details to be examined. To the outsider, this simply looks as if the inspector is moving somewhat aimlessly around the room while running his or her eye along the walls and floor. What the inspector is actually doing is switching on his or her professional vision and, based on knowledge and

experience, working towards a judgement of the environmental safety of the activity.

As concerns interpretive frameworks, these are strengthened by the collegial community. Colleagues teach each other to see what is important for professional work. Together, they help each other interpret what they see in order to perform proper work (Goodwin, 1994, pp. 608-609). This is also what our study shows to be a judgement dimension in the work of environmental inspectors. In order to make a judgement, it is also important for inspectors to speak to colleagues, either at their own department or in another municipality. It is not only communication with colleagues that helps to strengthen and develop the interpretive framework. Reading previous decisions and examining the legal aspects also strengthens the interpretive framework. This is done through the language used there and through the focus on certain phenomena existing in both the Environmental Code and in previously formulated decisions.

We would argue that part of the inspectors' interpretive framework consists of checklists used during an inspection. The Environmental Code also constitutes part of the interpretive framework, as do communication with colleagues and previous decisions by colleagues. However, an in-depth investigation is needed to determine how these four elements are interrelated and how they support each other and the inspectors' interpretive framework. Recalling the definition of an interpretive framework as “one systematic practice used to transform the world into the categories and events that are relevant to the work of the profession”, this corresponds well with the dimensions described earlier in the chapter.

6.3.2 Marking phenomena

Human perception functions in such a way that objects or shapes draw attention because they are relevant to what the individual is doing at that particular moment. The rest of the surroundings merge and form a background (Goodwin, 1994, pp. 609f). Someone interested in birds notices them in a completely different way to someone not interested in birds. When driving a car, for example, it is all the objects and living things that are moving around, or look like they might start to move, that attract attention. The rest of the surroundings is not really observed; it forms a background. Many occupational groups use perceptual ability in a systematic manner in the course of their work, as do environmental inspectors.

One way of emphasising important information is to use a marker to highlight words or sections of text that are being read. Another way is to draw on the ground to show where, e.g. waste oil has spilled. Different occupational groups use different methods to mark what is important in their surroundings, in a document or in an event. Excavator operators have their methods and so do nurses. Another way of marking important information is to write it down. This is a common method used by environmental inspectors during inspections. They describe in words what they perceive to be significant based on their interpretive framework. They take notes of the operator’s answers to the questions asked. Another way of creating documentation that is sometimes used by inspectors is to photograph certain details of the activity’s premises or outside the workshop or factory.

Once more, it is the professional interpretive framework that determines what is photographed.

In this way, it could be said that environmental inspectors mentally “mark out” in advance what is important to their profession. It could even be said that the notes and photographs become an embodiment of the mental map drawn by means of their interpretive framework. They will return to their notes and photographs prior to the official decision they will eventually produce.

6.3.3 Components that express an occupational group

Some occupational groups develop a dress code that enables outsiders to recognise them. This may be a case of uniforms that must be worn in service, such as those of police officers and religious leaders. It may also be a case of practical and durable clothing worn by craftsmen or healthcare professionals. Certain tools and equipment belong to certain occupational groups. The stethoscope is associated with doctors and a special kind of sewing machine with shoemakers. All objects of this kind signal a certain occupational affiliation, which in turn lends legitimacy to those wearing/carrying them. Over the years, some occupational groups acquire a certain way of moving that makes it possible to recognise them, at least by some, even if they are not wearing/carrying any of their typical attributes at the time.

The question is whether there are any special tools or objects that are unique to environmental inspectors. They have no special uniform or unique objects that characterise them. They come in plain clothes and often carry a notepad. That is all. When they return to the department, they use computers, as so many do in their work today. Thus, they do not stand out at all. The interesting thing is that they still have something that lends them legitimacy (besides being able to certify that they are employed as environmental inspectors at an environment department or at a county administrative board). It is their way of speaking. Their manner of expressing themselves and asking questions allows one to understand that the speaker is an official and someone who is knowledgeable in environmental issues. For the individual inspector, this way of talking is developed in the interaction of three components. One component is due to the inspector's training. This undergoes continuous development throughout a career because the inspector learns new things about environmental work and the exercise of authority. Another component is the example that other colleagues may constitute to the individual. The inspector learns by seeing what colleagues do. A third component is, of course, the inspector's own personality. These three components mix to become the individual inspector's unique expression in his/her professional communication with operators, the general public and other colleagues.

We sometimes speak of an occupational group's nomenclature, that is, the common words and concepts employed by that occupational group. What was shown in our research programme, and not least in the survey we sent out to all municipal heads of EIE, was that certain words and concepts meant different things in different parts of Sweden. Some concepts were not used at all in some municipalities, which meant that they had to ask

what we meant by certain questions in the survey. The interesting thing is that all "EIE words" used in the survey originated in material from the Swedish Environmental Protection Agency.

Since it must be possible to subject official decisions to an appeal, it is extremely important that the language used in official decisions is unambiguous. For this reason, a special way of writing emerges that also gives a certain character to the occupational group. Therefore, it is of even greater relevance to understand the occupational group of environmental inspectors from the interplay among written practices, interpersonal communication and the use of tools. This is where we can find what distinguishes them from other occupational groups. Among other things, inspectors have developed various checklists that they use for inspections, which are a form of written practice that has its origins in the Environmental Code and interpretations thereof. In communication with operators, they make use of their specific professional language that enhances their legitimacy. Strictly speaking, we might not be able to say that inspectors make use of certain tools that are unique to them. But they use pen and paper, cameras and computers. By means of these, they express their profession, they provide a picture of what sort of occupational group environmental inspectors constitute, and with these they strengthen their legitimacy. Something unique to the occupational group is that they have the right to make inspections. They have a statutory right to examine premises and areas where environmentally hazardous activities are conducted. This right might be called a "tool" for the work and something that distinguishes them as an occupational group.

Finally, we would point out that professional vision is not primarily an individual capacity, but something that belongs to a collective and is shaped by all members of that collective (Goodwin, 1994, p. 626). Therefore, it is important for inspectors to meet both formally and informally. Conferences on special themes offer them the opportunity to learn more about a specific subject and the opportunity to strengthen their identity as inspectors, as well as an occasion to reach consensus with other colleagues. It could be said that meetings and discussions with colleagues are a means of improving their professional vision. In our study of the assessment criteria used in inspectors' judgements, they also emphasise the importance of speaking with other inspectors for making their judgements as correct as possible.

6.4 Professional judgements – objectivity

An important dimension in our study of inspectors' judgement dimensions – what they are and how they are described – is that of legal certainty and objectivity. We choose to focus on the concept of objectivity because it is an ambiguous term that most of us, despite this ambiguity, believe that we know what it signifies. This can lead to trouble for the individual inspector because she or he may find themselves in the dilemma of how objectivity is to be exercised. Another problem that may arise is operators claiming that an individual inspector's work has not been performed objectively. Both these situations are examples of matters that complicate the work of inspectors, forcing them to spend more time on a case than what would have otherwise been needed.

In this section on objectivity, the EMT researchers further analyse what objectivity in Swedish EIE involves, with a focus on the work of environmental inspectors. In 2011, Tillsynsforum and Krus (the Swedish Council for Strategic Human Resources Development) arranged a conference to discuss the values on basis of which all the country's EIE agencies have to work. Among the subjects discussed were objectivity and facts. The conference found that "it [is] important both to be and be perceived as factual and impartial" (Tillsynsforum, 2011, p.10). MSB, the Swedish Civil Contingencies Agency, has developed this wording somewhat: "Agencies should also – in accordance with the objectivity principle – be factual and impartial. This means that, in making decisions, agencies may not take into account circumstances other than those that the applicable regulations state may be considered in the examination of a case. They may thus not allow themselves to be influenced by a desire to favour or not favour certain individual interests, and they may not take into account extraneous circumstances, such as an individual's nationality or political opinions" (Swedish Civil Contingencies Agency, 2012, p.134). Factuality and impartiality are certainly important criteria for what it means for an agency to be objective. In this analysis, EMT would emphasise that there is more to objectivity than just these criteria, criteria that are important for the ability of environmental inspectors to be able to carry out their work.

At times, we imagine that objectivity is to "take a step back and report everything we see" (Edlund, 2008, p. 161). This kind of objectivity is not possible for environmental inspectors. It is perhaps not possible for any occupational group since it requires two things of us humans for which we do not really have the ability. First, we would need to be able to see and take in everything in a situation or place, and second, reporting of this kind would be both too detailed and too impenetrable. Looking at the interpretive frameworks that are part of the inspectors' profession, they focus on specific details of the activity being inspected. They neither shall nor can report everything they see. They must take into account certain things that pertain to environmental legislation and environmental considerations. Everything else is irrelevant. This specifies their objective mission. It is not about reporting everything they see, but about concentrating the report to a few things. Yet another aspect of the inspectors' exercise of objectivity is that they are to make an assessment of the components on which they are focusing (the fan system, oil separator, self-regulation programme etc.). Thus, reporting is not enough. In addition, there is also something that they themselves formulate as follows: "The inspector's role is to make an objective judgement between two parties, that is, between the operator and the legislator and its legislation."[22]

The environmental inspectors shall thus report certain specific conditions and make a judgement of these conditions. It should also be emphasised that their judgement is based

[22] Workshop *Avloppsguiden's* conference, Hudiksvall, September 30 2011. The source material is held by the authors.

on the fact that they are making a judgement between two parties, the legislator and the operator. This delimits the inspector's objectivity, but it is still difficult to understand.

Therefore, it is important to start bringing order to the concept of objectivity. To begin with, we could divide objectivity into three components: the objective truth of an assertion, objective procedures guaranteeing that a conclusion has been reached on an objectively correct basis, and the objective behaviour of the person doing the work (Douglas, 2004, p. 453). These three components of objectivity will already deepen our understanding of the landscape through which environmental inspectors move when they are to be objective in their exercise of authority. What they assert to be objectively true. In other words, what they describe should be the way a place and an activity are organised. Second, they are to use certain work practices so it can be said that their work has been performed objectively. Third, they must also have behaved objectively. Criticism of their objectivity can be levelled against one of these components, not necessarily all three. This is important to bear in mind when discussing what objectivity is both in general terms and in a specific inspector or a specific situation. Something that is objective is something we can rely on. With regard to EIE, an objective judgement is a judgement that is reliable. It must be reliable for the operator, for the legislator and for the general public. These three aspects of objectivity are ultimately about a completed judgement being something we can rely on, something we can label as objective.

So far, we have three aspects of objectivity, aspects that are needed for a judgement to be reliable. The philosopher Heather Douglas has further illustrated objectivity by answering three questions about the concept:

1) When looking at human interactions with the world, what does it mean to say that such a process leads to something objective?
2) When looking at individual thought processes, what does it mean to say that the end result of that process is objective?
3) When examining the social processes involved in knowledge production, what does it mean to claim that the end result is objective? (Douglas, 2004, pp. 456, 458, 461)

Douglas' reasoning enables us to better understand what are important aspects of objectivity in the judgements made by environmental inspectors and what is required of them in the course of their work. What Douglas demonstrates is that objectivity has many dimensions, and all dimensions are not applicable in all contexts. Some dimensions are more important in certain situations, and we will examine which dimensions are relevant in the judgements of environmental inspectors.

6.4.1 Interactions with the world

An initial, rather simple form of objectivity is that which is based on an investigation of the world. For example, by investigating a chair and using it, a person may assert that there is a chair and also say where it is. Other people may perform the same investigation and come to the same conclusion. The process of investigation allows them to conclude that the object really exists (Douglas, 2004, pp. 456-457). From one perspective, it can be

argued that this is an almost banal form of objectivity, but in some cases, it is crucial. An example of this form of objectivity is in order.

"During an inspection, environmental inspector Linda has not found the self-regulation programme required for being allowed to conduct operations on the site. She writes this in her report and requests the operator to submit such a programme no later than in three weeks' time. A few days later, she receives an irate e-mail from the operator where he announces that the company actually has one. Linda thinks the response sounds evasive and phones him. After talking for a while, she begins to understand the situation. They do have a self-regulation programme and he can explain what they are doing to follow it, but it has not been written down anywhere.

"When we come for an inspection, we have to see a document describing the self-regulation programme. When we are satisfied with the arrangement of the self-regulation, we also want to know that all relevant employees have access to the description of the programme and know how to follow it. So it is not enough that you are able to tell me about it when I ask. Do you understand what I'm looking for? she asks the operator."

This example displays a form of objectivity that is necessary for the functioning of the inspectors' work. The work includes making inspections to ensure that things are the way they should be in terms of the environmental work of an activity. The example also shows something else, namely that communication is necessary to determine that things are the way the inspector claims them to be. It is not enough for the inspector to claim something. Operators have the right to present their claims about the situation in an attempt to convince the inspector in a particular direction. In cases that are difficult to interpret, such as when locating an activity close to a watercourse, the inspector may need the help of a colleague, and the operator has perhaps also enlisted the help of an expert in the field. Operators' arguments for their case may then include an account of what measures the operator has taken to minimise the risks. Then, it is the inspector's task to assess whether this is sufficient by investigating the matter at the site. This form of objectivity, called *manipulable objectivity*, means that we rely on our ability to assess via our senses whether a specific thing exists and whether it is reliable. It is important to note that it is human interactions with the world that are being assessed as objective or not, not the person who has carried out the judgement, or the approach. Has the inspector made the right observations during the inspection? Can anyone else see the same thing? In other words: does what the inspector claims exist?

Another form of objectivity is called *convergent objectivity*. This means that if the same result is reached in various ways, it can be said that the result is objective. In practice, this means that different methods are used to investigate a phenomenon. If the same result is obtained with all these methods, the result is objective. An everyday example is when someone tries to find out whether or not an item of food is rancid. The first thing the person does is to look at, say, the sausages. What is their colour? The next step is for the person to smell them. Do they smell rancid? Finally, the person maybe touches them with

her fingers to see if they have become slimy. If the sausages have an unusual colour or have patches of mould, if they smell rancid and have started to become slimy, all three methods say that the sausages are too old and should not be eaten. The result of the investigations is a convergent objectivity, that is, using different methods of investigation to arrive at the same result. Convergent objectivity can be said to be something that environmental inspectors use in cases where they feel uncertain. By using multiple methods of investigation, they ensure that their decision is correct and can be supported by several different arguments.

6.4.2 Individual thought processes

With respect to assessing whether or not an individual's thought process is objective, there are three forms of objectivity: detached objectivity, value-free objectivity and value-neutral objectivity. Just because someone wants something to be true does not mean that it is true. Individuals' own values should not be allowed to blind them to this fact. If someone holds to a certain conviction or certain values, this may cause the person to only emphasise certain information. It may also mean that the person is not open to further information on the subject (Douglas, 2004, p. 459). Therefore, it is important that those making judgements have control of their own values and understand when these can trick them. It might also be in this area that operators and the general public are sometimes critical of the actions and decisions of officials. But as they might find it difficult to put this into words, they instead claim that the official has made an incorrect judgement of a thing or circumstance.

Detached objectivity is about keeping a certain distance to the subject of investigation. By remaining detached from or neutral to the subject of investigation, it is hoped that the individuals' own desires do not influence the result of the investigation (Douglas, 2004, p. 459). This approach can sometimes be seen as cold or indifferent, which may be a misconception. What the environmental inspector emits need not be coldness or indifference, but a sign that she or he is using the professional vision (see above) to be able to make his/her judgement. Inspectors screen themselves off in order to focus on the details that are important for the judgement, and this should perhaps instead be seen as concentration. Another misconception, in this case on the part of the person who is to exercise impartial objectivity, is that feelings should not be involved. This may result in the inspector sending out signals that might be perceived as “stay away from me”. In the long term, this may lead to communication difficulties.

Douglas makes the point that detached objectivity easily expands to value-free objectivity. These two are not the same. In value-free objectivity, all valuations are banned because the advocates of detached objectivity believe that all values are subjective opinions and should be excluded from every form of judgement that calls itself objective. This position is not the same as asserting that values may never supplant evidence or facts (Douglas, 2004, p. 459). A value-free EIE would probably not be either possible or desirable. It is on the basis of values about how a society should manage its environment, and thereby its citizens, that environmental legislation comes into being. Attempting to be value-free in that respect is erroneous. It might even be a strength for

the inspector to be able to argue for compliance and good environmental management by being able to refer to the values of society in this area. What the inspectors emphasised in our interviews, however, is the importance of keeping quiet about their personal views of how people dress and behave. These are expressions of values that should not be allowed to obscure their professional work, something which they are very careful about. Douglas writes that it is important to be able to negotiate the line between values damaging one's reasoning and using values for making informed decisions (Douglas, 2004, p. 460). Where the line is between these two is not something that has been determined once and for all, but is something that is part of the inspectors' daily routines to constantly reason their way towards, for themselves and together with others (see also Chapter 7 on roles and competence).

The third form of objectivity for thought processes is *value-neutral objectivity*. This is often confused with value-free, but these two are not the same. Value-neutral objectivity means taking a balanced or neutral position with respect to a whole spectrum of values. A good example of such a neutral position is a report that provides an overview of the current state of affairs, giving equal space to all aspects of the situation or problem and not taking a position for or against someone or something. This is seen as a balanced report (Douglas, 2004, p. 460). We perceive value-neutral objectivity to be merely one step in the work of environmental inspectors because they are making a judgement between two parties, the central government with its environmental legislation and an individual operator. It is not enough to describe the different parties' views on the matter. It needs to be present as an explanation in a written decision but, in terms of exercising enforcement and making official decisions, it is not enough. There also needs to be a judgement of whether or not the operator complies with the environmental legislation.

6.4.3 Social processes

So far, we have described objectivity as human interactions with the world and as human thought processes. The third perspective is objectivity seen as social processes. This relates to processes between people for the purpose of developing new knowledge or arriving at a joint decision (Douglas, 2004, p. 461). Here, three forms of objectivity can be discerned.

The first is called *procedural objectivity*. This means that processes are considered to be objective when the outcome is the same, regardless of who is performing the actual process. This is a form of objectivity where society, for example, places requirements for a certain process to be performed in a certain way in order to ensure objectivity. This relates, for example, to certain tests where it can be said in advance which answers are correct and which are therefore incorrect. There is no need for individual judgement in the case of these tests (Douglas, 2004, p. 461). Procedural objectivity is various kinds of highly quantifiable measurements.

The second form of objectivity is called *concordant objectivity*. Here, the focus is not on eliminating individual judgement as is the case with procedural objectivity. Instead, it investigates whether a group of people can, in fact, agree. If they make similar

observations and interpret these observations in similar ways, it can be said that they have arrived at an objective result. It is not a matter of engaging in discussion or trying to bring about agreement. Either they will make the same observation, in which case there is concordant objectivity on the result, or they do not make the same observation, in which case there is no objectivity. It is important to note that it is possible for even a group to be wrong, that they have not discovered anything real but that it is an illusion. Neither does this form of objectivity guarantee that the individuals in the group are not guided by values (Douglas, 2004, pp. 462-463).

The third form is called *interactive objectivity*. This requires conversation and discussion between the members of a group. The members are to argue their cases and discuss each other's opinions and suggestions. Rules are needed for how these conversations are to proceed, as well as agreement on how good arguments should be constructed and how they should be presented. One really crucial question is who gets to participate in these discussions. Objective results in this respect mean that such discussions have been conducted in an acceptable but perhaps also creative way (Douglas, 2004, pp. 463-464).

How can we relate these three forms of procedural objectivity to the work of environmental inspectors? Regarding procedural objectivity, there are certain requirements for what an environmental inspector is to pay attention to during inspections, but the environmental legislation is too complicated for it to be possible to achieve the same judgement of a particular object in all situations regardless of inspector. There are too many parameters involved, and inspections are about judgements and not a vocabulary test in which a correct answer gives a certain number of points. Neither is concordant objectivity completely applicable to the work of inspectors. Even if one were to examine the official decisions made over the past ten years at, for example, all Swedish pulp mills, and in that examination conclude that in all similar cases, all environmental inspectors have arrived at the same decision, it is still not certain that this is correct. All of them might have made incorrect observations or, because of the way the legislation has been worded, might have focused on things other than what turns out to be really crucial for the environment.

Finally, interactive objectivity is a natural part of the daily routines of environmental inspectors. On one occasion, an environmental inspector expressed it as follows: “With regard to legal certainty and objectivity, communication with colleagues is extremely important. Hearing a colleague's comments can sometimes be crucial to my arriving at a correct judgement.”[23] One of the eight judgement dimensions from our study is indeed “communication with colleagues”. We have understood this communication precisely as discussions, where colleagues have helped each other weigh the pros and cons of a particular judgement, where colleagues have put forward different perspectives and points of view and where they have sometimes tried to come to a unanimous decision and

[23] Interview on professional judgements with three environmental inspectors, June 11 2010. The material is kept by the authors.

sometimes realised that they think differently on certain points. In this way, inspectors inviting discussion have received help to formulate their own positions and have been able to justify why he or she is making that particular final decision. In other words, it is an explicit strategy for making objective decisions. In communication with colleagues in the department or at conferences, every inspector also develops a feeling for what is right within the profession. They develop a common interpretive framework, thereby strengthening what is an objective approach and objective behaviour for inspectors.

What the above analysis of the environmental inspector's work is intended to illustrate is that the inspector's enforcement and judgement constitute an interwoven fabric consisting of several different aspects of objectivity. Being factual and impartial, in the words of Krus and Tillsynsforum, has in the above analysis been called value-neutral objectivity and detached objectivity, respectively. In this section, we have shown that factuality and impartiality are only a part of the objectivity that inspectors need to exercise for their judgements and work to indeed be objective.

6.5 Summary

The results of this study and the analysis of environmental inspectors' professional judgements consist of several components.

1. A description of the different judgement dimensions that environmental inspectors themselves emphasise as the constituent components of a professional judgement. These are:

- Studying the specific case, the type of objects to be visited and the history of the individual object
- Inspection
- Communication with the inspectee
- Communication with colleagues
- Studying previous decisions
- Examination of legal aspects
- Legal certainty and objectivity
- Appraisal and assessing reasonableness

These eight dimensions deepen our understanding of the inspectors' work, which is usually divided into preparation, the inspection itself and subsequent work. The dimensions highlight the advanced work performed by environmental inspectors and what according to them is required for them to perform their work properly.

2. Decision research has shown that highly experienced decision-makers usually make use of what researchers call *forward-chaining reasoning*. This means that decision-makers work their way forwards from the present situation and try to make the best of it. The inexperienced decision-maker instead tends to start from the set goal. On this basis, the decision-maker works backwards in *backward-chaining reasoning*. This may be one reason why experienced and inexperienced inspectors do not always agree on how the

work is to be done. Decision research draws the attention to different reasons for the wrong decisions being made. An example of these is that the requirements which the organisation places on the work to be performed do not filter through to those who are to do the job. Another example is that the decision-makers have received too little training, and a third example is flaws in the design of technical support or computer support that forms part of the decision documentation.

3. Professional vision may be divided into three components; interpretive frameworks, the marking of phenomena and the expression of the occupational group. We would argue that part of the inspectors' interpretive framework consists of checklists used during an inspection. The Environmental Code also constitutes part of the interpretive framework, as do communication with colleagues and previous decisions by colleagues. With regard to the marking of certain phenomena, the environmental inspectors use perceptual ability in a systematic manner in the course of their work. Language is also an important tool for marking the phenomena that are important in their work. Using notes and pictures, they mark out the phenomena they need to take with them in order to make their professional judgement. How can we know that we are standing in front of an environmental inspector? The answer to this resides very much in the language. Their manner of expressing themselves and asking questions allows one to understand that the speaker is an official and someone who is knowledgeable in environmental issues. Education, role models in the profession and the individual’s own personality stamp their influence on what “sort” of inspector an individual becomes. Professional vision is not primarily a personal capacity, but something that belongs to a collective and is shaped by all members of that collective.

4. Objectivity in EIE has many more facets than what is seen at a first glance. What the inspectors assert is to be objectively true. In other words, a place and an activity should be organised in the way that they describe. Second, they are to use certain work practices so that it can be said that their work has been performed objectively. Third, they must also have behaved objectively. This chapter's analysis of what objectivity entails in the exercise of the inspector's profession discusses a number of issues, divided into three areas: a) an investigation of the world and whether this investigation has been performed correctly, b) assessing whether or not an individual's thought process is objective, and c) objectivity seen as a social process that goes on between people for the purpose of developing new knowledge or arriving at a joint decision. Objective judgements in the exercise of the environmental inspector's profession are therefore about more than factuality and impartiality.

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Chapter 7
The environmental inspector – roles and competence

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In this chapter, we want to highlight some aspects of what an environmental inspector is and what an environmental inspector does. The objective is to show the different aspects of the inspector's profession that may be significant to the efficiency of environmental inspections and enforcement (EIE). Just as we described in Chapter 1, these aspects are a result both of the focus and the objectives of the programme and of scientific perspectives and interests. The aim of this chapter is primarily to

- provide insights into how the inspector's work and role have been considered in the research programme, in part to understand how design workshops and prototypes were to be designed
- understand the inspector's work and role on the basis of a number of theoretical perspectives in order to illustrate that the scope of research fields can say something more about efficient EIE.

7.1 The environmental inspector

One of EMT's goals has been to provide a description of the environmental inspector as part of EIE. Thanks to all meetings with people, both inspectors and others, a picture has emerged of a profession consisting of women and men from virtually the whole of Sweden aged between 25 and 67, with the primary task of ensuring compliance with environmental legislation in all 290 municipalities and 21 counties in the country. We have limited ourselves to focusing on environmental inspectors at the municipal level and thus, not inspectors at the county level. This is for practical reasons. Our aim was to visit Sweden from north to south, and we have studied the individuals and agencies to which we gained access. Most have been at the municipal level. Because EIE conditions partly differ between municipalities and counties in several ways, including in terms of financing and work organisation, we had to impose this limitation. The description below will discuss how the picture of the environmental inspector has emerged. Obviously, such a picture will be general in nature since the role described represents several thousand individuals but, at the same time, the overall picture will also be tangible.

The Employment Agency website states that “Environmental and public health inspectors mainly work at various agencies in the field of environment and public health. The inspector's duties include carrying out EIE. This involves visiting various activities, such as restaurants, petrol stations, industrial premises, water purification plants and private sewage systems to ensure compliance with acts and ordinances. The biggest employer is all Swedish municipalities. The inspector is an expert official to the political committee that is locally responsible for implementation in accordance with the Swedish Environmental Code, food legislation etc.” (Swedish Employment Agency December 11

2012). An environmental inspector usually has a higher education degree in either environment and public health or the natural sciences, possibly with supplementary studies of the Swedish Environmental Code and the Administrative Procedure Act. The nature of the profession presupposes that an inspector is interested in meeting people. It is relatively easy to find work as an environmental inspector, and they can work throughout the country at municipalities, county administrative boards and also companies.

We now leave this formal description to instead describe how the picture of the environmental inspector has emerged in the research programme. This picture is also general, but less formal, and is based on our experiences of various individuals and groups that we have met through field studies.

At our first meetings with environmental inspectors, we described the EMT research programme based on who we were, the research institutions in Stockholm from which we came, the goals of our research, how we would proceed, that it would take three years and that we had received a major grant to carry this out. A number of things were quite striking. The fact that a new group of researchers, all from major, well-known universities in Stockholm, who were not knowledgeable in the environmental area, would be examining the efficiency of a group that had, as expressed by its members, been subjected to constant new studies and requirements for more efficient (read: faster and cheaper) EIE, meant that we were received somewhat coldly. As time passed, during field studies and further meetings, we learned what we needed to explain our research and working methods so as not to be suspected of running someone's errands or of lambasting inspectors or their managers. On basis of this and our field studies, we realised that the inspectors were used to being marginalised or perhaps misunderstood and sometimes felt obstructed from various quarters, from the Swedish Environmental Protection Agency and the Swedish Association of Local Authorities and Regions (SALAR) to politicians, the general public and their own heads of EIE.

The picture painted also included a general criticism of the lack of clarity about career paths in EIE, or perhaps rather that there are no such paths. Moreover, the skills required to move ahead in some form of career or to get a salary increase or differentiation are not clearly specified. Sometimes, it is not even clear what skills are required to work as an environmental inspector and there are great differences across the country on these points. It often falls back to how a certain municipality or manager deals with these issues. How competence is actively managed may ultimately be a factor leading to these differences in EIE between municipalities. If there is no clear picture of skills, profiles and career opportunities, competence supply might become difficult.

What also became clear over time is that environmental inspectors as a group are characterised by being meticulous and having a desire to do things properly. Professionalism and correctness are important components for being able to make assessments and decisions. They have, and want to have, a legal, fair and environmental ethos, that is, a clear moral stature and responsibility in their EIE work, e.g. making decisions in the right way and on the right grounds, but also practising what they preach,

e.g. being careful about recycling garbage and choosing to travel by train wherever possible. This general picture possibly makes environmental inspectors comparable to professions such as teachers, doctors or priests, who could be described as having a "calling" or working for a higher purpose beyond the specific work to be performed. This is not something that all inspectors express or feel at every moment, but within the group of environmental inspectors, there is often a desire for something more and there is a wider purpose to their work than, say, what we read on the Employment Agency website.

If these various pictures of the environmental inspector are true, it becomes relevant to define in detail not only the inspector's skills and knowledge, but also the inspector's incentives and motivation, both at an individual level and at a group level, in order to clarify where boundaries are drawn with respect to assessments, decisions and priorities. It becomes important to examine what incentives and motives, besides the legal ones, that EIE uses in practice. This will require multiple ways of describing the environmental inspector and the role of the environmental inspector. It will also require more perspectives to illustrate these descriptions.

7.1.1 Role descriptions

One of these ways, for example, is that when in the EMT programme, we have discussed inspectors' work and work situation ahead of workshops or when producing prototypes, we have created and used a number of roles or experiences that it has been important to highlight in order to understand how future technical decision support could constitute exactly such support for environmental inspectors.

There are recent graduates who have worked for about a year in a smaller municipality and have fresh knowledge from inspector training and the issues discussed there, but little experience of what it is like to work as an inspector. There are those approaching retirement age, having worked in EIE for a long period of time, both as an inspector and perhaps as acting head, in some smaller municipalities around the country and some municipalities in one of the metropolitan areas. There are those who have worked for 30 years in the same municipality and others who have moved around to many different places. There are those who have only worked in small municipalities and others who have only worked in metropolitan municipalities. Some have only worked in northern municipalities, and others only in the south of Sweden. Some have only worked in their home areas, while others have moved far from home to work as an environmental inspector.

As a way of describing the environmental inspector in relation to operators and the work to be performed within the project, we created personas and a number of scenarios, which give another kind of picture of the environmental inspector. User-centred system development has many different methods for ensuring that what is developed meets the client's requirements and objectives. The persona methodology is a working method in human-computer interaction to ensure that everyone within a technology or system development project works toward the same target group. Rooted in data on real people in real contexts doing real things, fictitious characters were created with a picture and a brief

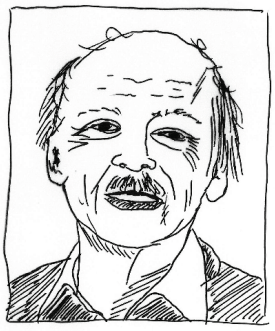
descriptive text (personas), were each has individual goals and work-related goals. Activities or individuals that affect the persona's work can also be illustrated (examples of literature discussing the persona methodology are Artman et al, 2010; Cooper, 1999; Cooper & Reimann, 2003; Guðjónsdóttir, 2010 and Pruitt & Adlin, 2006).

Below are three personas that were jointly developed by subprojects 1 and 3 in order to articulate what an environmental inspector is and what EIE might involve. This was not only a portrayal of the main target group (inspectors) but also of an operator with his goals and incentives, since the operator constitutes a part of how inspectors must plan and prepare their work. The future scenario was created through discussions and concerns solving the problems of the great amount of material and equipment that inspectors may in some cases need to bring with them and the problems of inspectors for each case having to make use of information from many different sources and systems.

Åsa, 34, married, with a husband and two children of pre-school age. She has always loved dogs, had dogs as a child and now has two, Bejje and Astrid, whom she trains in agility and sometimes enters into competitions. Åsa trained in Umeå and graduated three years ago.

After a work placement in the Municipality of Umeå, she immediately found work as an inspector in the Municipality of Malma in Västerbotten. In Malma, she worked withmost kinds of cases, ranging from private sewage systems and ski resorts to quarries. Since there were not many inspectors at the department, she got to help out in all kinds of cases, including urgent cases, such as when Anna Bergström from Hed called and complained about the noise when the heating plant was refilled with pellets.

After about a year, she moved to the Stockholm region because her boyfriend, now husband, Anders got a job there in healthcare. For two years, she has been working in the Municipality of Sollenbjörka where she has the opportunity to become more specialised in different areas at the Environment and Planning Department. She is currently working on the inspection of private sewage systems, which has been the focus over the past year, but tattoo, hairdressing and beauty establishments have also become her special fields.



Bengt, 62, married, one adult child. In his spare time he likes to do orienteering in the summer and long-distance skating in the winter, and potters about in the garden and meets friends. When he was young, he was an active field biologist.

He trained as a biologist in Lund in the late 1970s and, after a few years as a lab assistant, began to work as an environmental inspector at the County Administrative Board of Jämtland. He stayed there for seven years, later working four years as an inspector in the Municipality of Östersund, before moving to the Stockholm region to be closer to his ageing parents. Since then, he has been working in the Municipality of Sollenbjörka. He has worked in many different types of areas and with many different kinds of cases, and he knows the municipality well. He often gets to look after specialactivities that are less common.In the past four years, he has had the task of specifically working with petrol stations and their car washes.

Bengt will be reducing his working hours. He is to undergo surgery for a slipped disc, partly due to overexertion and he does not want to work full-time after the operation. He will introduce Åsa to the objects that she will take over when he is on sick leave and will probably also continue to be responsible for in the future.

Ove Larsson has run a petrol station and car wash, *Lasses mack & meck*, for the past ten years. He inherited the company from his father and has developed and modified the petrol station and car wash over time.

Ove wants to do things properly, preferably straight away. “Otherwise, it'll just create a lot of extra work that you don't get paid for!” Ove is not particularly well informed with regard to the environmental legislation or the environmental objectives. And he does not really understand why the inspectors at the municipality are so pedantic about everything, but for the sake of his children's future and the firm, he is anxious not to pollute nature and wants to be as environmentally friendly as he possibly can. But the firm also has to break even.

The car wash consists of an automated washing system, where cars go through, and a hall for manual washing. In front of the automated section, there is a special tile where a car should be parked when being applied with degreaser. There are quite a lot of chemicals. There is a filtration system for the water used for washing. There is a crack in the floor near the outflow by the floor drain, which was criticized in the latest inspection.

Future scenario

Preparations

Bengt contacted Ove three weeks ago to propose a visit to *Lasses* on 14/4 at 1.00 pm. The e-mail confirmation to Ove comprises relevant documents including previous decisions. He sends the link to previous decisions in connection with sending an e-mail confirmation of the time. Ove has submitted his environmental report to the Swedish Portal for Environmental – Reporting (SMP) and has seen that Bengt has reviewed it. Ove and Bengt have access to the same documentation and can see the same things, except Bengt's own notes which only Bengt can see. Bengt prepares for the inspection of *Lasses mack & meck*. He has studied the material before their meeting. It is little more than a year since he was last there. On that occasion, most things looked good, but there were a few things that he wanted Ove to rectify inside the facility itself.

Inspection

Bengt and Ove sit down in Ove's office and go through the checklist that Bengt has on his ipad (or similar). Since last time, Ove has rectified the points for which he was criticized, among other things, the crack in the floor near the water outlet.

The automated system sprays degreaser, shampoo, wax and water. In reviewing the economic report and the self-report, they jointly conclude that a great deal more degreaser is used now thanpreviously. Ove does not really know what this is due to. After this paperwork, they go out into the facility for an inspection where they discover what appears to be a leak in a hose connection. Both Ove and Bengt realise that there are environmental and economic gains to be made from sealing the leak. Bengt informs Ove that this must be rectified from an environmental standpoint and with reference to the rules of consideration in Chapter 2 of the Environmental Code (which is in line with the fourth environmental quality objective of *A Non-Toxic Environment*, specification no. 4 on unintentionally produced substances and specification no. 6 on polluted areas).

Bengt tags this on the screen and makes notes continuously as they walk around the facility. Among other things, he tags the location of the leak on the map.

Ove realises that it was fortunate that he had managed to mend the crack in the floor, otherwise the leak might have spread hazardous substances further.

Decision

Back at the office: Based on the checklist and the notes Bengt made, he formulates a decision with a remark that the leak should be rectified within x weeks to avoid a fine. Bengt links the tag of the leak's map location to the text concerning that point in the decision. Environmental objective point 4 is marked as deficient. He clicks the button: Communicate decision.

Åsa takes over

Prior to the takeover of Bengt's cases, Bengt and Åsa meet for a general discussion of Bengt’scases These are car washes and a group of special cases. Partly by using the Map, he shows Åsa which cases these are and their location. They conclude that they will transfer some car washes to Åsa. After the meeting, Bengt transfers the responsibility for those cases to Åsa. Because one of the cases, *Lasses mack & meck*, involves follow-up, Åsa takes an extra look at the case and notes that one of the environmental objectives is marked as insufficiently fulfilled. She clicks on it and sees the decision, reading that it was a leak that must be rectified. Otherwise, things appear to be in order for next year's planning.

The personas serve as tools in a design process that aims at producing a prototype for a technical support system for future use. They do not constitute a goal in themselves or the only or most accurate way of describing what an environmental inspector is and does. Depending on the purpose of the descriptions, their content will differ. Below, you will find some descriptions that aim at problematising and nuancing the picture of the environmental inspector from some theoretical perspectives.

7.2 Norms, language, body and role

There is no single perspective from which to consider environmental inspectors and their work or a single theory of which aspects of EIE that are the most important. Different sciences focus on different kinds of questions and theories. So, on the basis of scientific background and using data from field studies, we have highlighted a number of concepts that are significant for the problematisation of the environmental inspector's role and EIE. The concepts we discuss are norms, language, body and role, and how these are related to and are relevant for an understanding of the environmental inspector's work.

7.2.1 Norms

Every society has its norms, as does every occupational group. There are norms in scientific work, just as there are norms in EIE. Being a multidisciplinary research programme, EMT represents several different scientific approaches and research perspectives, such as economics, ethnology, computer science, cognitive science, philosophy and psychology. In most sciences, the words norm, normalise or normative are active concepts used, e.g. to describe and understand something in depth, or norms as perspectives from which to investigate a phenomenon. The phenomenon may, for example, be to view laws (as norms) to investigate how they define an individual's possibilities for action in the event of an unintentional offence, or it may be to investigate the normative notions that exist regarding the recidivism of convicted people and how these affect the convicted individual.

Different methods and various information sources and data can be used to investigate the importance of norms. For example, statistics can be collected and compared or people can be interviewed. The different methods and the collected material will affect the way in which the result is reported, even though it is still norms that we are studying.

In this text, in the first instance, we do start out from the definitions and descriptions of the concept of norms set out in “Om normer” [“About Norms”] (2009) by Matthias Baier and Måns Svensson and in “Normvetenskap” [“Norm Science”] (2002) by Håkan Hydén.

The word norm occurs both in everyday speech and in various scientific disciplines, and in each context, there may be reason to clarify what is meant by the concept. Norm is used in the sense of a rule, guide, principle, model, yardstick, pattern. There are certainly more synonyms and definitions that could be used depending on the purpose when using the word. Baier and Svensson write “... that in common language, ‘norm’ is mainly used in the sense of ‘something that determines or lays claim to determining something else’;

we believe that this is also a general understanding" (Baier & Svensson, 2009, p. 34). This "something" may be a technical rule, an act, regulation or ordinance, such as environmental quality norms regulating the quantity of particles in the air to protect human health (Naturvårdsverket, 10-12-2012) or a norm of conduct or a social norm that dictates that we shake hands in greeting or norms as societal structures such as "the male" as the norm in the public sphere and "the female" as the norm in the sphere of home and care.

It could also be said that norms tell us what something is. What is a checklist? A checklist is not just a piece of paper containing points, but also part of an elaborate professional practice containing questions and points for compliance that the environmental inspector must go through when inspecting an activity. It has become a norm to use checklists in EIE. A norm can also say something about normality and tell us how common something is in a population, such as how common it is not to have a permit for a private sewage system.

Norms are not tangible. Neither are they physical phenomena like gravity. Norms do not initially exist, but arise in interaction between people. Norms emerge in relationships ranging from those between two individuals to those between entire groups of people, even large groups such as nations. The concept of a norm is useful for describing and explaining human behaviour and actions. Norms are instructions on how to act, telling us how we are to do things and behave. Norms are prescriptive.

"The concept of norms can be seen as the intermediary link between the actual and the desired, between the 'be' and the 'should be' or, expressed in terms of the social sciences, between actor and system" (Hydén 2002, p. 19). The concept of norms helps us articulate and explain what occurs between how we do things and how we should do them (according to the prevailing norms). And this applies to how we do things and how we should do them at all levels, at the individual or professional level, at the organisational or national level. "The concept of norms provides us with a common denominator that makes it possible to translate and understand human and organisational actions that have different and sometimes competing backgrounds" (Hydén 2002, p. 20). The concept of norms makes it possible to discuss the same phenomenon from different perspectives and points of view and how different norms interact or contrast with or against each other. The concept of norms is also useful for examining how new patterns of actions and practices emerge and why, as well as for actively influencing society in a certain direction.

There is probably no uniform explanation for exactly what is necessary for a norm to arise, or when or how. Rather, there are several explanations for the origins of norms that are related to the different kinds of norms that exist and the scientific explanatory model used. Social norms are composed of expectations which, in turn, must have a certain degree of permanence. The emergence of norms can be explained by their creation from expectations but also by these expectations governing our actions. "In other words, norms contribute to the constitution and coordination of action systems" (Hydén 2002, p. 101).

These expectations and norms can be internalised, that is, exist within the individual, but they can also come from groups. Depending on the importance of the group for the individual receiving the expectation, the norm will differ in strength and importance. For example, in order to understand something about the strength and importance of the Environmental Code, the relationship between the group environmental inspectors and operators as recipients of the expectation to think in an environmentally friendly way needs to be examined.

Expectations may also be linked to roles, that is, we are expected to act in a certain way because we hold a certain position. For example, many environmental inspectors believe that they should have a higher level of environmental awareness than most people in society and act in accordance with environmental legislation and agencies' environmental policy in an environmentally sound way.

How the norm is communicated is relevant to how we learn a norm, something which makes language a tool for making norms visible and describing them. Language rules in themselves, such as a common nomenclature or conversational conventions, are important norms. The MI study (Chapter 8) can be seen as an example of a means for the inspector to learn to ask operators questions that make it easier to understand how operators think about their own environmental work. Thus, it is possible to learn a technique of interacting with people that is based on how we use our language. Learning an interview technique for interaction indicates that there is a norm of training to perform one’s work as efficiently as possible. This is a different norm than the one that says “an environmental inspector should have good social skills”, which points towards the norm of there being certain innate and somewhat vague characteristics which are a prerequisite for the work of an environmental inspector. The statements “learning an interview technique” and “having good social skills” are not necessarily contradictory in themselves; they may be linguistic variations of saying the same thing, but they take on completely different meanings for discussions of competence and professionalism in the field of EIE.

Different types of norms (formal, social and structural) that are about or deal with the same phenomenon may be concordant and work together, that is, they support each other and mark out a common direction or a “truth”. A clear example is the phenomenon of domestic violence. Greatly simplified, this may be described as there being a formal legislation that deals specifically with the violation of a woman's integrity; (there is no such thing as violation of a man's integrity, which in itself can be the subject of discussion about the norm of the man and “the other”, the woman). Moreover, there are statistics that indicate that women are particularly exposed to certain types of crime in close relationships (or are the statistics skewed because it is more socially acceptable to report a man for the violation of a woman's integrity than the reverse?). Furthermore, there are structures in society that make women more vulnerable to assault in this sort of crime, for example because they are often in a position of dependence with respect to the man, who is often the one who earns more, and through their often having the overall

responsibility for the children, if there are children. There is also a norm that says ‘do not hit girls’, and those who abuse women are very low on society's social ladder. The formal, social and structural norms point in the same direction and serve to verify each other. At the same time, there are other norms about other phenomena (e.g. male violence) that have an impact on the norms that govern how we see women's and men's vulnerability and domestic violence.

Sometimes different kinds of norms for one and the same phenomenon point in slightly different directions. We can exemplify this with private sewage systems. All private sewage systems taken into use since 1969 are to have a permit. This is stipulated in the regulations. During 2010 – 2011, the enforcement campaign, “Små avlopp – ingen skitsak” [Small sewage systems – not to be sniffed at], initiated by the Environmental Protection Agency, primarily aimed at informing house-owners what they have to do about their poor sewage systems, but the enforcement of existing sewage systems has not been a priority for a long period of time and there has been no continuous on-site enforcement. There is some difference of opinion as to how long a private sewage system lasts, that is, retains its intended functions. Today, the Swedish Agency for Marine and Water Management, SwAM, is the agency responsible for private sewage systems. Previously, it was the Environmental Protection Agency. The guidelines for the responsible agencies state that a sewage system works satisfactorily for between 15 and 20 years, depending on facility and usage. Many facilities are old and have old permits. The EIE agency may prohibit activities with reference to such things as discharge levels, that is, the facility does not function the way it should. To continue using the sewage system, the system owner must apply for a permit to rebuild the existing facility or build a new one that meets today's requirements. For the EIE agency to become aware of the discharge, someone has to discover it and report it, e.g. the sewage system owner, a neighbour or an environmental inspector. There is a general perception (norm) about its being bad to pollute nature, and nobody wants a sewer to clog or smell bad. At the same time, it is also true that what we cannot see, hear or smell tends to be neglected.

Thus, there are clear formal norms in the form of acts and regulations that tell us what is right and what is wrong and there are social norms that mean that we do not prioritise the inspection of private individuals' property, even though we suspect that a large number of system permits and sewage systems are inadequate. At the same time, there is a societal norm of not polluting. So, the legislation points in the same direction as the basic norm of not polluting, while the norm governing EIE with regard to private sewage systems is partly related to a social pressure not to single out and expose individual households and individual persons.

If the above description truly depicts reality, this poses a large number of questions about how EIE is implemented. What sort of discretion does an environmental inspector have? Which norm carries most weight? Do the different norms interact? If so, in what direction do they interact? An environmental inspector must relate to these different norms simultaneously, and this is part of making professional judgements (see Chapter 6), even

though the inspector's work is not about clarifying various interacting and conflicting norms.

From a property owner's perspective, it costs money to do the right thing, but doing the wrong thing entails no cost, as long as no one reports that something is wrong with the sewage system and because EIE is not always a priority. From an environmental perspective, and perhaps also a moral perspective, most people probably do not want to be polluters. But if something does not smell or look strange, and because it is difficult to control old sewage systems both for the property owner and the inspector, they might not know that their systems are inadequate. Condemning a facility on the basis of age has probably not been tested in a court of law; the discovery of, for example, a discharge is needed.

The example of private sewage systems is not only about EIE priorities, but also points to the importance of changing norms at the societal level in order to achieve an efficient EIE. It is the responsibility of all (citizens, police, environmental inspectors, municipal leadership etc.) to ensure that the various norms regarding the phenomenon point in the same direction. The text of the Environmental Code in fact addresses everyone about a joint responsibility. Polluting is polluting even if we cannot directly perceive it, on-site, with our senses. There are also private individuals who want to have their private sewage systems examined to ascertain the status of their own environmental impact and learn more about what they need to consider in order to maintain a sound environment.

How operators and private individuals relate to this in their daily lives and what incentives exist for compliance can, for example, be investigated through Motivational Interviewing (MI), which may be briefly described as an interviewing method aimed at behavioural change in, e.g., an operator by making knowledge and motives visible (read more about MI in Chapter 8).

7.2.2 Body and role

Another way of problematising the role of the environmental inspector is to differentiate between the role of the inspector and the individual who is an inspector. Several examples have been given of inspection planning where active, though often without reflection, use has been made of the role of inspector or manager or the individuals' bodies to achieve a certain enforcement goal.

One example is the head of EIE (he was middle-aged and big and tall) accompanying an environmental inspector (she was quite young and not particularly big) on inspections where it was suspected that there might be aggression and it was considered that his physical attributes would be more of a deterrent than hers, as well as the fact that there would be two of them. For this description, it is important that we know the sex of the respective roles because we can imagine that they contemplated whether the operator would see the inspectors as individuals when they met. The same head of EIE also sometimes visited a sceptical operator, where his role as a manager, that is, the one who has overall knowledge and the power to make decisions, was the most important factor in

being able to argue convincingly against the operator. The fact that the manager was a man might further have reinforced the power of the manager's role, but this was not part of the reasoning when planning the inspection. Research on intersectionality particularly studies the points of intersection between different types of markers (sex, age, ethnicity, class etc.) and, from a perspective of power, how these interact, or do not interact, in a given context (see e.g. West & Fenstermaker, 1995 or Yuval-Davis, 2006).

These types of stories can be studied from several different perspectives or approaches, where, e.g. the power perspective appears to be important in order to further understand the work situation of inspectors. Here, we intend to problematise the environmental inspector role and the individual by highlighting the concept of sex. Our understanding of sex helps us track how the manager and the inspector were thinking when planning the inspection and possibly also how the operator would perceive the two people performing the inspection. This means that the inspectors' bodies, their physique in terms of size, age, gender etc. are of importance for how the environment department plans EIE. What significance does this have for the environmental inspector and the inspector's practice?

Sometimes we talk about “the body as situation”, that is, the place where physical attributes and societal expectations coincide and become significant for the subject's actions (de Beauvoir, 2002). We can also speak of “the body as text”, where the body is described as a symbolic world where cultural contexts of meaning are created and maintained on the basis of corporeal experiences, and bodily expressions are formed with the body as a carrier of cultural patterns. This means that body and cultural meaning are interconnected, with the body serving as its own specific information system (Solheim, 2001).

For inspectors, this could mean acting in certain given situations, say an inspection, as the official they are and interacting with an operator with clarity, knowledge and professionalism, while the operator may perceive the inspector as a “young slip of a girl from the municipality”.

The above example shows how the individual and the role can be used together, but also that it is important to be able to highlight both aspects in the same person. This also means that different inspectors will face different expectations when meeting operators. What these expectations are depends as much on who is the inspector as on who is the operator.

Several episodes have been related where sex or other physical or experiential attributes have been described as factors to take into account when calculating the outcome of the inspection. These accounts are often portrayed as an exception to the “normal” picture of what has to be kept in mind during inspections, but are included as an aspect to take into consideration and above all to reflect on afterwards in case something did not go as planned. We can take another of the given examples. What, for example, was the significance of the fact that the inspector who was physically removed from the company

building by the operator was a rather small young woman? Well, it was probably the factor that determined the operator's action.

7.2.3 Two-sex norm

Below we intend to discuss sex and gender by problematising the relationship between conceptual categorisations (language) and the understanding of a phenomenon.

The two-sex norm is a norm through which we divide people into two sexes, male and female, and see ourselves and others as either belonging to one or the other category. It is a dichotomous relationship of man-woman that can be described as a "law of separation", where individual, action and context define each other (Hirdman, 1988). Dichotomous means "jointly exhaustive and mutually exclusive", that is, that everything must belong to one category or the other, and that nothing can simultaneously belong to both categories. We attribute a range of qualities, knowledge and relationships to the two existing categories, among other things, jointly "negotiated" through our culture. There are, for example, notions that women are better at taking care of people and that men are more assertive and "hard". Some of these properties, we all more or less agree on, while others are considered as more controversial. The problem with the two-sex norm is the very fact that it is a norm, that is, an order that we relate to as a general truth which always applies, which applies to all and which we take for granted. The two-sex norm rarely forces us to problematise the two categories, which means that as soon as we see a woman or man, or see the words "man" and "woman," we also include a whole range of properties that may or may not be true for a group or for an individual.

In discussing the two-sex norm, we want to point out that language sets limits and sets the norm of two sexes because we have hitherto only had two gendered personal pronouns, 'hon' [she] and 'han' [he] – at least according to the official rules of the Swedish language. This linguistic norm is interlinked with the two sexes, male and female, but is also a cultural norm in which two sexes can be said to be part of the Western norm of dividing the world into pairs of opposites, or dichotomies, where this state of opposition means that the two parties define each other. If a person is not a man, the person is, by definition, a woman.

The difference between the concepts of sex and gender may be briefly described by saying that sex is the biological sex, whereas gender is the social sex. The body's constitution (sex, size, age etc.) carries a social expectation. It is possible to change and shift the norms of femininity and masculinity in different directions, but individuals are dependent on how their body is understood by those around them. It is not about making gender, but that gender does something to us (Ekström, 2002). We can talk about gender as imagined and perceived sex differences, but also as "a primary order" that determines how we understand sex. Gender becomes the concept through which different types of knowledge about sex converge (Scott, 1999). The usual way of describing the differences in power, influence and status between and within the sexes, that is, social differences, is to describe them as biologically founded, that there is a difference between us due to sex (Scott, 1999; Hirdman, 1988). But in fact, social differences follow from a pretended or

illusory knowledge of sex and sex differences, since the knowledge is based on personal and shared experiences and notions which, in turn, are based on there being differences between the sexes and that it is these differences that are the distinctive and characteristic qualities of the sexes (see e.g. Jarrick, 1997; Laqueur, 1994).

Highlighting the issue of sex and gender is not related to how individual inspectors perceive which sex they belong to, but how others will perceive the inspector as an individual, where sex is a prominent marker of social difference and social expectation. So instead of investigating the nature of the sexes and the content of the gender categories, it is more relevant to look at how gender functions in a given practice and context. In the role one represents, thought can be given to which notions come first. Does the norm of masculinity obscure the role of inspector and official? Does one have to act with reference to that relationship? Can it be influenced, and if so how? How do notions of sex difference affect our practices (language, actions, interaction, organisation etc.?) within a defined field or arena, in this case in the field of EIE?

7.2.4 'Hen'

For a number of years, there has been a hot, sometimes bitter, but also nuanced debate about the word 'hen', a new word in the absence of a sex-neutral pronoun in the Swedish language (unlike the sex-eliminating word 'den') to be used instead of 'hon' [she] or 'han' [he].[24]

The purpose of discussing 'hen' here is partly linguistic and partly a way of problematising the environmental inspector as a role and as an individual. Language-wise, the term 'hen', that is, a sex-neutral pronoun, is here seen as an additional word to increase the variation when writing about the environmental inspector. Given that language affects our understanding of the world and that the world affects our language, we may view the word 'hen' as a way of influencing norms and highlighting the sex-unspecified aspects of the role of the environmental inspector. It can be used as a way of masking the project's informants, who are speaking in the role of environmental inspector, that is, that a particular inspector is identifiable to others through our revealing the inspector's sex. Using 'hen' may thus represent a way of observing the ethical rules of research on informant anonymity.

According to *Språkriktighetsboken* [The Book on Language Correctness] published by the Swedish Language Council, the word that is recommended for marking a neutral pronoun is 'den' (Språkriktighetsboken, 2011). But 'den' and 'hen' are not fully

[24] In almost all media, blogs and newspapers, on television and radio, various researchers, activists, politicians and bloggers have voiced different positions and angles on the significance of the term and if there is any relevance in using it and, if so, for whom, about whom and how. See e.g. http://www.dn.se/kultur-noje/hen-i-stallet-for-han-eller-hon, http://www.newsmill.se/gs/hen, http://forskarfeministen.wordpress.com/2012/02/18/nu-blir-det-prat-om-svenskans-nya-pronomen-hen/, http://www.dn.se/nyheter/sverige/vi-sager-inte-barnens-kon, http://blog.svd.se/sprak/2012/05/28/hen-eller-den-pronomenval-med-betydelse/.

synonymous as neutral pronouns. ‘Den’ is well known and almost sexless (objectifying) and is perceived to be almost condescending in many contexts, while ‘hen’ is new, sex-neutral, but sex-inclusive and is controversial because the word highlights and questions the two-sex norm.

We could use the feminine, that is, ‘hon’ in the sense of human being to get away from the sex identity of a given individual. At the same time, there is reason to have the words ‘hon’ and ‘han’ available to us in those cases where the sex markers for woman and man are relevant to what we want to state in our descriptions and analyses, such as in the above example with the head of EIE. This becomes relevant for being able to separate the two aspects of the environmental inspector – the role and the individual – in order to investigate how the two interact and/or differ as a way of deepening the knowledge of the inspector's conditions and work.

Within EMT, we have no reason to embark on a discussion of the two-sex norm, but find it relevant to highlight it because the environmental inspector is a role that we could describe as sexless or sex-neutral. At the same time, this role is borne by an individual who does have a sex.

While ‘den’ unsexes the role of the environmental inspector, ‘hen’ marks that sex has implications for our understanding of that role. At the same time, ‘hen’ anonymises and eliminates the ability to unconsciously, and as a matter of course, ascribe the entire set of properties that we link to sex as soon as we read ‘hon’ or ‘han’.

7.3 Competence and professionalism

For the local environment department to do the right things (external efficiency) and do things right (internal efficiency), it must have the right competence and make use of its professionalism.

Competence may be defined as the application of knowledge, skills and behaviours. Competence is relative and is about how well knowledge can be applied and a job performed. Formal competence usually means the training or experience that is required and is quantifiable, in the same way as knowledge, that is, whether there exist the know-how, skill and ability to do something. Social competence usually means how well someone can “take people” and how well someone works in a group. Professionalism often means the execution, purpose and properties that characterise a professional person or an occupation. Professionalism can be expressed as the characteristic way in which individuals carry out their work in the context of their professional role.

To be able to use the terms competence and professionalism, we will need to reason and draw conclusions on what they mean in EIE. Based on the observations and interviews performed under the project, we have compiled a number of aspects of environmental inspectors' (and managers') competence and professionalism at different levels.

Formal competence most often means some experience or knowledge acquired by formal means, through education, for example. Social competence often stands in contrast to formal competence on the grounds that "it is something you just have" more or less of. This is important to underline in a profession where conversations and meetings constitute an essential part of professional practice. In order to make professional judgements, social competence must become formal. This means that social competence must be defined at a detailed level, such as "knowing how empathy can be expressed in conversation" or "flexibly and depending on the goals of the meeting and the operator's manner, being able to make use of different interaction strategies" or that "it is important that one of the inspectors speaks Finnish". The development of social competence must be included in the training and must be maintained in the same way as other knowledge. It needs to be defined at the national, regional and local levels in order to form a consensus and transparency in procedures and decisions.

7.3.1 Joint and individual competence

In our interviews and observations, we have noted three different levels or perspectives of the competence needed to perform inspections. These are individual competence, specialist competence and group competence.

Individual competence can be divided into a general, basic competence that everyone should have and a niche or specialist competence. The basic competence concerns such things as knowledge of environmental legislation and the Administrative Procedure Act, and a linguistic knowledge both about clarity and correctness (to enable decisions to be used in any legal proceedings) and nomenclature (that there is national agreement on terms and that the right terms are used in decisions). There are legal cases where an "application for the imposition of a fine was rejected due to an ambiguous injunction". Specialist competence primarily refers to the in-depth knowledge that person(s) have of some special type of activity, such as garages or tattoo studios, but can also be special competence in areas such as technical support systems or EIE methodology.

There must also be a concordant competence relating to the foundations of EIE and the fact that every employee must have a well-founded knowledge and competency as concerns legislation, administrative procedure and a correct and clear language, both orally and in writing. This refers to a common ground and consensus on transparency with respect to acts and regulations so that operators and the general public may feel confident in the decisions made and how they are made.

Competence has also been described as something joint, that is, a collective competence at the department or within the group. Collective competence is the sum of all individuals' knowledge. This should cover the municipality's need for the right competence to be able to make correct decisions given the cases they have within the municipality. If, for example, there is a chemical accident and notification is received when not all inspectors are at the environment department the person who is present must be able to handle the situation and know what procedures are to be used in emergencies. In a small

municipality with few inspectors, there is a need for generalist competence in order to be able to carry out inspections in all activities and in all sections of the law.

Today, other people than those with a background as environmental inspector are also employed, such as eco-technicians, biologists, people from the industry, food engineers etc. Their competence can strengthen the group's competence, but they might not have the same knowledge of the law, neither environmental law nor administrative law, as trained environmental inspectors. Recently graduated environmental inspectors may have a deeper knowledge of various modern technological tools and systems than older inspectors, while experienced environmental inspectors have developed a feeling for how to handle different situations over the years. The mix of competence is important so that the group has experts in different areas, but at the same time, there is a risk that decisions are not made uniformly when everyone does not have an equally extensive legal competence. Both legal fields are equally important for the capacity to work in compliance with the rule of law and to maintain competence among the inspectors. One way for small municipalities of creating a sufficiently large group with a sufficient knowledge mass (and to more easily avoid conflicts of interest) is to merge into a joint environment department.

7.3.2 Professionalism

For environmental inspectors, professionalism is about being professional in their assessments and in their interactions. Below is a text that is partly based on Chapter 6.1 and interviews with a number of heads of EIE.

An efficient assessment when exercising authority is very much about its being in compliance with the rule of law and equitable, but also about being correct from the beginning. The latter means that it should stand up to judicial review, that is, if it needs to be used in court, it should contain all information that the court needs to pronounce its verdict. The judgment should not be in the operator’s favour on account of substandard work on the inspector's part or an obscure officialese. But the professional judgement does not only take place when observations are written down or decisions formulated, but is continuous, that is, before, during and after an inspection.

Before the inspection, the inspector performs “strategic intelligence” and goes through the operator’s file, reviews environmental reports, previous decisions, the operator’s self-regulation, that is, the operator’s list of the division of responsibilities, list of chemicals, what they are used for, risk assessment of the activity, how the company has managed those risks, permits etc. The inspector studies the subject, for example through various trade organisations' information material, and the legislation that is relevant for the specific activity. The inspector might also call the operator for clarifications.

During the inspection, the inspector explains why he is making the visit, e.g. to inspect waste management or to protect a watercourse from pollution. “No one, almost, wants to pollute on purpose!” said one head of EIE to whom we spoke. The principle is that operators know their activity and inspectors know the legislation and its objectives. The

inspector must take into account the uneven balance of power between the EIE representative and the operator. The inspector can work with open questions to gain a broader insight into the operator's knowledge. The inspector looks, listens and smells ... "We have to be a bit like detectives and dare to ask questions...," said another head of EIE. The inspector does not always have to make a visit to exercise EIE. If inspectors are certain about the operator's documentation and of their own knowledge of the operator and the activity, a phone call may suffice.

After the inspection, the inspector must reach some kind of decision. The inspector's decision is based on knowledge of and information from agencies, society and the central government (acts, ordinances, regulations, manuals), projects and collaboration (environment collaboration projects, enforcement projects), colleagues and other contacts, activity-specific information (location of the activity, compliance history), time (urgent case, continuous case) and consensus and dialogue with the operator. If the inspector is puzzled about something after the inspection, it may happen that the inspector has to return to investigate further. A detailed description of assessment dimensions is given in Chapter 6.

An important prerequisite is to look at each individual case, since each case is unique and is to be assessed as unique, based on the particular conditions of the case.

7.3.3 Interview, meeting, interaction and approach

One aspect of internal and external efficiency relates to meetings between people and their interaction , regardless of whether these are between operator and inspector, between inspector and municipal politicians or within a group of inspectors. It is important for the interaction to take place in a manner that allows the goal of the meeting or interaction to be fulfilled. This might be obvious, but we often fail to make clear to ourselves what conclusion we want to reach, its actual purpose and goal. Below we describe some types of interaction that are important to efficiency.

Meetings and discussions are an important part of knowledge transfer in EIE, both in the organised meeting, but also in the lunch room or in the corridor, when a case pops up or when someone needs advice. The planned joint discussions raise general themes such as equality of treatment and fairness, based on specific cases, e.g. what to do when operators offer lunch. Sometimes inspectors accompany each other on inspections, both to check that they do things in a similar way and to learn from each other, but also in cases where they anticipate a "difficult" operator. They also read each other's written communications if they feel uncertain about how to express themselves in such communications and in the decision itself.

The inspector needs to have a professional approach to the law. This may seem self-evident, but it was something that was expressed in an interview with a head of EIE on how to measure the effects of EIE. Most of those we have spoken to describe inspectors as generally meticulous and conscientious. Sometimes the environment is spoken of as a silent agent. Some argue that it is not unusual for inspectors to more readily take the side

of the weaker party and thus, also that of the environment. Integrity is important, as is a discussion of values and questions of loyalty. Is the loyalty to the Environmental Code or to the Work Environment Act? Or perhaps to the municipality? Or to the environment, oneself and to colleagues? And when does an inspector become disloyal? Inspectors need to make their motives clear to themselves and together with the others at the department, and think about whether they are happy with things as they are, or if something needs to change. If there were to be an undefined and unrecognised contradiction between their own motives and the objective of the legislation, it may be necessary to study in more detail whether external or internal efficiency is adversely affected.

It is important to make the environment committee, operators and politicians aware of the objective of inspectors and the environment dedpartment and the purpose of their EIE work. To achieve this, there must be a certain knowledge base, a concordant competence; actions must be fair and those working with EIE must give everyone equal treatment. Few inspectors want to give operators “VIP lanes” just because the municipal leadership thinks that “the entrepreneur has done so much for the area”. Sometimes there is a gap between politicians and officials, where both groups feel that they are working against each other. Since politicians might be replaced after an election, and since officials are also replaced, it is important to strive for a continuous dialogue so that everyone understands what the environment department does and the objective of EIE and that we all have an obligation to ensure compliance with the Environmental Code. If everyone understood how environmental legislation is intended to work and the importance of EIE for the environment, the exercise of authority and compliance, the effect should be seen both in more efficient work practices and in the environment. Since the environment is a joint responsibility and goal, consensus in society at large, not just among EIE actors, must be a catchword. How this will occur must be further explored, in part by studying the effects of projects such as *Tillsynsutveckling i Väst*, where different professional roles have been involved (inspectors, administrators, communicators etc.) at municipalities and county administrative boards that in various ways come in contact with EIE (Tillsynsutveckling i Väst, 10-12-2012).

A comment from one inspector about the meeting between inspector and operator: “It is a different type of meeting, it is ‘depersonalised’, it has to be correct”. These are roles that meet around a legislation and must ensure compliance with the law. If there is an active differentiation between role and person, it is easier to disregard the possible lack of personal chemistry in the communication and to act correctly. In some cases, use can be made of the different roles in the department in order to achieve a certain purpose in the most efficient manner. The head of EIE is the one who signs the decisions. In tricky cases where the inspector and the operator cannot agree on a decision, the manager's role can be used as a “punchbag”, that is, a third agent who is the one who ultimately decides and signs the decision. This will ensure a continued good relationship between the inspector and the operator with the aim of ensuring that future inspections of the activity are made in an efficient way .

The approach is important. Inspectors should have a good service level, explain why an inspection is being made and what the assessments are. Inspectors are to be pleasant and should try to be accommodating and understand problems from the operator's point of view, while also complying with the law. The operator's knowledge should be respected One can learn how to behave towards and interact with different individuals or organisations, such as operators, politicians or private individuals. Sometimes there may be reason to work in different ways in relation to the operator, e.g. a difference in work practices and interaction in relation to those who want to do things properly and those who are "a pain in the neck", as expressed by one head of EIE. The most important thing is for everyone to behave professionally in all situations where they exercise their profession. Therefore, it is important to identify and create a common picture of what "professional" means in different situations. For example, occasionally going on inspections together, in pairs, may be useful for learning practical dealings, interaction and more specific knowledge of each other, and for managing tricky or threatening situations. A joint inspection also provides a basis for discussing issues of decision-making, interaction, professionalism, data collection, legal support, guidance etc., resulting in a greater consensus.

One head of EIE said that when an inspector is accompanied by a trainee on an inspection, there is reason to explain why the inspector is doing something in a particular way for the trainee to understand and learn. At the same time, this means that the operator also gains an insight into the inspector's perspective on EIE and possibly a deeper understanding of what EIE is. The operator is able to understand why the dialogue is conducted in a certain way or why a particular element must be examined. Later at the office, the trainee fills out an inspection report, which is then reviewed together with the inspector as an opportunity to learn and practise. This entire process becomes a transfer of a kind of professionalism. This is not a formalised or perhaps not even discussed way of transferring professional interaction or professionalism. All ways in which experience is shared are an integral part of the work, but not always a scheduled part, and are rarely described in terms of professionalism and efficiency, even though they relate to internal efficiency, that is, doing things right.

The conversation or interview, both speaking and listening, is fundamental to finding out how much operators know about environmental legislation and their own responsibility, and what they are actively doing to more closely align their own environmental behaviour with the purpose and goals of that legislation. The conversation is about achieving a specific goal in the most efficient manner. For this reason, the environmental inspector needs to be clear on which the goals of the environment department are, which goals the environment department has for its activities, but also on the national goals of Sweden for its EIE and the consequences of these for individual EIE. Important questions before an interview are: What does the inspector want to achieve in the interview and how does the inspector check that this has been achieved? How can the operator become involved in goal achievement?

Direct questions must be asked about specific things as concerns the operator's activities and more indirect and leading questions to create a dialogue. By means of questions and what is said in the conversation, the inspector must try to understand the questions asked by operators and the way things are at the activity, in order to understand what they know about the legislation and the objective of the EIE (see also the discussion of professional vision in Chapter 6 and motivational interviewing in Chapter 8). Sometimes the operator is doing the right things, but does not know the law and the reasons behind it. This means that the operator might be up to speed in practical terms and do the right things, but might not know what it is all about. This, in turn, means that the focus of the EIE agency should continue to be on control to ensure compliance and continue to provide information to get the operator to understand the objectives behind EIE and the law.

Thus, if all inspectors received training in methods of interaction and interviewing, this would be likely to make EIE more efficient, provided that during the conversation, the inspector is able to understand how well the operator understands the objectives of the Environmental Code and enforcement and is able to understand how the operator plans to ensure that these objectives are fulfilled. EMT has explored Motivational Interviewing (MI) as a method of interaction and conversation in EIE, but other methods, e.g. for conflict management, or methods for making the individual visible in the role of inspector, could also support the inspectors in their profession. This could have an influence on internal efficiency, that is, doing things right, in that use is made of a proven interviewing methodology for inspections and for meetings with operators that allows inspectors to measure an increase in the understanding of the objectives of the Environmental Code and EIE over time.

7.4 Reflection as practice

Reflection roughly means 'mirroring back' (a word never has an exact synonym). An approximate definition of reflecting on something means something like to think about thinking. "Reflection is different from the usual 'thinking' or 'pondering' in that it has a significant focus on a target, that it is implemented with some form of systematic approach and structure that aims to distance itself from old thought patterns and develop new ones and to seek solutions to problems" (Emsheimer et al, 2005). Another fundamental aspect of reflexivity is that it is self-referential, that is, it bends thoughts both towards the subject (the person thinking) and the object (the phenomenon) and back to the self again (Archer, 2010). Reflexivity arises when the thought runs from subject to object and then back to subject.

In everyday life, we rarely have the opportunity to give time to reflection. We might at most lapse into staring into space, allowing our thoughts to go off for a moment while we wait for our turn in a queue or are on the way to work. Sometimes we happen upon some good things, and sometimes "the stare" is more like a moment's rest from all our thoughts. In principle, reflecting beyond what we already know about something requires two things: that we know what we already know and that we use our imagination. And because our imagination is based on our experience, the two are interconnected.

For reflection to be focused on a target and be an active part of a practice, methods and structures must be found to develop the quality of that reflection. Different professions and activities require different types of reflection, both the way they should be performed and their timing. Scientists might need to create pictures to deepen their understanding of the subject, while painting artists can reflect their work through words (Dahlman, 2004). Every individual practice, such as EIE, needs to find its ways to reflect in a planned manner, that is, to problematise and discuss. Moreover, the reflections need to be gathered in such a way as to be useful to the individual(s) doing the reflection, but perhaps also to others. Thinking for thinking's own sake is valuable and often underestimated from a human perspective, but here it is not thinking itself that is in focus, but actually the result of that thinking. But since the result of thinking is preceded by the actual thinking, and because thinking takes time (Jönsson, 2002), it is at least as relevant to create scope for active reflective thinking, the thinking that takes place over several stages and is related to the development of knowledge.

Reflection as an active concept is often found in literature about teaching and in literature about understanding humans. Donald Schön speaks of professions and the professional and the fact that there are elements of a professional practice that may be real but diffuse (e.g. in what is usually referred to as “creative professions” such as artists, designers or choreographers), especially in the attempt to describe professional practice. He highlights reflective practitioners, those who actively, individually or in dialogue with colleagues or supervisors, thoroughly think about and discuss their actions and their decisions (Schön, 1983 and 1987).

Based on the complex work that EIE constitutes for inspectors, and where the inspectors' knowledge, legislation and practice have to be weighed together and not be disrupted by their own or other's values or other lobbying, there is a need for a reflective practice. The MI study gives a number of inspectors in four different municipalities the chance to test the setting of tangible goals when preparing an inspection and to subsequently evaluate the result. One can imagine both a need for methods to actively reflect on the individual practice, that is, what today has been partially tested through the MI study, but also to reflect on the work practice at other levels such as the work group, among managers, locally at the municipality or at the regional level.

Since EIE is to be carried out on the same basis and developed in the same way across the country, we need to systematically collect data and knowledge. The conceptual prototype indicates that when data is collected in a consistent manner, all contribute to the joint knowledge base. It should be possible for the same to apply for the practices that are related to exercising the profession.

In the gap between the description of how to do things and actually doing them, there is a need for a “reflection in action”, whereby one reflects aloud to oneself or to a teacher while doing something. Schön primarily speaks about artistic professions where people work with different types of materials and qualities, and not mainly with people.

Reflecting aloud is not always possible in meetings with people who are, for example, responsible for different types of activities for which the inspector is to exercise EIE. In those cases, reflection must be given scope on a later occasion, when alone or with colleagues. But the principle is the same.

To know something about the quality of EIE, qualities in the profession must be clarified, qualities which are learned through performance and reflection individually and in groups. Since EIE is a thinking practice in which different knowledge, regulations and assessment dimensions are to be weighed and interwoven, reflection must be allowed to take an active place in the work. Ways of institutionalising/individualising the reflective elements need to be found.

7.5 Summary

We have presented a variety of pictures of the inspector (e.g. persona, the official, the person with a strong ethos) and the inspector's competence (e.g. joint and individual, the necessary reflection) and shown that these different pictures demonstrate the complexity of the inspectors' work and competence. We have also provided an insight into how EMT has studied and observed the inspector's work and role and how EMT has begun to problematize the complexity of the role in order to understand more about the inspector's competence. We write “begun” intentionally because we have come some way in locating relevant perspectives, such as norms, roles, body and individual, and what these perspectives may yield in the observation of EIE and the environmental inspector. There are more perspectives than those we have presented here.

The perspectives highlighted and the descriptions created are based on the studies we have made in the field, such as when we travelled around Sweden and in various contexts met environmental inspectors, held workshops on professional judgements, interviewed heads of EIE about how they measure EIE results and the results from the field of environmental inspectors. The perspectives from which we have examined the data are partly a result of the research fields in which we as researchers are interested, but they also reveal some of the knowledge gaps on the environmental inspector in *hen's* complex daily routines. In order to understand how to influence EIE towards greater efficiency, that is, to both do the right things and to do things right, this complexity needs to be further investigated, and in order to measure whether a good job is being done, there is not only a need for data on work procedures and content, but also for inspectors to reflect on and critically examine their own profession. Better knowledge through the collection of data (see Chapter 10) in combination with research on aspects of professionalism (see Chapters 6 and 8) will make the efficiency of EIE clearer.

7.6 References

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Chapter 8
Motivational interviewing - attitude and communication

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Motivational Interviewing (MI) is a communication technique that has proven effective when it comes to facilitating for people to change a lifestyle behaviour leading to poor health, such as smoking. The method has mainly been used in the healthcare sector, but also for other types of human behaviour such as promoting water treatment efforts in Africa (Thevos et al 2000). In order to determine whether MI can be applied by environmental, health protection and food inspectors during their inspection and whether MI is perceived to be useful, the method has been tested in four municipalities. This chapter gives a brief introduction to Motivational Interviewing, a presentation of how the training has been conducted and the results that emerged. In this case, MI has been used to promote and enhance positive environmental behaviour from operators. The method has, to our knowledge, never previously been tested for environmental or food inspection. The chapter highlights the results obtained so far.

8.1 What is Motivational Interviewing (MI)?

The latest definition of MI according to Miller and Rollnick (2012) reads: *Motivational interviewing is a collaborative conversation style for strengthening a person´s own motivation and commitment to change.* In nearly 200 randomised controlled studies over the past 25 years, MI has shown that only 1-2 conversations can lead to clients reducing or stopping harmful alcohol consumption or to stop taking drugs, end sexual risk behaviour, complete a treatment, etc. (Burke et al, 2002 and 2003, Dunn et al, 2001; Forsberg, 2002; Rubak et al, 2005; Hettema et al. 2005). The growing evidence base of the effects of MI has contributed to an intense focus on MI training and the spread of the method within, but also outside, the healthcare sector.

Introducing MI within environmental inspection is in agreement with psychological discussions of social learning about how more efficient environmental work can be achieved (Larsson, 2011, 2013). In that discussion, environmental consideration would be promoted by concentrating on long-term general human values such as being able to provide a viable environment for children and grandchildren. This focus on the psychology of learning for strengthening the individual's reasons for change constitutes part of MI and has strong support in research on the psychology of learning (Baldwin & Baldwin, 2001). In MI, the conversation is directed towards developing and strengthening the individual's main reasons for implementing a particular behaviour. Inspections have often concentrated on the consequences of breaking the law. At best, MI can extend the perspective to other consequences of significance to operators, which may increase the probability of achieving the environmental objectives (sustainable development) which, of course, is the purpose of environmental inspections.

Below we review approach, skills and strategies in MI (Miller and Rollnick, 2002; Farbring 2010) (summarised in figure 8.1).

MI approach: MI spirit, empathy and control

The primary starting point in MI is that an individual is more likely to change a behaviour if she gets to explore and express her arguments for a cause rather than if she receives information about what, why and how she should act (traditional counselling). People are influenced by what they hear themselves say and it has been shown that if the individual expresses a *desire to change* (intention and reason to make a change, confidence in being able to implement a change), this is then related to a real behavioural change (Apodaca & Longabaugh, 2009). The opposite correlation also applies, i.e. if an individual talks about not changing, the likelihood that a change will take place decreases. In MI, the aim is therefore to reduce the comments of the advisor, which run the risk of making the individual talk about continuing as before and not making any change (*MI-non adherent utterances)* but the aim is rather to *elicit* a desire for change from the person in question. This approach reflects the fact that people are presumed to be ambivalent when a change arises and can see the pros and cons of both keeping things the way they are and making a change.

MI is an approach that conveys *collaboration* (dialogue) rather than the advisor solely presenting something (monologue). Arguments for change are to be formulated first and foremost by the individual and the advisor's role is to facilitate this. Information, which can be an important element in conversations, is only given once the adviser is satisfied that the individual is interested and the advice is designed so that the new knowledge the advisor gives is received by the other person.

MI is based on people’s preferences to decide about their own affairs and that people often become defensive when their freedom to choose is questioned or opposed. In MI, respect for the client's *autonomy* is conveyed. Combined evocation, collaboration and autonomy are known as *MI spirit*.

Another factor that is important in exercising MI and which has a positive correlation with behavioural change is *empathy* (Moyers & Miller, 2012). It has been shown that low empathy may even lead to a worse result than if you do nothing at all (Miller et al, 1980; Miller & Baca, 1983). The definition of empathy varies: MI talks about showing an active interest in trying to understand another person and actively communicating this understanding of her perspectives and starting points.

While discussions are characterized by the MI spirit and empathy, they must be focused on a specific given target behaviour. In MI, this is known as *directing* the conversation, the advisor must act so that the conversation is about the target behaviour and act to elicit a desire to change associated with this behaviour.

Communication skills that facilitate an MI approach

Communication skills that may be helpful in an MI approach are: affirmation, open questions, reflections and summaries. *Affirmation* is about conveying that the individual has done something good, it can concern matters related and not related to the target behaviour. *Open questions* are about asking questions that cannot be answered in a single word, but which direct the individual to explore her situation, a type of question that can also strengthen the message of collaboration, i.e. that the other person is the focus of the conversation. *Reflections* are considered to be the most important of the communication skills, it is about the advisor reflecting what the client has said by returning an assertion, either just what the client stated (*simple reflection*) or what the client may be expected to feel, think and experience (*complex reflection*). Complex reflections can be said to be the primary way of conveying empathy. *Summaries* are used to convey that you have listened, to explore whether you have understood things correctly and not least enhance the desire for change that the client has expressed.

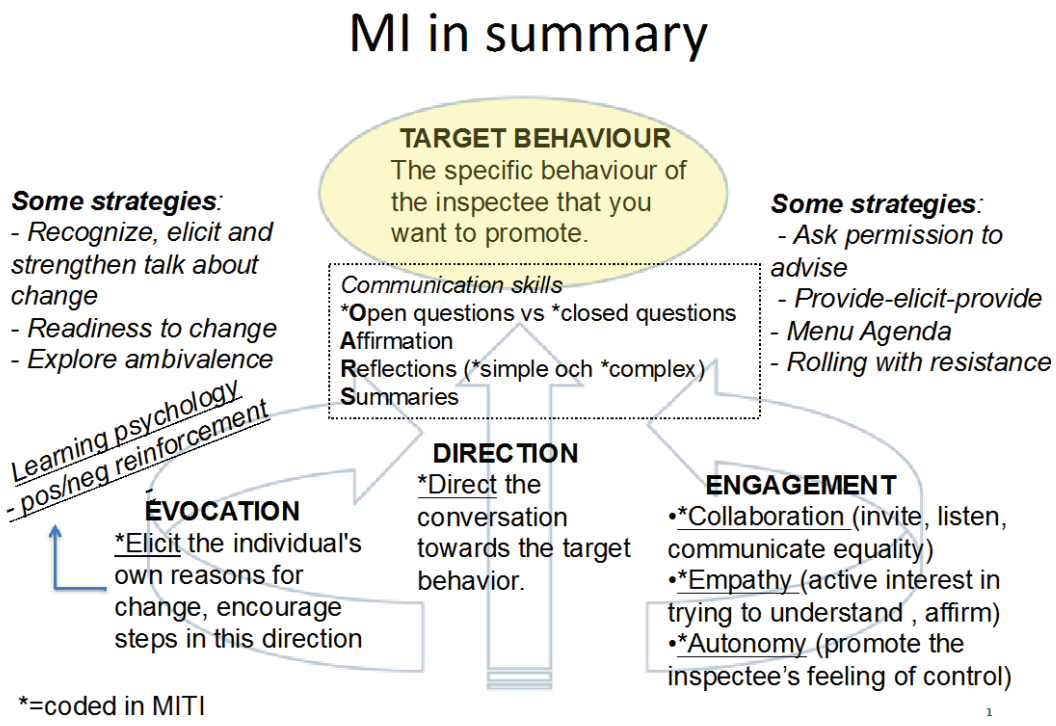

Figure 8.1: Image summarising approach, skills and strategies in MI. An asterisk (*) denotes that these aspects are assessed when coding conversations.

Research on MI-training

All training requires feedback – you do not learn by playing golf in the fog – something that also applies to MI. Research has shown that MI-training, where feedback on recorded conservations which includes the use of a coding protocol, has been effective for sustainable learning of MI skills. Research indicates that MI skills after training tend to disappear unless feedback on own application of MI is applied in a constructive manner (Miller et al, 2004; Miller Mount, 2001).

Study to examine the usefulness of MI

In order to investigate the perceived usefulness of MI and whether MI fits into the inspector's professional practice, a study has been carried out where environmental, health protection and food inspectors from four municipalities have been trained to use the conversation method in their ordinary duties.
Primary hypothesis: An MI-training adapted for environmental inspectors leads to increased MI skills.

Secondary hypothesis: Equipping environmental inspectors with MI skills leads to the environmental inspectors considering that the environmental inspections become more efficient .

8.2 Method

In order to develop MI training designed for inspectors and get an initial indication of how the inspectors perceive the applicability of the method, a pilot training course was run in cooperation with Eksjö municipality between October 2010 and August 2011. Six inspectors (environmental, health protection, food) and the head of the unit underwent training which all-in-all comprised 6 days divided into 6 full days with 1-3 months between each training day. The inspectors recorded inspections with operators throughout the training period. The conversations were coded and assessed in terms of the exhibited MI skills (fact box about the coding procedure can be found later in this chapter). Each training day consisted of theory exercises and training linked to the conversation method, feedback on recorded conversations and the completion of surveys where inspectors had to provide feedback about the training, the feedback element and the perceived applicability. Open discussions about MI, pedagogy and applicability of the method were held during the training. Based on the experience gained from this pilot training, an MI training has been designed for inspectors.

MI-training tested in four municipalities

After the initial pilot training in MI that was conducted in Eksjö municipality, inspectors from four municipalities were offered the opportunity to take an inspector-adapted MI training. The municipalities that showed an interest in participating in the study were asked to take part . Those that participated in the study were Ale, Nybro, Älmhult and Östersund. In order to illustrate whether the work duties had an impact on the applicability of the conversation method, inspectors with different duties were recruited (environmental, health protection and food inspectors). The inspectors were asked whether they wanted to participate in a study where the changes in the inspectors' conversational behaviour (MI-skills) were systematically measured before, during and after they had received MI training and where, via surveys, the perceived usefulness of the training and the perceived applicability of the method in the practical work of the inspectors were followed. The study was conducted during the period September 2011 to October 2012 and took place on each municipality's own premises. An overview of the study is given in table 8.7. The study has been approved by the Regional Ethical Review

Board in Stockholm (2012/1:7) which did not find any obstacles to its implementation, provided that the operators were informed that conversations would be recorded for training purposes.

Participants were selected through their managers and the inspectors' willingness and ability to participate. We believe that about 30 inspectors spread across four different municipalities in different parts of Sweden constitute an adequate basis on which to assess 1) how the inspectors perceive the usefulness of MI and 2) whether, after completing training in MI, the inspectors changed their conversation skills in MI during conversations with operators in regular professional work.

MI-training structure

The training was held over 6 full days with 1-3 months between each training day. The training followed a clear structure where the elements on each occasion were the same in each municipality. Each day consisted of 6 hours where the first 3 hours were spent on theory and practical exercises while the final 3 hours consisted of feedback on regular inspection conversations recorded with operators before each training day. The theory and practice sessions followed different themes on each training day. Transcripts of dialogues from recorded inspections were used as educational material to clarify the MI concept and to train MI skills. The choice of MI-themes for the different training days was made: 1) in the light of the current set-up of training within the MI practice (Miller & Moyers, 2007) and 2) in the light of experience gained in the pilot study in Eksjö and from other work in the EMT programme, for example, with roles and skills (chapter 7) and professional judgments (chapter 6). A particular element concerning learning theory and behavioural principles to strengthen the individual’s main reasons for implementing a particular behaviour was also added. See table 1 below for MI themes on each training day. A more detailed description of MI theory and different MI skills taught can be found earlier in this chapter.

The afternoons during each training day were used for feedback on recorded conversations conducted with different operators prior to each occasion. The conversations that had been recorded were coded with respect to MI-skills, a coding protocol was obtained, which was then used as a feedback tool (more on the coding procedure in the fact box below). The inspector group was divided into two groups of 3-4 inspectors during the feedback sessions, where each group received 1.5 hours of feedback. Two conversations were reviewed per group and feedback was given regarding MI-skills that had been completed up until that point. The coding protocol was increasingly used during training as the participants learned the different skills. At the beginning, the inspectors were only allowed to see a few coding results while, at the end, they got to see the entire protocol before they got feedback.

Training day	MI theme
1	**To listen and communicate collaboration**
-	- To understand the meaning of Motivational Interviewing
-	- To listen and elicit a conversation
-	- To convey collaboration and equality
-	- To direct the conversation towards target behaviours
2	**To strengthen the operator's own motives for positive behaviour**
-	- To recognize, elicit and reinforce the desire to change
-	- To ask open and probing questions
3	**To exchange information and understand the reenforcing mechanisms**
-	- To inform in dialogue
-	- To understand and use knowledge about positive and negative reinforcement
-	- To listen through reflections
4	**To make an effort to understand the other's perspective**
-	- To use empathic listening
-	- To show that you are listening and try to understand through reflections
-	- To use MITI coding as feedback
5	**To face ambivalence and resistance in an accessible way**
-	- To explore readiness to change and ambivalence
-	- To face and roll along with resistance
-	- To avoid MI-non adherent utterances
6	**To use Motivational Interviewing in practical inspector work**
-	- To summarise what has been discussed during the training
-	- To draw up a personal plan in order to maintain MI skills

Table 8.1: MI-themes for each training day during EMT's six-day MI training for environmental, health protection and food inspectors.

Theory and practice sessions were offered to all inspectors in each municipality, while the feedback sessions were offered to a maximum of ten inspectors per municipality. A total of 44 inspectors from the four municipalities participated in the theory and practice sessions of the programme, of which 32 inspectors contributed with recorded conversations., For ten of the inspectors, there is data from all recording sessions; 13 of the 32 inspectors performed supervision according to the Food Act, 17 according to the Environmental Code and two according to the Planning and Building Act.

Measurement of change in MI skills

During the training, approximately 1-3 times per month over a year, the inspectors recorded their own conversations with operators. The inspectors brought voice recorders or mp3 players and asked the operators for permission to record the conversations. All recorded conversations were coded with respect to MI-skills (see the coding fact box). Two types of assessment are used in the coding system: global assessment and frequency counts of behaviour. The results of the coding are summarised in the form of coding protocols, the coders hand in the protocol as well as comments where the assessments are motivated and possibilities for improvement are discussed. The global assessments are

made on a five-point scale where 1 signifies a low grade and 5 signifies a high grade. See table 8.2 below for a summary and description of the variables (Forsberg et al., 2007).

Global assessments (scale 1-5)	**Frequency counts of behaviour (quantity)**
Direction towards target behaviour *- direct the conversation so that it is about the target behaviour*	Information comments *- give information, teach, give feedback, give personal information, express an opinion.*
Evocation *- elicit the individual's own reasons for change and confidence in being able to implement a change*	Open questions *- ask questions that allow a range of possible responses*
Collaboration *- seek collaboration (dialogue) rather than the advisor solely presenting something (monologue).*	Closed questions *- ask questions that can be answered with "yes" or "no"*
Autonomy *- assume the willingness of people to decide about their own affairs*	Simple reflections *- reflect what the individual has said without adding any new meaning*
Empathy *- show an active interest in trying to understand another person and actively communicate this understanding*	Complex reflections *- reflect what the individual is assumed to know, feel, think or experience*
	MI-adherent utterances *- for example, ask permission to advise, affirm, emphasise the individual's control, support.*
	MI-non adherent utterances *- for example, give advice without permission, confront, direct, warn*

Table 8.2: Summary and description of the variables used in the assessment of MI skills (Motivational Interviewing Treatment Integrity Scale; MITI)

The teacher receives the coding protocol which is used as a pedagogic feedback tool in training. The inspectors who participated in the study recorded three conversations each prior to the start of the training, which gave a description of the inspector's MI skills before the start of the training. All inspectors also recorded three conversations each after the whole training had been completed, which constituted a measurement of the MI skill level after training.

To be able to follow the inspectors' MI skills with more quality certainty, a focus group was created that recorded more conversations. This resulted in better control over the conversations, which varied depending on the operator and the inspection situation. Two inspectors per municipality (three in one of the municipalities) constituted the focus group that also recorded three conversations between each training session, while the remaining inspectors recorded one conversation between each training session.

The dropout rates of recordings and coding of conversations are summarised for the entire inspector group and the focus group in table 8.3 below. The dropout rate has been calculated as the percentage of the planned number of codings that is missing, for both personal (chosen not to record conversations) and technical and practical reasons (poor sound quality, too short recording time – a minimum of 10 minutes is required, refusal by the operator to allow recording, too few inspections during the relevant time period).

Municipality	All inspectors			Inspectors in the focus group		
	Number of planned conversations	Number of recorded and coded conversations	Dropout rate (%)	Number of planned conversations	Number of recorded and coded conversations	Dropout rate (%)
Ale	82	56	32	49	42	14
Nybro	94	67	29	36	31	14
Älmhult	85	57	33	42	40	5
Östersund	119	109	8	36	35	3
All municipalities	380	289	24	163	148	9

Table 8.3: Number of planned conversations in accordance with the study plan, number of conversations that actually were recorded and coded, and dropout rate. The dropout rate represents the percentage of planned conversations not recorded and coded.

Below follows a description of the coding process.

Coding of conversations was conducted by MIC Lab at Karolinska Institutet in Stockholm. Recorded conversations were uploaded to www.miclab.org and were assessed at MIC Lab with respect to the MI skills by independent, professional assessors according to the Motivational Interviewing Treatment Integrity Code (MITI) (Moyer et al, 2007). MITI is an instrument to measure the therapist's MI skills that are used for monitoring and feedback during training in MI, as well as control of MI skills in research (Madson & Campbell, 2006; Madson et al, 2005; Moyers et al, 2005; Forsberg et al, 2008). MITI measures competence in MI, which has been shown through individuals receiving low assessments according to MITI prior to training in MI but high assessments after an MI training. The instrument measures the amount of change in MI-skills that training leads to, so-called discriminative validity (Forsberg et al, 2008; Mitcheson et al, 2009).

MIC Lab at Karolinska Institutet has strict working procedures for objective assessment and secrecy. The coders are blind to the research subjects for whom they assess conversations. The assessments are made with the help of the Swedish translation of the coding instrument MITI (Forsberg et al, 2007). The coders use 20 minutes of the recordings. Two types of assessment are used in MITI: 1) Global assessments and 2) Frequency counts of behaviour (see summary of the assessment variables in table 8.2). Both assessments are made by listening to the tape once. MIC Lab's expert coders have had "good" and "excellent" (Cicchetti, 1994), inter-rater reliability (ICC) in codings according to MITI 3.0 (Forsberg et al, 2008).

To further strengthen client and research personnel security, the conversations are encrypted when uploaded to MIC Lab's website and are registered in a database on a protected server. When uploaded, the conversations are also anonymized using a serial number before entering the archives. Currently, it is uncertain when the conversations should be deleted, but the research management at MIC Lab has recommended that the same principles should apply to this archive as the research archive, i.e. that they are kept for up to 10 years and then destroyed.

Participation is voluntary and there are no negative consequences for the inspectors if they choose not to participate or terminate participation at a later stage. When the conversations are uploaded to the MIC Lab's website, they are anonymized using a serial number. A personal register stored on data medium at the Karolinska Institutet has been created for inspectors who have agreed to take part in the study. The Personal Data Manager and the Data Protection Officer at Karolinska Institutet are responsible for the personal register.

Fact box: Coding of conversations.

Training survey

In order to assess and follow up how inspectors have experienced the benefits of training in their practical work, participants during each course were given a survey to complete, hereafter referred to as the training survey. The training survey consisted of five questions that were answered on a six-point scale and four open questions that allow free text (see table 8.4 below).

5 questions on a six-point scale						
1) How would you rate the usefulness of feedback on recorded conversations (afternoon)?	Very little (1)	2	3	4	5	Extremely large (6)
2) How would you rate the usefulness of theory reviews and exercises (morning)?	Very little (1)	2	3	4	5	Extremely large (6)
3) How would you rate the training as a whole?	Extremely poor (1)	2	3	4	5	Very good (6)
4) Will you be able to apply your new skills in your inspection work?	Very little(1)	2	3	4	5	Mostly (6)
5) How would you rate the teacher's performance?	Extremely poor (1)	2	3	4	5	Very good (6)
4 open questions that allow free text						
6) This was good in today's training:						
7) This was not so good in today's training:						
8) I believe this will be useful to me in my work as an environmental inspector:						
9) I would like to give this as advice or tips for similar courses for inspectors:						

Table 8.4: Training survey filled out by participants after each training day

The dropout rates for training session surveys are summarised below (table 8.5), both for the sessions of theory and practice and for the sessions focusing on feedback on recorded conversations. The dropout rates were calculated as the percentage of surveys not received in relation to the number of participants at all training session.

Municipality	Training survey session: theory and practise			Training survey session: feedback on recorded conversations		
	Number of participants x days	Number of submitted surveys	Dropout rate (%)	Number of participants x days	Number of submitted surveys	Dropout rate (%)
Ale	29	23	21	28	21	25
Nybro	52	39	25	45	36	20
Älmhult	35	31	11	35	28	20
Östersund	* 117	101	14	* 57	56	2
All municipalities	233	195	16	166	142	14

Table 8.5: The municipal dropout rates for training session surveys, both for the sessions of theory and practise and for the sessions focusing on feedback on recorded conversations. The dropout rate represents the percentage of surveys not submitted in relation to the number of participants at each training session. *In Östersund 17 inspectors attended the theory and practice sessions and 10 inspectors attended the feedback sessions.

Inspection survey

In order to follow the development of the inspectors' subjective experience of inspections conducted during the training, the inspectors completed an online survey after each implemented inspection, hereafter referred to as the inspection survey. Altogether, the inspection survey consisted of 18 questions, 8 objective questions about the nature of the inspections and activities as well as 10 questions on a five-point scale regarding the inspector's subjective experience of the inspection (see table 8.6 below). The inspection surveys were linked to individual inspectors and to the date in order to follow the assessment over time and to link to the training day. SurveyMonkey, a tool for web surveys (www.surveymonkey.com), was used to collect the data. The inspection survey was administered for three municipalities after the first training day had been completed and in one municipality prior to the first training day.

Eight objective questions about the nature of the inspections and activities						
1) Was the meeting with the operator considered to be an inspection?	Yes	No (if so what)				
2) First time visit to this operator?	Yes	No				
3) Type of supervision activity?	Environmental protection	Health protection	Food	Agriculture	Nature conservation	Construction
4) The inspection was announced in advance?	Yes	No, unannounced				
5) The activities require a permit or notification?	Yes	No				
6) Type of operator?	Private person	Private activity	Public activity			
7) Size of activity, number of employees	1-4	5-24	25-100	>100		
8) Have you or a colleague previously visited this operator under the EMT programme?	Yes	No				
Ten subjective questions on the five-point scale	Does not correspond at all	Does not correspond that well	Neither good nor bad	Corresponds somewhat	Corresponds very well	Do not know
9) The operator was positive to the inspection at the beginning of the visit						
10) My assessment after the visit is that the operator has sufficient knowledge of how his/her activities impact on the environment and/or health						

11) My assessment is that during the inspection, the operator clearly showed that he/she had understood the information I wanted to convey.		
12) My assessment is that the operator has performed actions/requirements for minimised environmental impact/safe food		
13) My assessment is that in the future, the operator needs to takes actions aimed at minimised environmental impact/safe food	Yes (If yes, go to questions 14 and 15)	No, no further action required (If no, go to question 16)
14) My assessment is that the operator will perform actions/requirements towards minimised environmental impact/safe food.		
15) My assessment is that during the conversation, the operator conveyed his/her own reasons and motives for carrying out the necessary actions.		
16) My assessment is that the operator expressed an interest in contributing to a positive environmental development		
17) I am satisfied with my own performance during the inspection		
18) My assessment is that after the visit, the operator perceived the inspection as positive		

Table 8.6: Inspection survey that was completed by the inspectors after each inspection during the training period.

Table 8.7 below is an overview of the study, where you can see when recordings of conversations took place as well as when training surveys and inspection surveys were collected.

Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct

-11	-11	-11	-11	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12
Ale (number of inspectors = 8)													
←----------Period when audio recordings of inspections were made (number of codings = 56) ----------→													
	←----------Training period (number of training surveys = 24)----------→												
	U1	U2				U3		U4			U5	U6	
Nybro (number of inspectors = 8)													
	←--Period when audio recordings of inspections were made (number of codings = 67) --→												
		←----------Training period (number of training surveys = 40)----------→											
		U1	U2		U3	U4		U5			U6		
Älmhult (number of inspectors = 6)													
←---Period when audio recordings of inspections were made (number of codings = 57) -→													
		←----Training period (number of training surveys = 31)-----→											
		U1	U2		U3	U4		U5	U6				
Östersund (number of inspectors = 10)													
←--------Period when audio recordings of inspections were made (number of codings = 109) -----→													
			←-------Training period (number of training surveys = 92*)----------→										
			U1		U2	U3	U4		U5		U6		
All municipalities (number of inspectors = 32)													
		←------Period where inspection questionnaires were collected (number of surveys = 511) ----→											

Table 8.7: Overview of the study by municipality; time period when audio recordings of inspections were made, training period with the six training days marked in chronological order from U1 to U6, and the time period when the inspection surveys were collected. Training surveys were handed out after each training day. *In Östersund, besides the ten inspectors who recorded conversations, another seven inspectors participated during the training days. Training surveys from these individuals are included in the study, thus the number of inspectors who completed these surveys was 17.

Reporting day/final feedback from municipalities

Two months after all training had been completed, there was a presentation day when the inspectors who participated in the study were invited to listen to its preliminary results, to report on their own experiences of the training and the application of MI and to discuss the desired trend in the use of MI.

8.3 Results and discussions

Measurement of change in MI skills

Overall, 32 inspectors recorded conversations during the training period, nine of these were focus individuals, who had been assigned to record up to three conversations per

occasion. In total, 289 conversations were coded, of which 148 were from focus individuals, distributed over the training period as shown in figure 8.2 below.

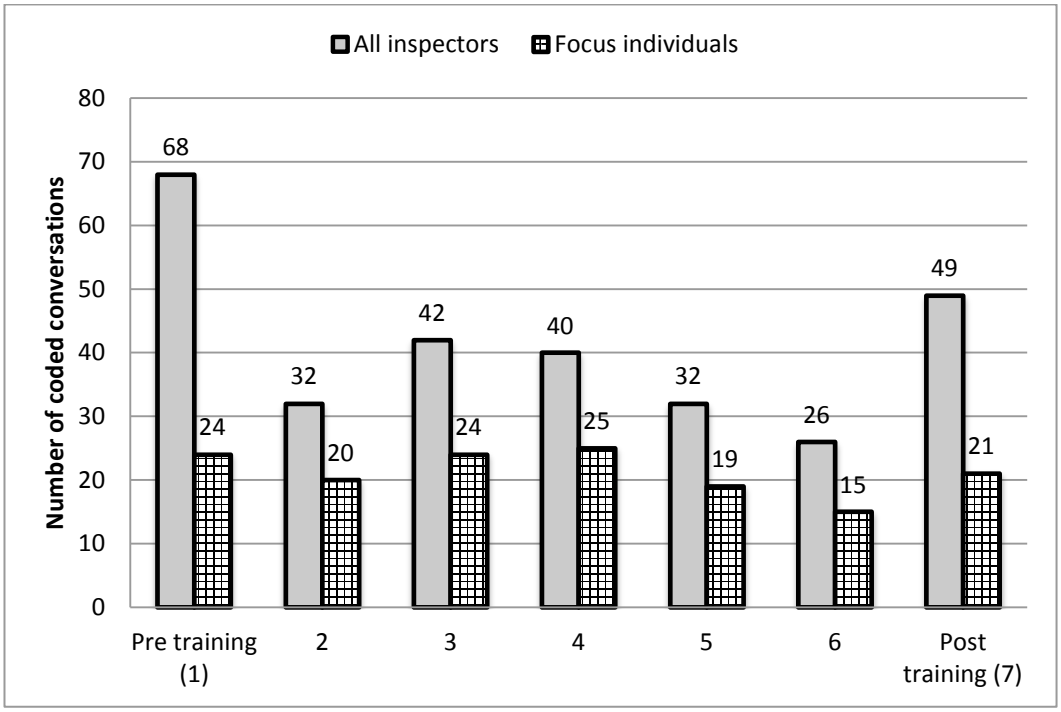

Figure 8.2: Number of coded conversations per training day for all 32 inspectors, and for the 9 focus individuals.

Conformity between the three coders at MIC Lab that coded all conversations were assessed in 30 randomly selected conversations. All assessed variables were compared and the conformity between coders was good.

The change in MI skills over time has been calculated for the global assessments and frequency counts of behaviour (see table 8.2 for a summary and description of the assessment variables).

Has there been a change in the inspectors' MI skills?

Yes, all inspectors are significantly better as concerns the most important MI variables. Two of the variables are more important than the others, empathy and MI-non adherent utterances. Today, there is strong research support for empathy, as we have defined the concept, having a positive correlation with outcome. Greater empathy implies a greater probability of behavioural change. Food inspectors are consistently slightly higher in empathy. The number of MI-non adherent utterances has fallen during the training period, but not significantly for the whole group. Yet for food inspectors, the reduction is significant. There is strong research support that MI-non adherent utterances predict that behaviours do not change. Accordingly, the inspectors' MI skills have improved in the two most important respects.

It has also been found that the inspectors have increased their MI-skills with respect to the aspects evocation and collaboration. They have also significantly increased the focus on target behaviours.

One assumption dealt with the possibility of MI being more appropriate or easier to use in certain types of inspections. Two agricultural inspectors have participated in the study, including one in the pilot study in Eksjö. Both these inspectors have shown a marked increase in MI skills. The increase, together with the results of food inspectors' slightly better conversation performance, may indicate that it is easier or more appropriate to use MI during certain inspections. The fact that food and agriculture inspections have been shown to differ from other inspections could be due to these inspections having clearer target behaviours.

In a comparison between individuals and between different codings of the same individual, it can be seen that the variation is quite large, something which is also visible in other MI studies (Forsberg et al, 2010). In this study, there are examples of individuals who have a marked development curve in terms of the development of MI skills during training and examples of individuals who have higher skills from the beginning and who remained at a higher skill level. What has been seen in other studies can be confirmed, i.e. that individuals may exhibit varying developments in skills.

Below is a more detailed presentation of the results in the different MI-variables.

Global assessments

DIRECTION TOWARDS TARGET BEHAVIOUR

The whole inspector group showed a significant increase in directing the conversation towards the target behaviour, the average was 4.88 on a five-point scale after training (see figure 8.3). The increase in directing the conversation is significant between days 2 and 4, 5, 6 ,7 ($p < 0.05$).

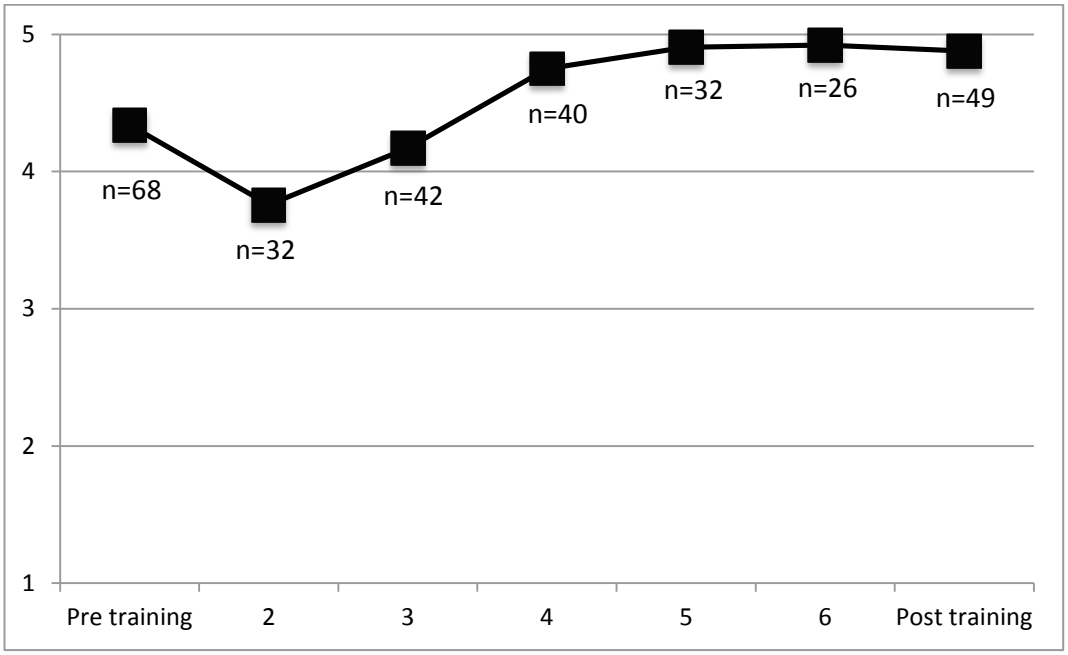

Figure 8.3: Global assessment of direction towards target behaviour per training day for all 32 inspectors. The number of codings per training day(s) is noted in the figure.

EMPATHY

The inspector group has significantly increased its competence in the MI-variable empathy ($p < 0.05$) during the study period. No difference in development can be seen between the municipalities (figure 8.4). The empathy variable is particularly interesting because in several previous studies, it has correlated with how individuals succeeded with their own change.

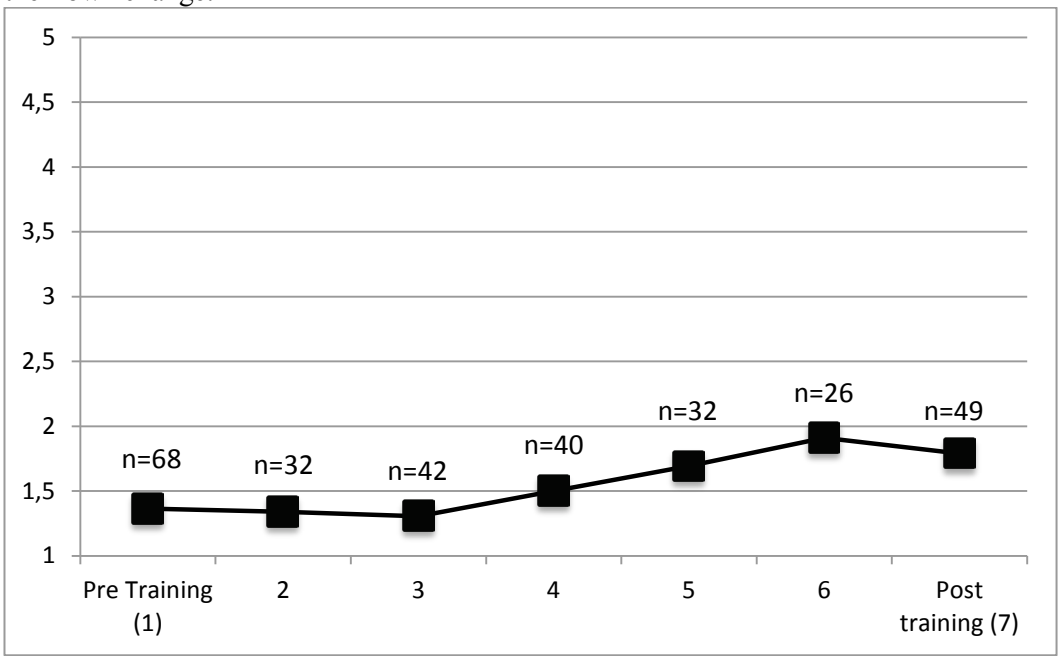

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Figure 8.4: Global assessment of empathy per training day for all 32 inspectors. The number of codings per training day(s) is noted in the figure.

EVOCATION, COLLABORATION AND AUTONOMY

The inspector group has significantly increased its competence with respect to the MI-variable evocation ($p < 0.05$) and collaboration ($p < 0.05$) during the study period. No significant change can be seen regarding the variable autonomy. The results show that the inspectors on average remained consistently lower with respect to the variables empathy and evocation as compared to collaboration and autonomy. This indicates that the inspectors developed MI skills within all global variables, while it is more difficult to use the skills empathy and evocation. No difference in development can be seen between municipalities (figure 8.5).

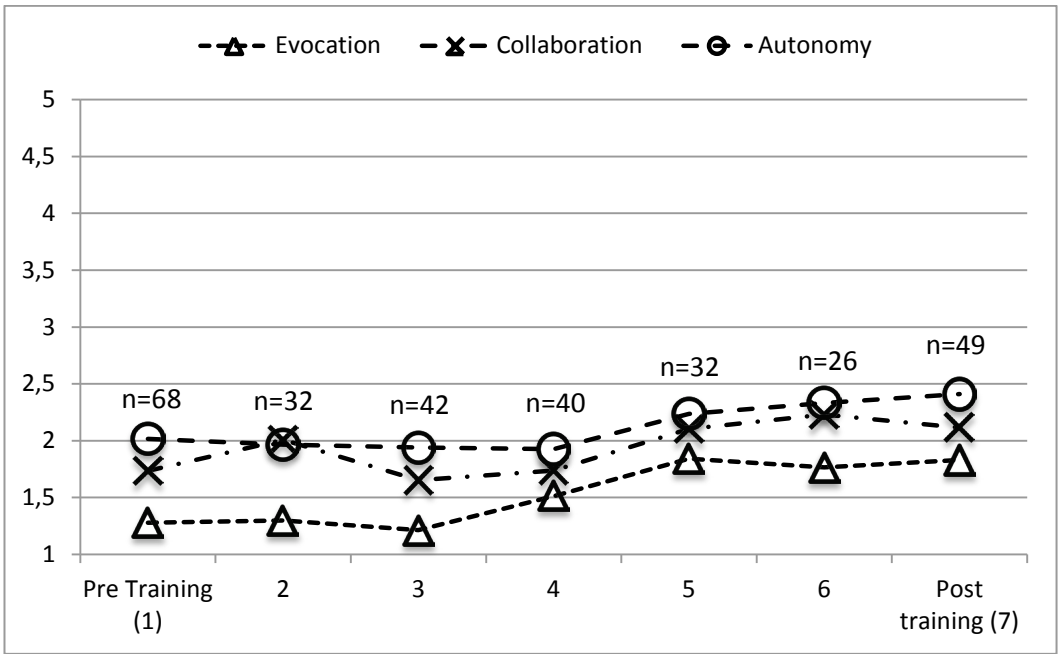

Figure 8.5: Global assessment of evocation, collaboration and autonomy per training day for all 32 inspectors. The number of codings per training day(s) is noted in the figure.

A significant change in empathy during the training ($p < 0.05$) can be seen when specifically calculating the global assessments for focus individuals, see figure 8.6 below.

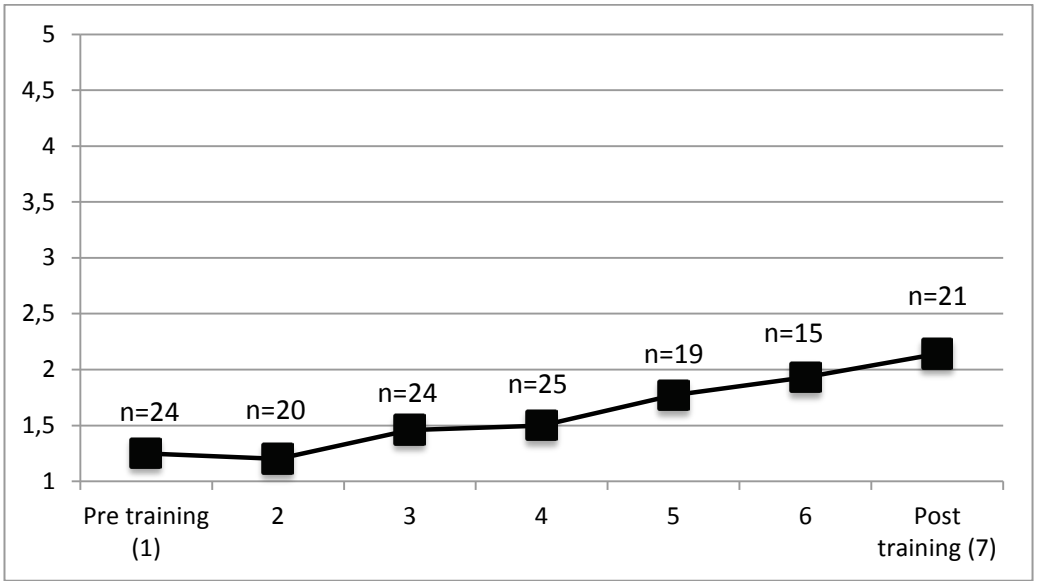

Figure 8.6: Global assessment of empathy per training day for all nine focus individuals. The number of codings per training day(s) is noted in the figure.

A non-significant tendency to change between occasions was identified in the focus group for the variables evocation, collaboration and autonomy (see figure 8.7 below).

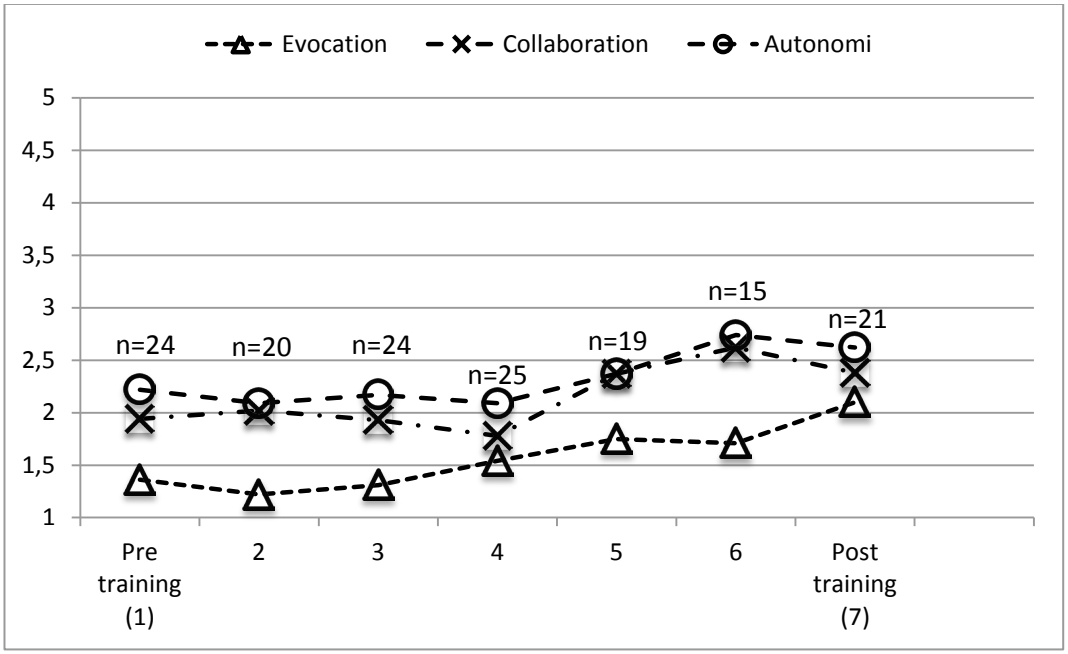

Figure 8.7: Global assessment of evocation, collaboration and autonomy per training day for all nine focus individuals. The number of codings per training day(s) is noted in the figure.

In a comparison between food inspectors and other inspectors (environmental and health protection inspectors), the analysis showed that the food inspectors were higher on empathy ($p < 0.05$, see figure 8.8 below).

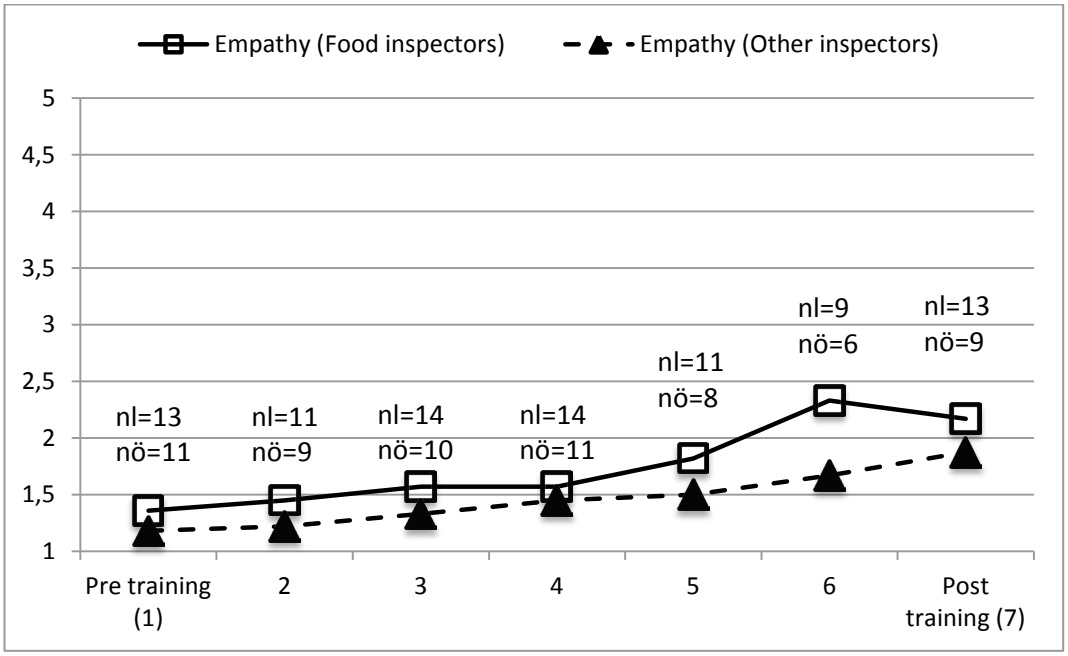

Figure 8.8: Global assessment of empathy per training day for the five food inspectors and four other inspectors within the focus group. The number of codings per training day(s) is noted in the figure. nl=food inspectors, nö=other inspectors.

Frequency counts of behaviour

INFORMATION

The number of information utterances has decreased (see figure 8.9) during the training period, but not significantly. The reduction is interesting as it may reflect that the inspector gives the operators' views and perspectives more space in the conversation. It may also be because the information is more adapted to what the operator asks for.

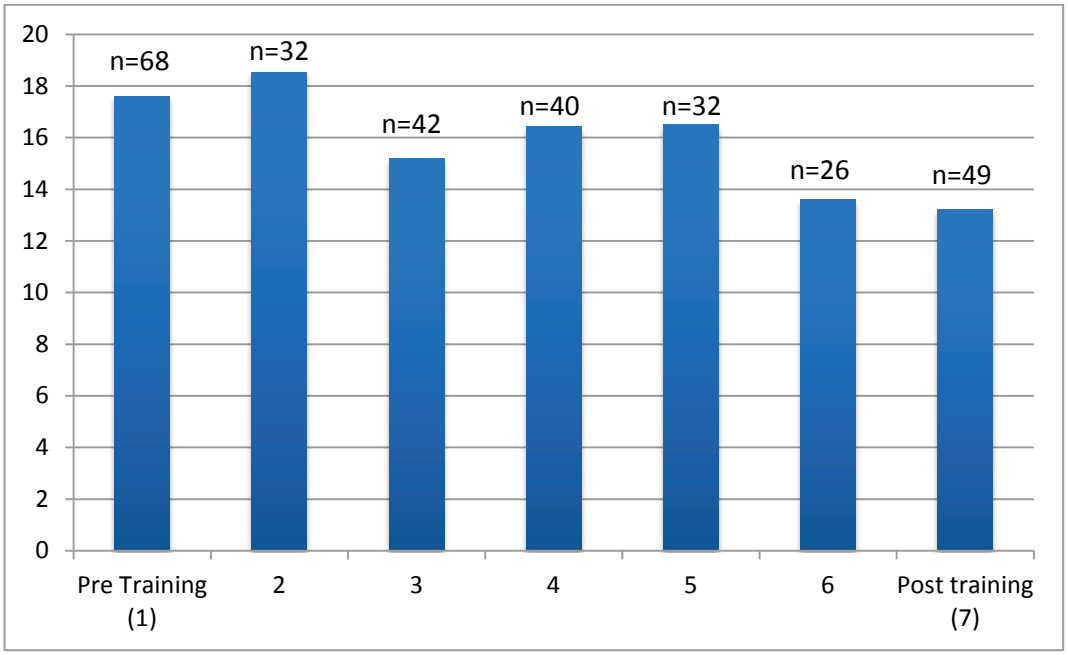

Figure 8.9: Frequency counts of the number of information utterances per training day for all 32 inspectors. The number of codings per training day(s) is noted in the figure.

QUESTIONS AND REFLECTIONS

No significant changes in terms of open and closed questions and simple and complex reflections were measured during the training period. There is a vague hint of an increase in complex reflections.

MI-ADHERENT AND MI-NON ADHERENT UTTERANCES

The number of MI-non adherent utterances has been halved during the training period (see figure 8.10), while a hint of an increase in MI-adherent utterances can be discerned. However, there are no significant changes. See table 8.2 for a description of the variables MI-non-adherent and MI-adherent utterances.

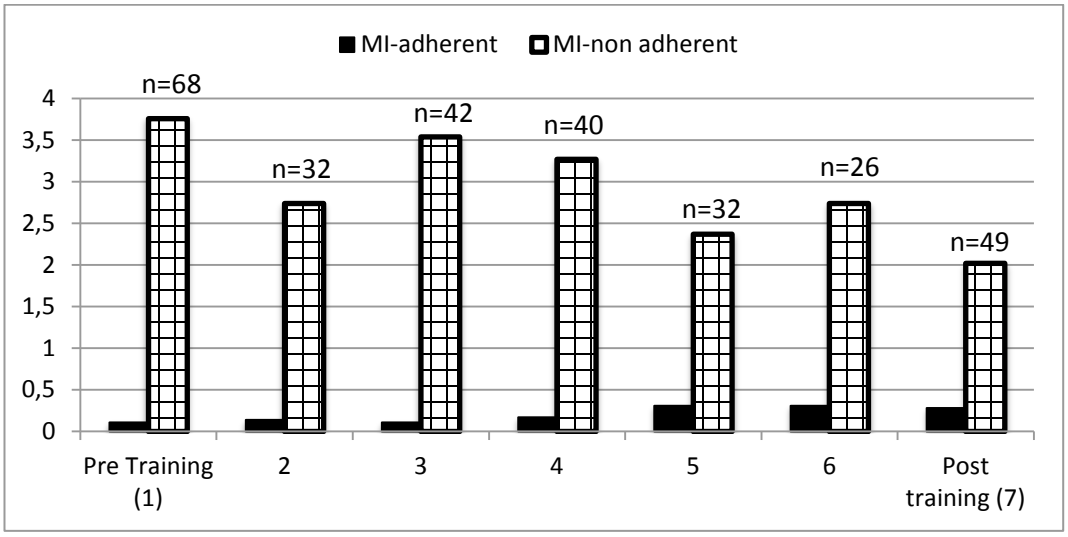

Figure 8.10: Frequency counts of the number MI-adherent and MI-non adherent utterances per training day for all 32 inspectors. The number of codings per training day(s) is noted in the figure.

In a comparison between food inspectors and other inspectors, there is a significant difference between groups in terms of MI-non adherent utterances ($p < 0.05$) and a tendency to a difference between the groups in terms of MI-adherent utterances (see figure 8.11). Food inspectors reduce the number of MI-non adherent utterances from just over five per conversation before training to just over two per conversation after training. In the group other inspectors, there was no clear tendency to change over time.

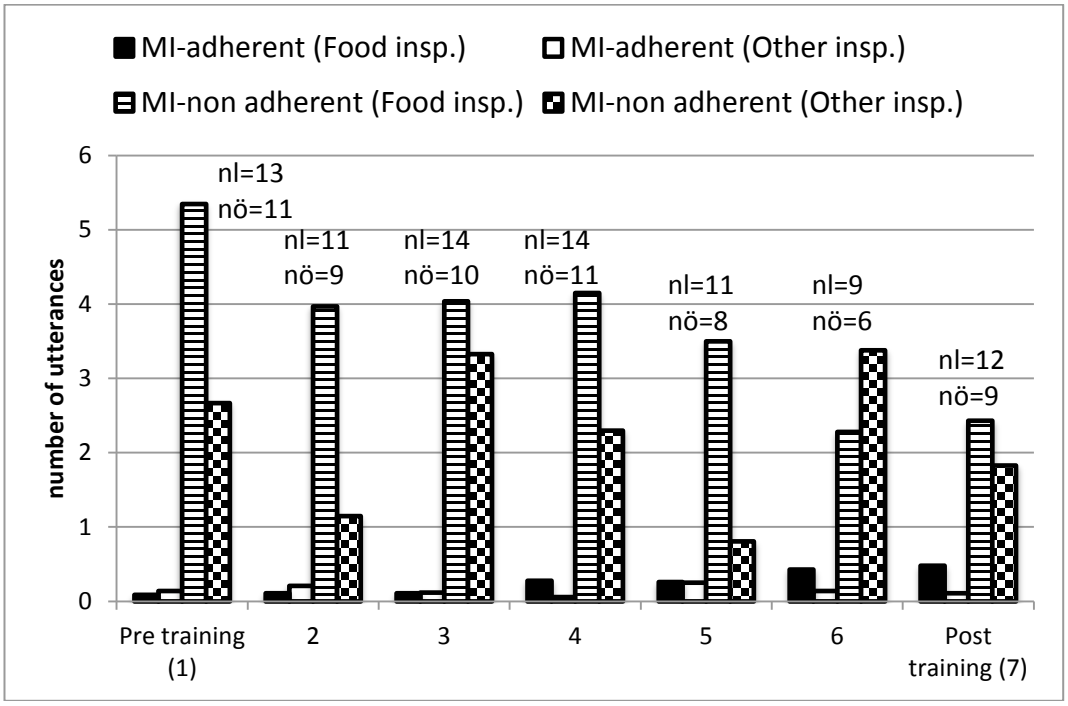

Figure 8.11: Frequency counts of the number of MI-adherent and MI-non adherent utterances per training day for the five food inspectors and the four other inspectors within the focus group. The number of codings per training day is noted in the figure. nl=food inspectors, nö=other inspectors.

Training survey

The main question regarding the training survey is whether MI is perceived to be beneficial to inspectors in their work. Furthermore, it is valuable to know how the training participants understand the significance of the MI-course. What elements or characteristics of MI do they find useful and what obstacles do they see? In what way do the inspectors specify what was good about today's training and what was not so good?

The usefulness of the training day and its different components

Three of the questions (1-3) dealt with the inspectors' perception of the usefulness of the training day and its different components. They responded on a six-point scale where 6 signifies extremely useful and 1 signifies barely useful.

The estimated usefulness of the training day as a whole was estimated to about 5, with no significant change over time, and the average value was relatively even around 5. Assessments of one of the municipalities were somewhat higher than for the other municipalities, about one unit higher than the municipality with the lowest score.

The estimated usefulness of the theory sessions and exercises were assessed at 5 and did not change significantly over time. Significant differences were seen between the municipalities where one municipality's assessments were somewhat higher than for other municipalities, except on the last training day.

The estimated usefulness of feedback on recorded conversations was assessed at between 4.5 and 5 and did not change significantly over time. Significant differences were seen between the municipalities where the assessments of the same municipality as above were somewhat higher than for the other municipalities except on the first two training days. In this respect, you can see a greater spread in the responses when compared to the other questions, where one of the municipalities on one occasion assessed usefulness at about 3.5 (after session 5) and another municipality assessed usefulness at 6 (after session 4). *Dropout regarding training session 1 for one of the municipalities.*

Applicability of the MI skills in inspection work

One of the questions (4), which was answered on a 6-point scale, dealt with the inspector's experience of the applicability of the skills in her inspection work. The result is presented in the graph below (figure 8.12). The assessed applicability did not change significantly over time.

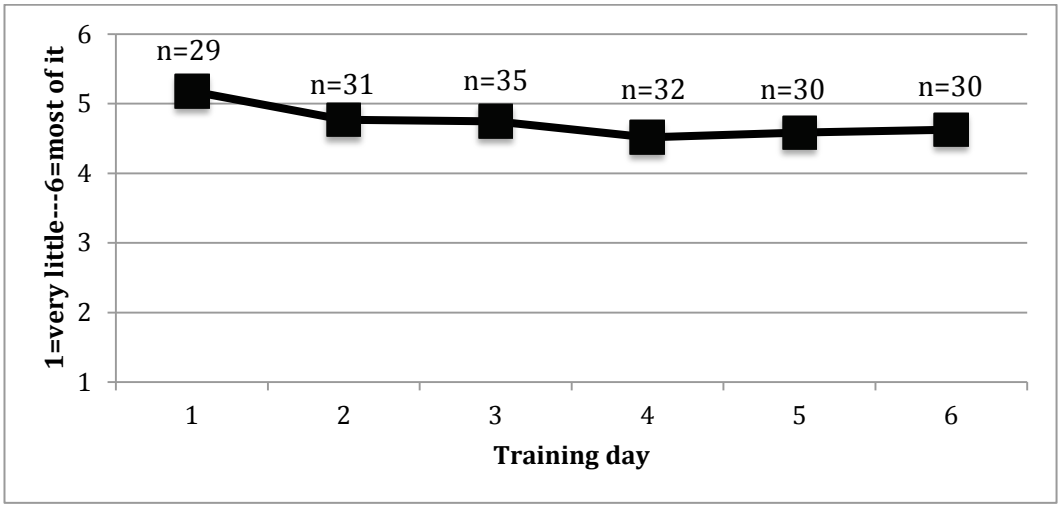

Figure 8.12: "Will you be able to apply your new skills in your inspection work?". The survey answer on a six-point scale per training day for all 40 inspectors. The number of survey responses per training day(s) is noted in the figure.

Scale question 5 concerning the assessment of the teacher's performance has not been included in this analysis work, as these data constitute valuable feedback in an on-going training process, but are far from the main issue if MI is to be useful to inspectors in their work.

During the twelve-month training period, where MI has been used in ordinary inspections and during different types of inspections with different operators, in four different municipalities, the inspectors unanimously stated that they perceived the method to be beneficial. No significant difference occurred over time and the inspectors perceived the same applicability over the year-long training period. We are surprised that the perceived applicability is maintained even after the novelty value of a new training subsided. And when the new interview method was confronted with an everyday routine inspection.

In terms of feedback concerning the recorded conversations, this follows the same positive pattern as the training in its entirety and applicability, albeit with a greater variation between different occasions within municipalities, which can probably be explained by the feedback from conversations to some extent being influenced by the conversations used and how well it is possible to make connections to the MI-practice. Even the perception of the usefulness of the theoretical component varied within municipalities, where one can imagine that some training days have been perceived to be more understandable than others, or that there was variation in the teacher's performance.

Processing and analysis of the four open questions in the training survey that allow free text

Categories have been created in order to process and analyse the responses to the open questions. A starting point for this analysis was to edit the free text comments in some respects. A) Only comments, which further clarify the information already provided in the first, second and third scale questions, provided material for categorisation. If the

comments represented a recurrence of what the respondent answered to one of the scale questions, the comment was deleted from the analysis. For example, if the respondent answered *"Today's training was good"* with "theory", this is considered as a repetition of the respondent setting the scale value 5 or 6 in scale question 2. B) Sometimes the respondent answered the free text comments so generally that the comment did not further clarify what was already stated in the scale question which is why this was also excluded from being categorised. Example: Question *"This was good with today's training:"* answered with "few aspects".

Free comments to question 4: *"I would like to give this as advice or tips for similar courses for inspectors:"* have not been included in this analysis work as they aim at providing information about the organisation of possible future training courses, which is an issue located far from the main issue of whether MI is beneficial to inspectors in their work. Free comments about the teacher's performance have also been excluded from categorisation, as these data are valuable feedback in an on-going training process, but are far from the main issue of whether MI is to be useful to the inspectors in their work.

Good with MI training

Free text comments concerning *what was good with the training* have been categorised and divided under three headings. The number of comments in each category has been summarised for the entire training period, see table 8.8.

General opinions that do not directly specify what is good about MI	Clarification of the pedagogical part	Specific clarification of whether MI is good and what is good about MI
- Study your own inspections, good discussions (9)	- To listen to recordings, discuss coding, give/receive criticism, give/receive peer feedback, all listening together (35)	- To use the evocation strategies, to discover the operator's motives (10)
- Everything in the training, MI as a whole (5)	- To repeat (11)	- To use open and closed questions consciously, get tips on issues (9)
	- Make a checklist, to-do-list, to sum everything up (6)	- The importance of understanding the operator's point of view, to listen, to reflect (8)
		- To use summaries (4)
		- To have a target behaviour in conversations (2)
		- To use ambivalence research (2)
		- The importance of help (1)
		- To meet resistance (1)

Table 8.8: Free text responses to the training survey question "This was good about today's training:" for all inspectors over the entire training period, number of inspectors = 40. The free text responses are divided into three categories, under 13 headings, the number of free text responses per heading in parentheses.

Not so good with MI training

Free text comments concerning *what was not so good about the training* have been categorised and divided under two headings. The number of comments for each heading has been summarised for the entire training period, see table 8.9 below. We have chosen to treat negative comments differently as it may be of particular importance to highlight what may be negative when a new element is considered. We have also chosen to do this to reduce the risk that we, as researchers, see MI with a misrepresented positive view.

Comments that are related to pedagogics during the training day		Comments that may be related to MI as a method and point to obstacles to its usefulness
Lack of time (22)	Too many contributions from participants (1)	Difficult to change, take in (4)
Too much repetition (9)	Research on MI (1)	Restless (2)
Poor hardcopy / hard to take in the hardcopy (5)	Would be good to listen to different areas of inspection (1)	Not sufficiently concrete (1)
Too little time to listen to recordings, including your own recordings (4)	Too little negative feedback on recordings (1)	Not a good behaviour to change (1)
Technical problems during training day (4)	Too little repetition (1)	Organisational change (1)
Could not record at the operator (1)		

Table 8.9: Free text responses to the training survey question "This was not so good about today's training:" for all inspectors over the entire training period, number of inspectors = 40. The free text responses are divided into two categories, under 16 headings, the number of free text responses per heading in parentheses.

What in MI may be useful in the inspector work

Question 4 is our main question in the study. It is of particular importance to analyse comments in free text, which addressed the issue. All free text given in the answer to the open question "*I believe this will be useful to me in my work as an environmental inspector",* was categorised. The number of comments has been summarised for each category, see table 8.10.

Categories about MI in general as a useful method during inspections or clarifying what in MI that is good to know	
MI entirety/all/to motivate/to meet the operator (26)	To be aware of and aim at target behaviour (2)
Knowledge of the operator's perspective, to listen and reflect (24)	Use a to-do list (2)
Different conversation techniques (12)	Not to evaluate the operator (1)
To recognize and reinforce the desire to change (5)	Confirmation/to convey operator understanding (1)
Important which questions to ask (5)	To invite collaboration (1)
EOE (Explore - Offer info - Explore), information exchange (5)	General skills for inspection that need not be related to MI
To summarise (4)	
Reinforcement approach (4)	
That the operator must think for himself/herself, not just drown in information, to roll with resistance (4)	The importance of how others perceive me (3)
Ambivalence research (3)	Use recording examples (1)

Table 8.10: Free text responses in the training survey question "I believe this will be useful to me in my work as an environmental inspector" for all inspectors during the entire training period, number of inspectors = 40. The free text responses are divided into two categories, under 17 headings, the number of free text responses per heading in parentheses.

Inspection survey

The inspection survey was completed before *training* in only one of the municipalities, Östersund, while other municipalities began to complete the online survey after training day 1. There is a great variation in the number of completed surveys, which fluctuated between 0 completed surveys for seven inspectors and 116 and 95 for the two inspectors who filled out most surveys (see figure 8.13). These inspectors constituted over 40% of the survey material. The survey responses from these inspectors are on the same level throughout the training period as compared to the other inspectors where survey responses reflect changes in experiences. The difference may be due to the experience of other inspectors changing during the training period. However, it could also be because the inspector group has completed fewer surveys, which leads to an uncertain assessment. The distribution of completed inspection surveys between the different training days is presented in figure 8.14. It is possible, through an analysis of the responses to the inspection surveys, to follow how the inspectors' opinion of their performance during inspections changes and how their *assessment* regarding the operator's attitude changes over time.

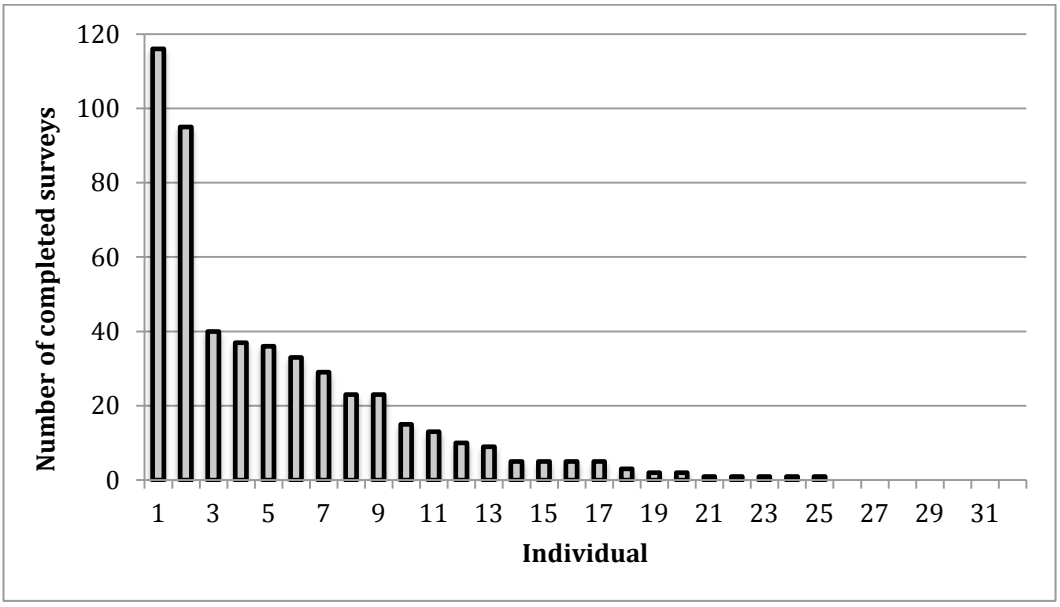

Figure 8.13: The number of completed inspection surveys per individual for the entire training period (n = 511)

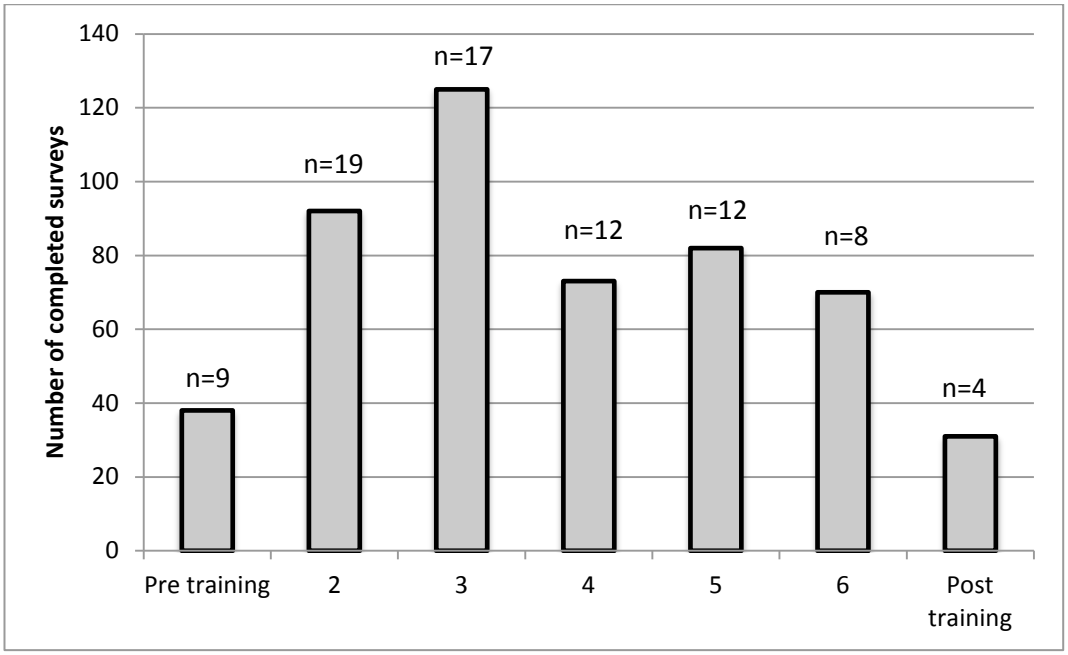

Figure 14: the number of completed inspection surveys per training day for all 25 inspectors. The number of inspectors who filled out surveys on each occasion (n) is shown in the figure.

Over time, it is possible, through the analysis of the responses to the inspection surveys, to observe:

1) the inspectors' perception of their performance during the inspections, and 2) the inspectors' subjective assessment regarding the operator's attitude and behaviour. When asked if the inspectors were satisfied with their own work during the inspection (figure 8.15 below), the proportion who answered "corresponds very

well" increased from 26.1% to 51.3% while the proportion responding "does not correspond well", "does not correspond that well" or "neither good nor bad" fell from 31.5% to 3.2%. *The two inspectors who contributed to 40% of the survey responses did not exhibit any increase in satisfaction over time, but were high the whole time and did therefore not contribute to the increase of the entire group.*

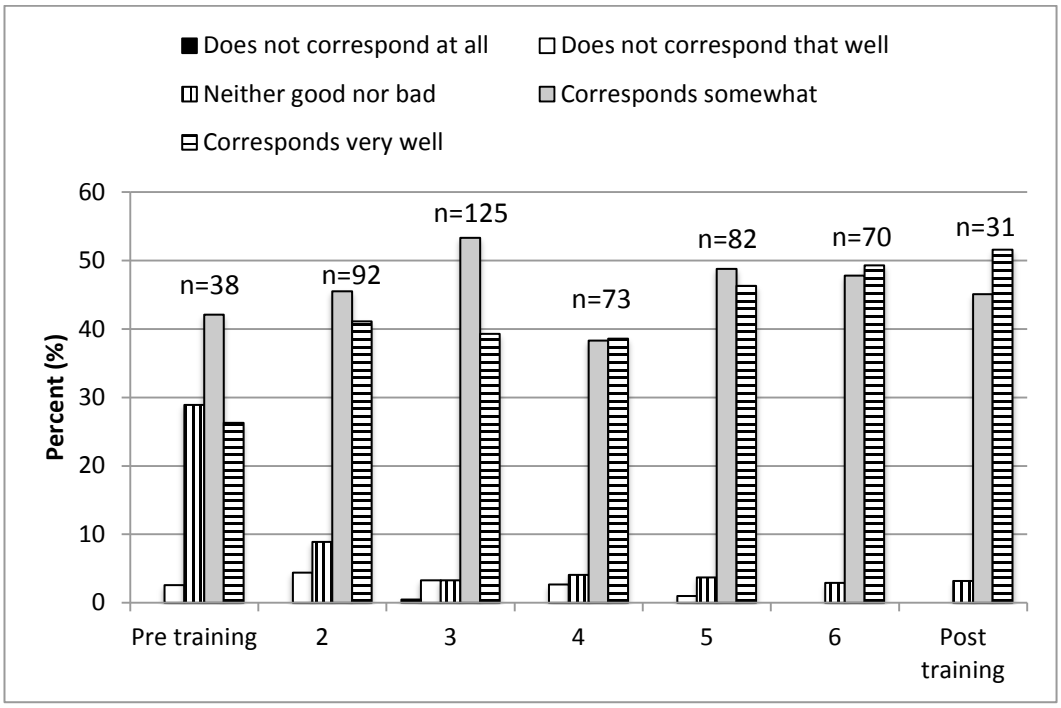

Figure 8.15: The question from the inspection survey "I am satisfied with my own performance during the inspection", response frequency on the five-point scale from "does not correspond at all" to "corresponds very well" for all 25 inspectors. The diagram is expressed as a percentage of the number of completed surveys per training day. The number of surveys per training day(s) is indicated in the figure.

Questions 18 and 9 were compared to give an idea of whether any change occurred in terms of the operator's attitude during the actual inspection. If the question *"My assessment is that the operator perceived the inspection as positive after the visit"* was given a higher value than the question *"The operator was positive to the inspection at the beginning of the visit"*, this was assessed as the operator being more positive after the inspection, if the question was given a lower value, the operator was assessed to be more negative after the inspection. If there was difference between before and after, this was categorised as equal. The proportion of inspections where the inspectors assessed the operator to be more negative after the inspection as compared to before the inspection decreased from 31.6% to 0% (not significant). The difference is significant with regard to unannounced inspections ($p < 0.05$). See figure 8.16. This indicates that by using MI during the inspection, the inspectors have improved their relations with the operators in situations where the need to meet operators with understanding is particularly large.

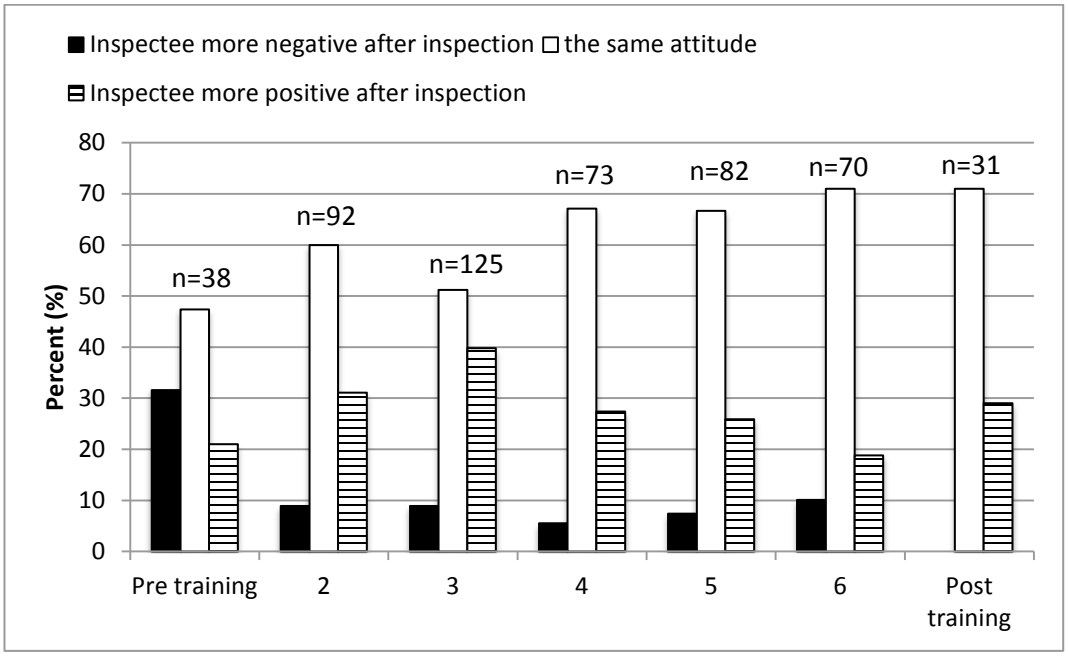

Figure 8.16: The inspectors' evaluation per training day with regard to the operator's attitude to inspection, percentage distribution between three options: The operator was more negative, more positive or had the same attitude to the inspection after the inspection compared to before the inspection. Comparison between the inspection survey questions 18 and 9. If the question "My assessment is that the operator perceived the inspection as positive after the visit" on a five-point scale was estimated higher than the question "The operator was positive to the inspection at the beginning of the visit" this was assessed as the operator being more positive after the inspection, if the question was given a lower value, the operator was assessed to be more negative after the inspection. In general, they were considered to be equal. 25 inspectors filled out the surveys. The number of surveys per training day(s) is noted in the figure. A significant difference over time was found regarding unannounced inspections ($p < 0.05$).

In conclusion, the data from the inspection surveys and the discussions during the reporting day reinforce the fact that during the training period, inspectors were more satisfied with their work during their inspections.

Reporting day/final feedback from municipalities

The final feedback from the inspectors given in conjunction with the reporting date on November 29, 2012 is presented below. These views are of interest for our analysis as they were conveyed after the training had been completed and all audio recordings submitted, after a few months of reflection about MI and its applicability. Below follows a brief summary and some examples of comments shown on two points.

Inspectors are positive and want to maintain MI

All municipalities presented the perceived benefits of the method and an ambition to work to develop and keep the knowledge alive. A new way of discussing, a new way of meeting the operator where the inspector takes a more listening and exploratory approach were highlighted. Besides MI skills and approaches, the feedback showed recorded conversations as an important part of the training, which provided insights about the

inspector's own behaviour. They highlighted the importance of finding ways of maintaining skills. Questions about upholding skills individually, at the workplace and at the national level, were discussed in small groups. Ideas that surfaced were to work individually with your own personal/unit specific guides, to work in pairs and give each other MI feedback after inspections, to create networks outside of the workplace, to ask for training/retraining from county administrative boards and the Environmental Protection Agency.

Group discussions took place regarding upholding MI, individually, at the workplace and at the national level. Listed below are some comments from inspectors as examples of views that emerged, "there's an immediate need of repetition", "the need of tangible support", "there is a need to record conversations", "questions about what is required in the organization to ensure that work to maintain skills gets off the ground? Money, time, good equipment?", "questions whether MIC Lab can be used for supervised feedback?", "you can work with to-do lists", "questions about the status of EMT?" How will MI benefit all municipalities? EPA should embrace this and take it down to the county administration board level. The same applies to the National Food Agency, "sometimes it's difficult to carry recording devices, one option is for two people to make inspections where one only listens to the conversation", "important that the whole team takes the course", "Promote MI in other projects: e.g. Supervision development in the West, Environmental Collaboration", "important that we take the initiative".

The inspectors think about how and when MI may be helpful

Discussions took place about the limitations of MI; whether to make a division between conversations where MI is useful and where MI is not obviously useful. Views that emerged were "at large firms, the applicability of MI was not as apparent as at small firms", "it is important to speak to the person who actually owns the question", "good to start and complete the inspection with MI", "it may be difficult to use MI in the actual supervision", "you can use parts of MI in the inspection", "it's good to use MI on people making complaints", "risk of MI only involving listening to complaints, which is not part of the job", "important to use MI to quickly reach a goal", "MI should be incorporated into basic values".

They also discussed in groups whether the pursuit of increased empathy and decreased MI-non adherent utterances is reasonable and adequate for the inspectors. The views that emerged were that "it is good to increase empathy, but it must not be exaggerated as we are an authority", that "it is good with MI at the beginning and at the end of the inspection", that "it is also important to be clear", "to increase empathy gives a better climate for discussion and confidence and provides opportunities for better cooperation in the longer term", that "it is important to build a good relationship as the inspector always comes back", "if we create a good conversation, we create a good working environment for the inspector".

During the reporting day, all involved municipalities reported that the experience of MI training was good and the reasons to apply the method substantial. Primarily, the

inspectors commented on the importance of the general MI approach and several central MI skills as an aid in their practical work. A great number of reasons to use the method involved MI being considered to contribute to the inspector becoming better at meeting and reaching out to operators in a situation involving a conversation, for example, to devote time to listen to and respond to the operator in a respectful manner, to understand the operator's perspective and to convey a message and motivate positive environmental behaviour. Many inspectors saw the method as a new way of thinking where more emphasis is placed on responsiveness, the attempt to understand the operator and the encouragement and strengthening of the operator's own ideas and less focus on giving advice and talking about what needs to be done before the operator has conveyed that she wants this information. Several inspectors thought that using the method helps to create trust between the inspector and the operator and better relations both in the short and longer term. All municipalities presented the hope and determination to continue to use and maintain MI. As for the inspectors' comments on what has been less good, there were only a few comments about things that can be related to MI as a method. In general, there were twice as many comments about things that were good as compared to things that were not so good about the training.

Limitations and strengths of the study

No random sample of municipalities has been made. There was a large and selective dropout rate for inspection surveys, which means that results related to the inspection surveys should be interpreted with caution. The dropout rate for conversations that could not be coded affected the study as the statistical data has been impaired on account of this; yet, at the same time, clear results can be seen for both the focus group and the group as a whole, so that we feel more confident about the results in terms of the inspector's MI skills. Independent assessment of MI skills is a strength – made according to the same criteria as other studies on MI. Another strength is the long period during which inspectors apply MI, between 10 and 13 months, with continuous control of the degree to which MI was applied and that this may be related to their perceived benefit from the method. One weakness is, of course, that we have no measure of whether the operator is influenced towards a better environmental behaviour by MI.

Looking forward

Several research questions remain. Can improved MI skills add and make inspections more efficient? Is MI only useful in certain contexts - for example, at medium and small operators but possibly less useful at a large company or authority? Should MI-use be adapted during inspections by using and not using an MI approach? And can this balance be dependent on whether you are trying to influence a behaviour (MI), or whether you are looking for information or studying the conditions before attempting to influence behaviour (not MI)? In order to assess the actual efficiency of MI, one needs to explore the relationships between MI-training-MI-skills and effects of operator behaviour. Carrying out follow-ups of effects in practical environmental work and linking implemented actions is a question in which more and more people are interested. Some questions of interest, in our opinion, are formulated in chapter 11 (Future analysis possibilities).

8.4 Summary

Motivational Interviewing (MI) is a communication technique that has proven effective when it comes to making it easier for people to change a behaviour leading to poor health. To determine whether MI can be applied by environmental, health protection and food inspectors during the inspection and whether MI is perceived to be useful, the method has been tested in four municipalities. To our knowledge, the method has never previously been tested for these kinds of inspections. More than 30 environmental, health protection and food inspectors attended a six-day training course with about two months between each training day. The days were divided into theory, exercises and feedback on their own recorded conversations with operators. The main hypotheses of the study were that an MI training leads to increased MI skills and that MI-skills lead to improved efficiency in environmental supervision as perceived by the environmental inspectors. Changes in MI skills were measured through the recorded conversations being coded with respect to MI skills. The estimated benefit of training in practical work and inspectors' experiences of inspections during the training period were followed by participants completing surveys after the training days and after inspections. The study generally found that after MI training, inspectors were significantly better in the most important MI variables, empathy and MI-non adherent utterances, that the inspectors experience the method to be of benefit during the inspection work and that inspectors became more satisfied with their own efforts during training. Future research questions are also discussed in the chapter.

8.5 References

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THEME C

THE FUTURE OF ENVIRONMENTAL INSPECTIONS AND ENFORCEMENT

Chapter 9
A scenario for future information management in environmental inspections and enforcement

Henrik Artman

The scenario presented in this chapter was developed together with inspectors, heads of environmental inspections and enforcement (EIE) and municipal operations controllers and with officials at the Swedish Environmental Protection Agency. The goal was to create an information management structure and process based on how the different stakeholders view the future organisation of EIE and how information sharing can take place for their benefit. The scenario was particularly developed from the perspective of operational EIE in municipalities, but it is probably also applicable to county administrative boards and other central government agencies with similar tasks. The starting point for developing the scenario is that environmental data should be interconnected and that the system should lay the groundwork for the ability of different stakeholders to compare each other's various results and methods so as to enable an evaluation of the efficiency of inspections. In particular, we took the inspectors' daily routines and needs as our starting point because it is the inspectors' professional judgement (see Chapter 6) that is of relevance for the specific case and should constitute the basis for the data collected.

The scenario assumes that Swedish EIE and inspection data will be collected, without forcing the inspector to collect such information that is irrelevant to the specific case. Our meetings with inspectors have led us to understand that they plan, organise and carry out their duties very differently, both from municipality to municipality and from inspector to inspector. The majority of municipalities have developed their own checklists, which many consider to be an unnecessary waste of resources. But even if there are local checklists, these are filled out differently, and sometimes certain information is omitted from the checklist. At the same time, central agencies place requirements and provide guidance to which municipalities and county administrative boards (and therefore inspectors) must adhere. On the other hand, a mandatory checklist system dictated by a central agency runs the risk of forcing the user to perform unreasonable and irrelevant data collections which, in turn, may cause the system not to be used, incorrect data to be entered or the system to be circumvented (Robinson, 1993; Orlikowski, 1992).

Parallel to this, each municipality is autonomous, which renders direct control by any central agency impossible. The research programme makes no reasonability assessment of Swedish administrative procedure. Instead, we assume that the inspector's professional judgement should determine which inspection data is to be collected and how this is to be

done. The scenario advocates every inspector's own creation of inspection point lists adapted to the specific EIE object (see Chapter 5). However, this does not mean that new and individual inspection points need to be created for each individual occasion, but rather that inspection points can be inherited. An inspection point proposed by one individual can be used by another individual because the system offers the inspector a series of inspection points based on the nature of the EIE object. Furthermore, it is possible for an EIE object that has similar characteristics to inherit inspection points from a previous object, so that a car wash, for example, inherits inspection points that were considered relevant to other car washes, or that a water purification process inherits inspection points from other water purification processes.

The idea behind the system is thus that it is interlinked by means of inspection points. However, it is always the inspector who determines whether a given inspection point is reasonable for a given EIE object. This also makes it possible to assess the established applicability of an inspection point since an inspection point that is used by several inspectors becomes more popular. As time goes on, the system will self-organise and self-regulate because inspection points that are not considered “good” (for whatever reason) will not be used, while inspection points that are used by more inspectors, and thus considered “good”, will have a high ranking. Today, there appears to be an intermediate position, where many municipalities offer their “own” checklists that are not necessarily coordinated with similar lists in other municipalities. The system is expected to contribute to a form of efficiency gain as compared to each municipality creating its own checklists and will also contribute to the possibility for all inspectors in the country to learn from each other through the system, known as trans-situated learning (Vaast & Walsham, 2009).

The basis of the whole scenario is thus that all inspectors at operational EIE agencies contribute information to a data warehouse covering the specific EIE object, the inspector's independently created inspection points and the content of the inspection points used. It should be said that this data warehouse need not be a direct copy of the local database, which might contain much more than inspection points. The focus is on data about the business, inspection points, values of inspection points etc. This means that the system will allow the sharing of more aggregated information on how a particular industry, business object type, FMH code (Ordinance concerning Environmentally Hazardous Activities and Protection of Public Health), SE-SIC code (Swedish Standard Industrial Classification) relates to one or more inspection points. This will create a statistical basis of EIE in Sweden and thus, various inspection points will be found that should receive particular attention. The idea is thus that the inspector, the municipality, the county administrative board and central inspection guidance agencies (e.g. the Environmental Protection Agency) will be able to compare different intersections of national EIE in order to thereby determine particularly efficient or less efficient inspections; find skewed distributions between regions; or find other comparisons in order to improve and share EIE procedures.

In the future scenario created with our assistance, we start with what is the basic EIE planning that all municipalities are required to perform annually. The system is circular in nature, that is, it is constantly fed with new inspection data. So the starting point for how to describe the scenario is arbitrary. We could equally well start with the first inspector's first encounter with the system where he/she faces a more or less “empty” system and has to start with the creation of inspection points (thus defining the database). However, in this description, we have started from a system that already has inspection data and we may thus start with the EIE planning for the calendar year performed by the municipality.

9.1 From EIE plan to inspection plan – before the inspection

A requirement that Chapter 1, Section 8 of the Environmental Enforcement Ordinance places on municipalities is the annual preparation of an EIE plan. This EIE plan is to include an overall plan of EIE in the municipality, which EIE activities are to be carried out, information campaigns etc. Naturally, not all cases can be planned, and there must be scope for unplanned cases that arise externally.

9.1.1 The municipality's EIE planning

The EIE plan is based on several different aspects, such as history, experience, risk classification and direct needs. So far, it is a matter of the legislation placing requirements on the municipality, which then carries out planning for inspectors in the municipality. How the actual planning is done differs considerably between the various municipalities; some heads of EIE do the planning themselves, others have a committee to do the planning and, in some, it is handled in more direct contact with the inspector (Report 5959, Tillsynsplaner – aktiva eller fiktiva styrdokument, Naturvårdsverket, 2009 [in Swedish]). Since the municipality and also the environmental department can be of very different sizes, it is also quite natural that the planning is organised differently. Some think that the annual EIE planning, and thus the inspector's work planning, is crucial for how well the environment office functions.

The EIE plan then constitutes the basis for the environmental inspector's individual work planning. Since the EIE plan starts from the requirements and guidance in legislation, the municipality's needs and interests and, of course the inspector's knowledge and work situation, it is to some extent a compromise of various needs. Inspectors currently feel somewhat unsure about exactly which needs are in focus. According to most inspectors, planning for the future should be based on:

(1) the actual outcome from last year (including an analysis in relation to the environmental quality objectives)
(2) the actual outcome from other operational EIE units
(3) the outcome of specific campaigns from operational EIE units
(4) directives from the Swedish Environmental Protection Agency and the EU

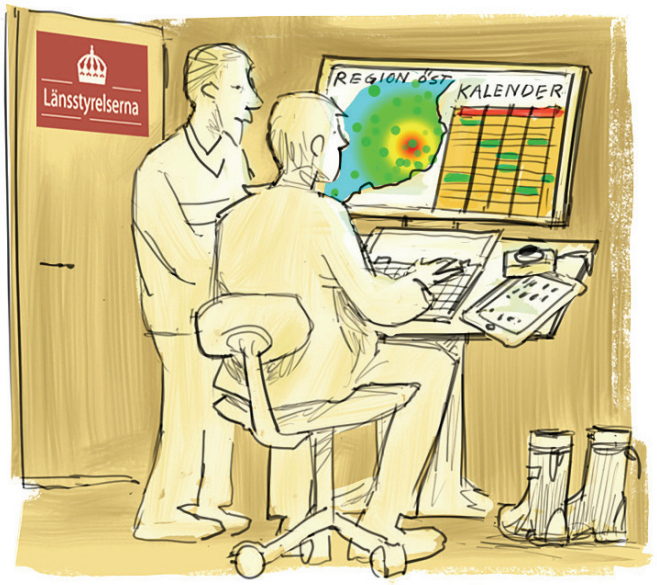

Figure 9.1: An illustration of how an agency plans enforcement for the coming year. © Rikard Hilding.

An annual EIE planning should thus primarily be based on the outcome within the municipality since last year. Which inspections were without criticism? Which EIE areas had many things that were subject to criticism and need to be rectified? Which companies are especially at risk in some respect, such as the handling of particularly hazardous products, recurring criticism etc.? For municipal efficiency, this means a link to the capacity to prioritise and highlight areas, industries or phenomena that need to be rectified or require special EIE (see also Chapter 4).

Every municipality consists of a specific geographical area where environmental inspections are performed. Today, the planning is usually based on someone's perception or experience from the previous year, and/or on simple products in terms of finances. It is difficult to learn from other municipalities unless environmental collaboration groups are created to highlight and discuss specific questions. However, this creates an additional level for the delegated information management system: the municipality, *collaboration groups*, county administrative boards and central agencies.

But to avoid that each individual municipality becomes preoccupied with its own inspection data and thus misses global changes, their skewed distributions, trends or core areas, it is also crucial to be able to get inspiration from other municipalities and results for their inspection points. Such differences make it possible to notice their skewed distributions and to see how other municipalities have improved their outcome by making certain additions to EIE checklists and protocols. A common data warehouse will enable municipalities to compare their own result with that of other municipalities.

In particular the larger municipalities work with various kinds of campaigns, in particular targeted information campaigns. The evaluated outcomes of these are very important for the possibility for other municipalities to reuse campaigns that turned out to be particularly successful. Therefore, it is essential to create and evaluate e.g. information campaigns so that other municipalities can make use of the campaign.

Of particular interest to heads of EIE and business controllers is access to various indicators, especially those indicating different effects of EIE. A nationally unified database would enable the management of an environmental department to compare its own municipality using variables that are of value to it. It may be particularly important to collect statistics about the type of businesses it plans to inspect. Let us say that the management for the inspection of a number of car washes. What are the most common inspection points? Which inspection points do most car washes receive remarks about? Are there any systematic differences across regions? It should be possible to retrieve all these forms of planning support from the system, which would facilitate the preparations of individual inspectors in a meaningful way that can also be traced.

The scenario is based on the fact that the municipal official(s) making the enforcement plan learn(s) from previous years' inspections within the municipality and learn(s) from other municipalities' procedures and results in order to create the annual EIE plan. Comparing EIE objects that are close in terms of similar inspection points makes it possible to see if there are particularly efficient procedures. The EIE planning can also generate statistics for the inspector by using inspection points to highlight inspection data and indicators from local and national inspections. Since the system offers comparative statistics, it will become more equal as time goes on (or where one opts to do something differently, it is then a conscious decision).

9.1.2 The inspector's planning of a specific EIE object

This scenario is based on two assumptions: that the inspector has been able to collect facts about the individual EIE object via existing systems and has been able to make comparisons with other similar objects. The idea is that inspectors will be able to compare industry type, geographic location, surrounding factors, inspection points etc. and be able to compare their own inspections of a specific EIE object with other comparable objects. Whether an EIE object is similar to another is determined by checking whether they have similar inspection points. This means that similarity is not based on higher-level categorisations. More on this is given in Chapter 10 on the prototype.

The common data warehouse is also of value to the individual inspector planning a specific EIE object because the overall planning provides good support for the individual planning and because the system says that the right tasks are being performed in relation to an overall municipal goal which, in turn, is rooted in data from a national perspective.

However, the most important thing for the individual inspector's planning is that he/she has the opportunity to search for statistics for similar cases in the national database. This

will also enable him/her to provide clearer information to the operator about other similar operators having similar (or different) conditions.

As the database is based on inspection outcomes, it is desirable for the inspector to be able to create a "checklist" of points to be inspected. We have understood checklists, according to current nomenclature, to be static proposals or ordered inspection points. Since the checklist that can be created via the system is dynamic and the inspector is given the opportunity to adapt it to the specific enforcement object, we call it *inspection list*. The inspection list is thus the questions, the inspection points, that the inspector has found meaningful for the given EIE object. It should thus be possible to see which inspection points a given case (or cluster of cases) has used to make a particular assessment or decision. This may therefore provide inspiration for determining the phenomena that should be inspected. The inspectors would also like to be able to have access to decisions and explanatory statements so as to share knowledge and unify decisions across Sweden. The idea is to be able to choose from a range of inspection questions to create an inspection list (= dynamic checklist) that is relevant to the needs of the EIE object and/or to add inspection points that are felt to be missing. The system will thus always allow inspectors to create their own inspection points if those in the system are not relevant to the given EIE object.

Once the inspector has created an inspection list that he/she considers to be good for the activity he/she will be inspecting, he/she can carry out the inspection.

9.2 Implementation of the inspection

There is a great difference between inspectors regarding whether or not they want support for information collection and decisions during the actual meeting with the operator. Some say that they would need a support tool that can handle everything from the checklist/inspection list, documentation (photos, directions, maps, notes), while others say that they want to keep their focus on the meeting with the operator and not have a handheld computer system that might disrupt the conversation.

One view of why there is hesitancy towards a handheld computer support is a certain dissatisfaction with existing support functions and their usefulness. They do not want yet another system where they have to try to figure out how it should be used. In many respects, it should be possible for individual inspectors to decide whether they want to use a handheld computer system of this kind. The inspectors who do not want a handheld system can enter the information afterwards at the office. In any case, the inspection list can be generated during the planning of the inspection and be used independently of whether it is in a handheld system or on paper.

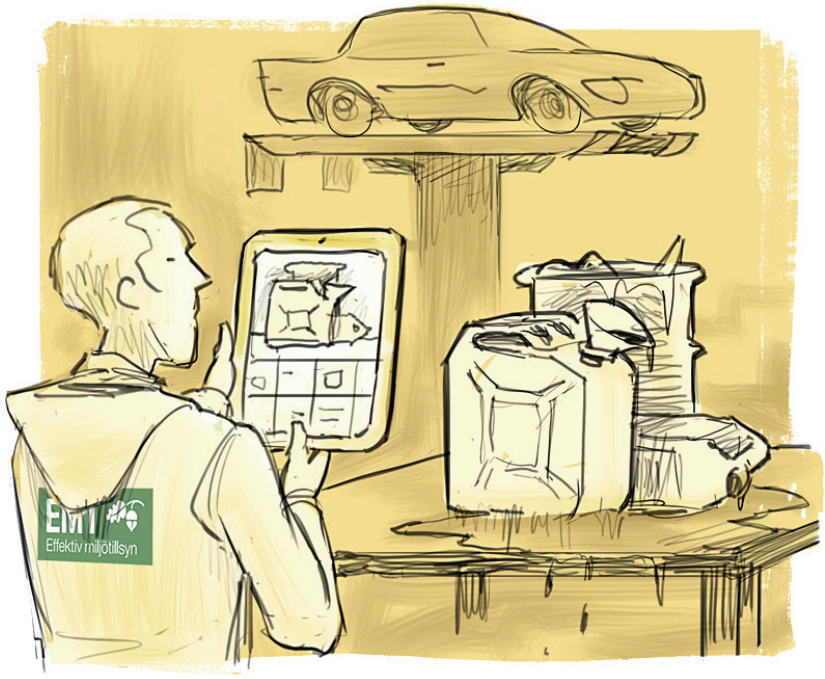

Figure 9.2: Illustration of how an inspector can use a support tool during the actual inspection. This case illustrates how an inspector takes photographs on site. The system then links the image directly to the inspection object in the agency's information system. © Rikard Hilding.

During the development of the scenario, these objections from inspectors have led us to be cautious in integrating a handheld system for inspections. The research programme includes a smaller prototype of a handheld system and how it could work, but the scenario is not dependent on such a support function. However, in the illustrations we present, it is of course possible, if so desired, to assume that the inspector uses some sort of handheld computer support. This is, of course, relevant for the actual validation of the scenario as the workshop participants reflected on such a support, thus raising the question and discussing it from different perspectives.

Regardless of whether one envisages a specific handheld data collection/documentation system that could be used during the inspection, it is now common to create documentation by means of photos and notes. It should be easy to link this documentation to the EIE object and inspection points in the inspection list. Regardless of how, and in which tools, the EIE is documented, it is essential to do it. Securing documentation, and hence data quality, in connection with the inspection itself is central to obtaining data that is based on quality.

Figure 9.3: The meeting between inspector and operator consists both of conversation and notes of this conversation. Chapter 6 provides a more detailed discussion of the inspector's conditions for making professional judgements. © Rikard Hilding.

In cases envisaging an on-line computer support during the actual inspection, it may be assumed that inspection documentation can easily be created and then directly linked to geographical coordinates. Furthermore, it may be assumed that the inspector can present operators with information based on national data, thus lending weight to why the operators must change procedures or improve their documentation. Another example might be that an operator asks questions about why a similar activity in the neighbouring municipality has different requirements on emission levels or amounts and that the system can be used to analyse differences between the businesses and the surrounding conditions. This could improve the possibilities for a factually oriented conversation.

9.3 Subsequent work – assessment, explanation, risk classification

After the inspection comes the central work of creating an overall picture of the inspection in order to make it possible to make a reasonable assessment. In cases where the activity is directly unproblematic and the operator keeps within the limits of the law, it is reasonable to conclude that the assessment and its explanation will also be quick and simple. It is reasonable to say that the inspector will find it more problematic to find the appropriate wording when the EIE object has not quite met the requirements or where circumstances might lead to the need for a more detailed analysis.

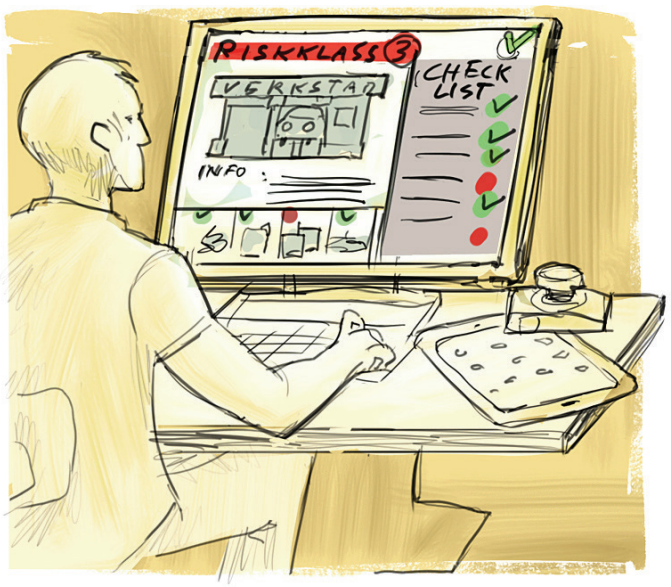

Figure 9.4: The inspector enters values of the inspection questions that he/she has assessed during the inspection, if he/she has not already done so in a handheld system. © Rikard Hilding.

Since questions for the inspection list have already been selected and values have also been filled out for each inspection point, there is a protocol of the inspection. Using this protocol, the inspector is then able to compare the EIE object with other EIE objects. Although an inspection list is always unique because it relates to a specific activity with a unique geographical location, it is comparable with respect to the inspection points used (except in the unique, and probably counterproductive, cases where the inspector has created entirely independent inspection points due to his/her dissatisfaction with existing inspection points).

Returning to the above example of similar activities in two neighbouring municipalities, the inspector can now let the computer compare the unique inspection list with other objects that have used the same inspection questions and thus compare the outcomes. How come that a similar business in the other municipality has have twice the emission levels or amounts of the recently inspected business? Could it be the better filter system? How many other three-compartment septic tanks have a problem with their T-piece? How serious should a discharge be for operations to be prohibited? The analysis system can help the inspector to be more confident that his/her assessment is in tune with that of other inspectors.

The idea is also that it will now be possible to access both assessment documentation and explanatory statements for inspection objects that are similar to the one just inspected. The inspector can see how other inspectors have reasoned in specific cases and specific circumstances, and it is also possible to borrow text from previous inspections. In terms of administrative procedure, it should also be possible to refer to judgements and

decisions made in other similar cases so as to lend additional strength to the assessment and explanatory statement.

Risk classification is an assessment that the inspector should then perform regarding the inspection object. What risk does the business pose to the environment? If the inspector understands the activity to be a high-risk activity (through having, for example, a less sound organisation for critical events or because it treats substances that are directly toxic), then he/she states a value higher than that of an activity that does not entail risks. This risk classification is an indicator of how the EIE planning should be organised for the following year in that the risk classification can give an idea of how often the business should be inspected in the future and also when the case should be followed up. In some cases, it is also argued that the charge for EIE should be based on a factor of this kind. This is normally indirectly true in that high-risk objects lead to more control hours, but this is more an issue for a financial or case management system than for an analysis system.

For each new case and EIE object, new inspection points might be added to the system. Some of these will be shared and thereby increase in popularity, thus allowing the analysis system to continuously and dynamically be refined and developed in order to address new conditions.

We have now come full circle for the inspector. Planning, implementation, decision and follow-up for the next inspection will now begin.

9.4 The municipality – before next year's EIE planning

Now that one year has passed, the municipality must once more perform the required EIE planning. The municipality now has a good basis for following up this year's inspection plan relative to the outcome in terms of adherence to the plan, time budget, expected outcome etc. There is also a plausible list of EIE objects that have received a high-risk classification and that should be particularly considered in the coming year.

Furthermore, the municipality can also see if there are specific areas where there is a need for particular information efforts due to operators making systematic errors in specific areas. As mentioned earlier, the municipality is also able to compare its own work with that of other municipalities. These are, of course, only examples of indicators that individuals in leadership have told us would be useful data for a system to provide.

Furthermore, an information system would provide a basis for being able to evaluate the effect of different EIE practices on different types of business. A fictional example might be that experience from previous years has shown that when a new legislation is introduced, broad information campaigns targeting, e.g. haulage firms, yield a greater environmental effect (as measured, for example, by the number of deviations from the Environmental Code in the industry) than inspections at a smaller number of haulage

firms. An information system provides the prerequisites for a more science-based EIE planning, making EIE both more consistent (= legally certain) and efficient.

9.5 The Swedish Environmental Protection Agency

The Swedish Environmental Protection Agency (Swedish EPA) is possibly the stakeholder at the national level that is in foremost need of collected environmental data on account of its task of compiling national data and producing guidance for the operational EIE agencies and inspectors. However, this does not preclude other central agencies from having similar needs. The following is based on the Swedish EPA's needs with reference to the above scenario and the information generated by the information system. As mentioned earlier, it is the inspector's needs and benefits that have been central in order to avoid burdening the inspectors with more administration.

For the Swedish EPA, it is essential to gain both an overall picture of various EIE activities across the country and more specific information about specific inspection points or campaigns. Today, every request for information means that the Swedish EPA must make the same request of the operational EIE agencies, which will then have to respond (see Chapter 5). The problem mentioned above is that this manual procedure means that the Swedish EPA can receive information in several different formats (paper, digital) and also in various measurement units (such as kg versus tonnes). Compilation is time-consuming, expensive and increases the risk of errors in the compilation. On top of this, there are many operational EIE agencies that do not respond to requests from the Swedish EPA.

Figure 9.5: Compiled environmental data helps us visualise comparisons within Sweden. If there were similar information management systems in Europe, it would also be possible to visualise comparisons between countries. © Rikard Hilding.

9.5.1 Audit and inventories of needs

A central task for the Environmental Protection Agency is to support and, in some cases, monitor the work of the operational EIE agencies to achieve the national objectives. For this purpose, there must first be access to information about the tasks of the operational EIE agencies as well as an analysis of this information. By gaining access to the way in which the municipalities and county administrative boards have worked, how long specific cases take, the results etc., the Environmental Protection Agency is able to carry out an annual audit of EIE in the operational EIE agencies. This can then be reported to the government to demonstrate how EIE is carried out.

A main objective of an audit is the ability, where necessary, to revise rules, create consensus and obtain/provide suggestions for targeted EIE or investigations of needs. The information system, as it is intended, will be able to meet such requirements through being able to break down the data warehouse on basis of particular interests. For example, it will be possible to see differences across industries, geographical, legislative or other areas and thus identify differences between similar cases, but also to provide pure compilations of the answers for a specific inspection point (or a cluster of inspection points). The compilations may also give an indication of particular needs, problems or issues of the operational EIE agencies. This, in turn, helps the Environmental Protection Agency to know where extra support or guidance needs to be created or the issues further investigated.

Combining information about the operational EIE with other measurement data for various substances in nature can also provide indications of the existence of longitudinal environmental effects of specific EIE campaigns or particular EIE practices (such as measurements, requirements, specific technology, conditions etc.).

An important aspect is the ability to evaluate the operational EIE agencies and how they manage EIE. This means both the need for information about how the municipalities plan their activities (the EIE plan) and how they implement them (data from actual EIE) as well as the effects of EIE. There is thus a need to have information about how much EIE is implemented by the operational EIE agencies and the requirements placed on operators.

Overall, audit is about being able to determine whether individual EIE agencies manage EIE in accordance with the law and about creating better prerequisites for investigating the need of support.

9.5.2 Legal functions

Another important function of the Environmental Protection Agency is to control the legal aspects of EIE and case law. Based on the legal aspects, it is crucial to have reliable, secure and current information. Equality of treatment and the creation of a national case law are central in order to maintain confidence in the system, but also to be able to influence EU legislation. It is necessary to be able to collect descriptive statistics in order to make analyses of violations, sanctions and court rulings.

The statistics can provide an overview of the current situation in Sweden, where comparisons of both the outcome and the conditions for the outcome can be of significance. Outcome statistics might, for example, indicate regional differences. If the same differences are linked to specific geographical conditions, these differences can present an explanation. Such information may be important for the ability to create systematic practice on assessments or provide indications for new directives. Analyses of national environmental data may demonstrate differences before the law, but also provide explanations for such differences.

Another important function would be to receive early warning signs that there may be differences in enforcement.

9.5.3 International investigations

A third task for the Environmental Protection Agency is to work within the EU and influence the EU's EIE. The Environmental Protection Agency considers that there will be a future increase in its international work on environmental issues. This will very much relate to the creation of conditions for international collaboration. Such contexts are seen as an opportunity to pursue a Swedish EIE agenda.

EU regulations on making environmental information available to the general public are also central in this context. The EU requirements for the public availability of environmental data mean that it should be possible to collect data and present it in a way that enables the general public to examine and compare it. Today, compilations and publicly available presentations of this kind are insufficient.

Current and clear inspection data from Sweden with clear links to EIE practices will increase the ability to influence future European legislation or defend Swedish derogations. This requires the possession of basic underlying data and the capacity to present figures and information about how Sweden exercises its EIE and the effects this yields.

In order to exert an influence, it is crucial to be able to test different ideas. Underlying data can be used to test different hypotheses that might be important for creating and testing arguments. A potential future need will be for the EU countries to have collected the same or similar data in order to perform comparative analyses among different nations and assess joint efforts. The system of inspection points as the smallest element would make such statistics dynamic and analysable.

Overall, this is about supporting an EU-wide legislation and also EIE practices. Since there are not only different legal texts, but also language barriers, it might be difficult to share inspection points and inspection lists across several nations.

9.5.4 Follow-up and coordination

The fourth task, and perhaps the most fundamental for the work of the Environmental Protection Agency, is to follow up EIE and produce EIE guidance. Here, this is rather about illustrating effects of EIE with respect to the environment and not solely an audit in relation to the legal texts.

The task here deals with the analysis of environmental data in order to create room for improvement. The collection of information from the inspection points used by the inspectors will enable trend analyses and the creation of bases for both descriptive presentations and comparisons of different EIE agencies with respect to EIE practices, results or resources. Facility data over time can be compared and inspection results can be used to provide guidance for the inspector on critical points that should be particularly taken into account.

The analysis of environmental effects as well as facility data can be used to create common guidelines and possibly mandatory inspection points for particular enforcement objects to support inspectors in their inspections. Furthermore, guidance material for EIE agencies can be created and particularly efficient practices and/or inspection points can be indicated.

9.5.5 Collaboration with the research community

The Environmental Protection Agency also has the task of collaborating with the research community. So far, data on EIE in Sweden has been inadequate, and the data that does exist has not always been collected consistently. In other areas in Sweden, the data supply situation is much better, for example in labour market research, where a good supply of high-quality individual data attracts a large number of researchers to work in that field. If the Environmental Protection Agency were to work to make better EIE data available, this data supply would create its own demand, which would in all likelihood attract competent researchers to become interested in EIE research. An investment in better data collection today would thus be able to pay for itself in terms of increased knowledge growth in the future. It is also likely that the Environmental Protection Agency will not need to finance all this future research as both Swedish and international universities and research institutions are attracted to use the data.

9.6 Summary

By working with scenario development together with the stakeholders, particularly inspectors, this chapter has laid the foundation for understanding how a future EIE organisation could function by means of a shared data warehouse. The objective of this scenario development is to establish a future system in current practice. The research shows that:

- Inspectors are in need of comprehensive statistics.
- Inspectors need a simple way to learn, relate and develop their EIE practices with the help of other inspectors.

- The inspectors believe that they themselves must assess the relevance of a particular inspection point for the specific inspection object.
- Operational EIE agencies need indicators to produce EIE plans and thereby plan EIE.
- The Swedish Environmental Protection Agency has a great need for being able to access comprehensive inspection data in order to collect statistics, develop guidance, exert influence and present data to the EU.

Based on this scenario, we have started from the fact that the joint inspection data can provide decision support and analysis instruments by establishing a system on inspection points. The system is based on the following:

- An inspection point is a question that is created by an inspector or a central EIE guidance agency.
- An inspection point can be shared with all inspectors.
- An inspection point may be used to a larger or smaller extent and thus, have a popularity index.

Multiple inspection points can then be combined to create clusters of similar activities. The next chapter presents the technical aspects of how this system can be designed.

9.7 References

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Chapter 10
Information management in environmental inspections and enforcement

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As mentioned in several of the earlier chapters, Swedish environmental inspection and enforcement (EIE) is struggling with different types of information-related problems linked to the autonomy of the operational EIE agencies. Examples of problems to which the decentralised management of information gives rise are that it becomes difficult to share information/data between different agents in the system, that local differences in the exercise of authority easily arise and that it is not possible to develop a national EIE guidance based on relevant underlying data. This chapter describes what could be achieved with modern information technology provided that data actually was available, as well as a vision of an information system that has the potential of making EIE more efficient with a starting point in existing EIE data. The fundamental idea for this information system is the use of underlying EIE data to support the inspector's decision process, something which will ultimately have repercussions for the underlying data. The objective is thus for the individual inspector's decision support system to give rise to both a more (nationally) uniform outcome of EIE and increased opportunities to influence and contribute to the global effort to identify indicators for sustainable development.

10.1 Modern information management in support of proactive environmental work

Reliable environmental statistics must be based on reliable underlying data, and a data-driven identification of relevant environmental indicators (see below) must be based on a complete and meaningful data set. These two things – statistics and indicators – constitute the natural cornerstones in the work of developing a well-informed strategic environmental policy for national purposes. For data to be taken into use, it is, of course, also important to place the information in its context and understand the perspectives of the various stakeholders. However, the actual availability of relevant underlying data still constitutes the key to well-informed decisions, prognoses that reflect reality, assessments relative to a national baseline, monitoring progress in real time and assisting in the development of IT support at different levels. A great deal has happened in the development of database and network technology over the past decade, which has given rise to new possibilities for storing and using data in distributed organisations in an efficient manner and to an extent not previously possible. This creates new opportunities to develop nationwide computer systems for the processing and analysis of national statistics and the use of new types of decision support systems. Perhaps most important in this context is the actual ability to contribute data to the great number of potential agents

that might benefit from the information in a completely different place and for a different purpose. In large parts of trade and industry, it has now become a matter of course to pull together organisational data and put it to use for various types of "business intelligence". To gain an idea about the importance of developing the underlying data structures, it will suffice to consider all services that are based on the internet and the same "data-driven" trend.

With today's system support in mind (see Chapter 5), it should be noted that it is not necessarily a new central database we are proposing, but rather a database structure that is suitable for a broad spectrum of users and areas of application. A data warehouse may be the ideal solution for *business intelligence* within a well-integrated organisation, but for our purpose of providing an interface into data for a host of partly unknown agents, it is probably more important to have a common database design around which all agents can cluster.

There are many benefits to a common database solution: some are obvious, some are less obvious and some cannot be predicted in advance. Here, the web and all the "unexpected" innovations that are being developed at a steady rate may once again serve as a comparison. Many of these innovations were hard to imagine a decade ago. The following provides some examples of opportunities that could arise in the EIE domain through an innovative IT design. With reference to what was said above about Swedish EIE as it looks today, these examples show that a common database can be used for both the local and the global perspective and could include, e.g., mobile handheld computers for data acquisition and data mining to see long-term trends using historical data etc.

To make things easier at the inspector level, national well-structured underlying data could be used to design one or more decision support systems that help the inspector make well-informed decisions, produce relevant explanatory statements rooted in current legislation, gain an overview of whether the decisions are implemented and have the desired effect, avoid unnecessary paperwork etc. Many different types of such decision support are conceivable. One obvious decision support system that we want to propose is an analysis support that provides concrete recommendations in the individual inspection case, based on experience from other similar inspection cases in Sweden. Basing decision-making on the national perspective is very important because EIE is ultimately about applying political decisions and upholding existing legislation, and it is therefore important that what is inspected is treated in a uniform manner. A decision support system of this kind may, for example, start out from case-based reasoning, which is related to developing a "solution recipe" for a new situation by looking at existing "solution recipes" that have previously been used to solve similar cases. An example of case-based reasoning could be that an environmental inspector advises (or orders) a company to alter its treatment of mercury by recollecting how a similar company had been dealt with when it had been handling mercury in a similar way. The main computer science challenge that can be linked to case-based reasoning is the development of algorithms to calculate similarity between different cases, that is, the set of inspected parameters, *inspection points*, that should be taken into account and how they should be

taken into account. This can be done in a great number of ways, but always requires the completed inspection to be represented in a systematic way. Another challenge that can be linked to case-based reasoning is related to the "solution recipe" itself and how the related solution should be modified to suit the new situation (of course, no two enforcement situations can be considered to be exactly the same). For operational EIE, however, this aspect is likely to be less important since the actual decision-making primarily relates to accessing previous decision documentation, that is, the most important support for the operational inspector is to find the related situations rather than obtaining advice on the penalty (although there is, of course, the potential to contribute also in this regard).

Another type of support that we would recommend at the inspector level consists of the automatic generation of an appropriate *inspection list* that can be used during the inspection itself, that is, instead of taking a static checklist to the inspection, help is provided to generate a checklist containing the relevant inspection points for the current inspection task. Such a list may initially be generated on the basis of other popular inspection lists used in the inspection of objects characterised by similar object-specific data (FMH [25], SE-SIC[26], geography/GIS[27] etc.) and then be expanded or limited with respect to data from previous inspections of the same object and the inspector's own subjective perception of what is important to inspect in the case in question.

In addition to the decision support possibilities mentioned at the operational inspector level, reliable national underlying data can also be used for a multitude of applications at the national level. This includes the ability to perform statistical analyses and monitor how EIE guidance may or may not have the desired effect and, above all, the cumbersome process of sending surveys to obtain historical data can be replaced by answers in real time and, where necessary, answers to any follow-up questions without having to send out more surveys.

From a more global perspective, a common database solution can also help researchers and opinion-makers with documentation and arguments in order to achieve a more sustainable development of the world. Here, however, it has been shown that the concepts of sustainability and sustainable development are just as complex as the problems they are trying to solve, so it is not easy to tell which data that will be needed. However, there is a broad consensus on the fact that science plays an important role in efforts to secure a sustainable future by unravelling the complex links between human activities and environmental impact, and by helping us identify methods to deal with the current

[25] The appendix to the Ordinance (1998:899) concerning Environmentally Hazardous Activities and Protection of Public Health (FMH) contains an approach for the systematic allocation of codes to activities.

[26] Swedish Standard Industrial Classification (SE-SIC) is an activity classification based on the EU standard NACE. Under SE-SIC, an operation may have multiple activities (known as SE-SIC codes). The latest version is SE-SIC 2007.

[27] A geographic information system (GIS) is a computer-based system for representing geographic information such as coordinates, distribution, directions etc.

situation. These efforts involve the identification of relevant environmental indicators that might illustrate some environmental and/or sustainability aspect of the problem. As a basis for further discussion regarding what an inspection point (and thus an inspection list) actually is, the following is a deviation from the main topic, influenced by the literature on efforts to develop environmental indicators.

10.2 EIE data as a basis for developing indicators

The efforts to identify relevant indicators of what is characteristic of globally sustainable development have been stepped up since the early 1990s (Rametsteiner et al, 2011). However, the development of sustainability indicators has entailed great challenges due to the difficulty in defining and measuring what should be considered "sustainable" and the normative dimension of the sustainability concept. From a macro-perspective, the intergovernmental processes for these long-term global efforts are seen as perhaps the greatest challenge, but rooting the indicators in relevant underlying data from a micro-perspective is equally important for the global perspective. From this global perspective, Swedish operational EIE can be seen as an important source of information that ultimately aims at achieving one or more major goals. Regardless of whether the level is macro or micro, the recurring challenge is that of combining scientific knowledge production in terms of environmental indicators with the political process of norm formation. The development of relevant environmental indicators may therefore be driven by a great number of different and changing motives. While the scientifically driven approach primarily aims at developing indicators in order to make preliminary assessments, consequence assessments of alternative strategies or produce a basis for modelling and simulation, the indicator development driven by political or administrative considerations aims more at measuring, or developing monitoring tools for, the most important sustainability variables. The identification of environmental indicators is thus characterised by the need for a balanced integration of the current state of knowledge with societal norms, something which also means that the need for and requirements on the underlying data vary depending on needs and over time.

The role of the environmental and sustainability indicators in sustainability efforts is to structure and disseminate information on certain key issues and related trends depending on what is deemed relevant for sustainable development. The environmental indicators accomplish this by aggregating multiple variables (or other indicators) into a single quantity, thus producing a one-dimensional indicator of a complex reality. The basic purpose of such indicators is to enable comparisons of states over time which, in turn, , among other things, aim at putting forward new environmental standards and draw (statistical) conclusions about the relationship between the state of the environment and social and economic variables (Ebert and Welsch, 2004). Naturally, it is also possible to envisage indicators that are completely independent of the environment and instead give a picture of how the administrative processes at the operational EIE agencies change over time. This places other requirements on which data that will be taken into account, but the basic principle is the same. The following assumes, however, that EIE has an overarching

purpose and must therefore be considered from an environmental perspective, that is, it is primarily data that can be linked to environmental impact that is of interest.

Indicator identification is thus about reducing a large data set to the data which best answers the questions that might be asked. In addition to describing current conditions and trends, indicator identification also provides the opportunity to understand, for example, how people and/or environmental management systems function, the link (including its nature and strength) between various processes and subsystems as well as how human actions affect different dimensions of sustainability in terms of e.g. economic, environmental and social questions (Rametsteiner et al, 2011). From this perspective, environmental indicators meet a far more important need than that of only providing descriptive statistics. The indicators also serve as support for researchers, politicians, citizens and decision-makers, providing them with the opportunity to visualise important environmental aspects and predict the consequences of measures or passivity. Identifying, measuring and applying appropriate environmental indicators thus belong to the great challenges for decision-makers, bureaucrats, scientists, and citizens engaged in sustainability (McCool and Stankey, 2004).

10.3 Inspection points as a concept

Just as in the case of environmental indicators, inspection points (and the inspection list belonging to an inspection) define *the data points that characterise the current inspection from both the local and the global perspective*. This definition of an inspection point means 1) that a point should be sufficiently self-contained and exclusive to be used for multiple purposes, 2) that points which are of significance for either of the perspectives are to be included in the inspection list and 3) that points which are of no concern should not be included. For an inspection point to be viable for multiple purposes, it must be measured often and reported quantitatively. For example, it is conceivable that the individual environmental inspector only needs to know that the distance to the nearest watercourse exceeds 50 metres to make a local decision, but for the national statistics, it is still important to obtain an estimate of the actual distance to the watercourse. If the inspector only enters “more/less than 50 metres”, it is no longer an inspection point, but is, in fact, an amalgamation of a numerical measurement and a conclusion regarding this measurement. The inclusion of all perspectives in the inspection list is also about including the data that might play a role for some other user. In a perfect world, these inspection points would already be included because inspectors should reasonably base their conclusions on all relevant data, but this would probably require the computer system to automatically insert such points in the inspection list on basis of known national needs, indicator development etc. The exclusion of extraneous points is perhaps not very important, but is ultimately about not causing confusion and risking distortion with regard to what actually characterises a situation. For example, an inspection point that is implicitly a consequence of another inspection point can result in this inspection point being counted twice, which is both a problem for the human assessment and for such things as the development of computer-based algorithms for identifying similar cases.

From a data storage perspective, it is important that the system really does enable the inspector's inspected and undistorted measurement to go straight into the database in connection with the inspector's entering of values into the computer system (which might already take place at the inspection site or otherwise upon return to the office). The differences compared to the current system are 1) that data quality is secured at the local level by the professional environmental inspector, 2) that data becomes available to other users "in real time" and thus, may be useful in other parts of the system and 3) that the underlying data is kept consistent for all users.

The inspection list belonging to a specific inspection thus relates to defining what characterises an inspection case in terms of the inspection points that will be measured, observed or otherwise extracted. Such an inspection point could, for example, involve unnatural vegetation at the outlet of a sewage system (which might indicate a leaking system), and if there is such vegetation, it is, as previously mentioned, important that this vegetation is not only documented with a yes/no question, but with an estimation of the degree of vegetation. By defining an inspection list in this way, the underlying data becomes available for many different types of data processing. Besides the possibility for database queries and obtaining descriptive statistics for individual variables, the inspection points also constitute a good basis for various types of machine learning (prediction with respect to previously known/learned patterns) and data mining (discovery of completely new patterns in data).

10.4 The inspector perspective

As mentioned earlier, at the operational inspector level, we want to put forward two possible decision supports that can be implemented on basis of previously entered inspection lists and help the environmental inspector before and after an inspection. Before the inspection, we propose the production of a relevant inspection list on the basis of other inspection lists for objects with similar FMH, SE-SIC, geography/GIS and other object-specific data. Letting the computer consider inspection lists for other objects with similar object-specific data and then producing a list of the most popular inspection points gives rise to an inspection list that should be the most relevant from an inspector perspective. This means that the inspection points are defined from below, by the environmental inspectors themselves: those wishing to influence this can enter new "smarter" points that gain in popularity if they are actually considered "smarter" by the rest of the inspector community. Similarly, old "inferior" points will disappear automatically.[28] To reduce the degree of "inspection point anarchism", it is conceivable that the Environmental Protection Agency, for example, can be allowed to enter some

[28] For the system to work, it is necessary for newly proposed inspection points to really be put forward as alternative proposals to existing inspection points. The new points otherwise risk being classified as unpopular/inferior, because they have not yet had the chance to be used to any significant extent. This problem may, for example, be resolved by new inspection points being assigned a weight that decreases with time, in that the new points become linked to existing points and are put forward as alternatives to them, or by new points being presented in a separate "new list".

more or less mandatory inspection points, which could be made tangible by these points coming highest on the inspection list, completely irrespective of whether they are unpopular in inspector circles. This might be a way of issuing EIE guidance by recommending that a certain measurement that has not been made before should now be made in the future. Analogous to this are the sponsored hits that appear highest in a Google search.

After the inspection, we further propose that the completed inspection list is used to find a number of similar inspection situations that can be used as a basis for assessing (and exercising authority) in the case in question. To be able to automatically compare and find similar decisions, the decision documentation (that is, the output data from the handling process) must be considered and compared with the situation in question. This can generally be done in either a model-driven or data-driven way, that is, either by using knowledge to develop a suitable statistical model or by training a model on the basis of large amounts of data. There are many different names for these two general approaches and they are often worth combining. Becoming familiar with the data material and identifying the distinctive features of the decision documentation that characterise the decision and how these features are interlinked is crucial to success. As mentioned, this will be a balancing act between training a model through machine learning and attempting to identify the characteristics by means of, e.g., data mining to then create a more transparent statistical model.

10.5 Effects

The outlined vision for a future national database solution for EIE fits well with current trends in society regarding information management and, at the same time, entails a separation between information management and autonomy. That is, viewing data (which ultimately is owned and paid for by the same taxpayers regardless of where the data points have arisen) as shared need not be seen as a threat to the autonomy of operational EIE agencies. Relative to the current situation, the approach to data can be changed from being a static snapshot to becoming useful underlying data which can benefit a host of known, and as yet unknown, purposes. Today's efforts at the national level, with EIE guidance being based on surveys, can be completely replaced with simple database queries, something which will make it easier both for those who no longer have to fill out the surveys and those who have the task of receiving often ambiguous survey documentation.

From a national EIE perspective, the National Food Agency's initiative for appropriating enforcement data deserves to be highlighted. The Agency already has a system whereby the operational agencies are expected to upload certain predetermined inspection data in a uniform XML format on an annual basis. This solution means that the Agency has made quite a bit of progress, even though its analyses are based on data that is more than a year old, with the resulting guidance not relating to current problems. To tie in with the renewal of the web, the vision outlined in this chapter could thus be called “National Food Agency 2.0”. Relative to the National Food Agency's solution, the common

database solution proposed here also provides the possibility to put questions to the database in real time and respond to any unforeseen questions that might be received. In addition to producing such statistics, it will also be easier to follow up how campaigns or other events alter/affect data.

Finally, the vision gives us the opportunity to maintain relevant underlying data which can contribute towards data-driven development of environmental indicators aimed at achieving a sustainable development. However, the link between the inspector-driven identification of relevant inspection points partly conflicts with this perspective, that is, it is not certain that environmental inspectors choose to define inspection points that are only beneficial from a global perspective. But the definition of an inspection point at least leads to the points that are actually collected and constitute the basis for enforcement assessments also being of potential relevance for the development of global indicators.

10.6 Work with prototypes

During the latter part of the EMT programme, the user-centred research activities and the developed scenario that is described in more detail in Chapter 9 have formed the basis for the development of computer-based prototypes to demonstrate, concretise and test the most important gains of the programme in general and the workshop series in particular. While today's computer systems at municipalities and county administrative boards are mainly for the purpose of case management (see Chapter 5), the work with prototypes instead focuses on helping and renewing the inspector's assessment and decision-making. With this focus, the programme can be said to take a position whereby EIE efficiency should be about the information management of environmental data rather than being a measure of the efficiency of an agency's case management.

One ambition of prototype development has been a user-centred focus rather than letting technology steer. This has been accomplished by allowing the work of the other subprojects provide information to the workshop series which, in turn, has provided information to and guided the development work. A further ambition has been to accomplish a technical whole where the most interesting functions have been implemented, with the remaining functionality being present in a simpler representative form (sketches).

Technically, the prototype work can be roughly divided into two components. One is a mobile application to demonstrate the possibility of efficient data acquisition by means of camera, GPS, document entry etc., and one is a more stationary information system with a focus on a “comparison view” (and other views in the form of sketches). The mobile application exemplifies how tagged/annotated data can be efficiently obtained in the right format, while the comparison view exemplifies much of what the programme aims at accomplishing in the form of uniform decisions across the country, the possibility for national follow-up etc.

The comparison view supports two types of comparisons on basis of the inspection points in the inspection list. Before the inspection, comparisons provide help to produce a suitable inspection list based on FMH, SE-SIC [förkortningar finns ju redan i originalet så detta känns mer som en fråga för er som författare att besvara] and geography/GIS. After the inspection, a comparison of the completed inspection list helps make an assessment (and ultimately to exercise authority). The EIE comparisons as implemented in the prototype yield a number of important gains in connection with the workshop series and the user-centred analysis of the material: a dialogue between operator and inspector is promoted, the degree of assessment uniformity is made visible and a national follow-up can be done "at the touch of a button". However, an important prerequisite for at all processing data is that the data is acquired systematically and is made comparable, something which is exemplified by the implemented mobile application. Furthermore, traceability is also important so that the final overall assessment is supported by relevant quantitative data, that is, that it is possible to return to the sources upon which the conclusions drawn are based.

10.7 From idea to reality

The prototypes in the EMT programme are research prototypes that were developed to illustrate important gains to serve as a basis for further discussion with stakeholders at different levels. This means that there is currently no single "EMT system" with well-defined system boundaries that might constitute the basis for requirements specifications and further procurement. Instead, there is a great number of more or less implemented concepts and research ideas that have been developed on basis of the conclusions presented in the other chapters of this report and that might serve as a platform for further discussion. These ideas and concepts could pave the way for further work on the development of one or more systems, or perhaps the development of system components within the scope of existing support systems. Only then can work to produce requirements specifications form the basis for various types of cost-benefit analyses. Such analyses might, for example, consider how to relate the investment cost to a better environment in terms of, e.g. a better understanding of environmental indicators (this is an example of a conceivable system at the national level) or more legally certain assessments (this is an example of a conceivable system at the inspector level). New types of technology support could be implemented within the scope of existing system support or in the form of stand-alone systems/computer programs, but first there is a need to consider EMT's ideas and consider how to proceed and what to proceed with (technically, politically, legally etc.).

10.8 Case study: notification of leaking sewage system

The developed concept prototype for comparisons of similar cases has a web interface as shown in Figure 10.1, with an underlying database, related GIS functionality etc. The following uses this prototype to describe how an inspector could be able to take advantage of analysis support with access to updated national underlying data in order to deal with a submitted notification about a sewage system.

The top of Figure 10.1 shows a number of process steps in the form of the tabs on which the user can click to proceed: Plan, Preparation, Inspection, Compare, Decision and Evaluation. To the left is a timeline that represents the link to the underlying case management system showing such things as contacts with the notifier and the operator. The general idea is that the system will be a stand-alone component that is kept separate from case management. The centre shows the inspection list, which in this case has already been filled out because the current tab in the figure, “Inspection”, is the tab that the inspector will work with on return to the office. Finally, to the right is a GIS layer with the ability to interact with a host of map layers. The other tabs contain other information, but have the same graphical appearance as in Figure 10.1.

The “Plan” tab represents the link to the municipal system for case management and tries to illustrate the operations management that constitutes the link to overall municipal planning. Here are planned activities and newly received cases. This tab has not been in focus during the prototype work because, as mentioned, it relates more to case management than to the new concepts that the prototype is primarily intended to demonstrate and has therefore been realised by means of a scanned sketch, which is an example of an alternative use of prototypes in the research programme. In this case, a notification regarding a leaking sewage system has been received by the municipality, something which is a priority under the inspector's existing schedule.

The timeline to the left in the second tab called “Preparation” shows information regarding the notification itself, with links to the relevant documents. It is not the property owner who has made the notification, but a neighbour who is concerned about the impact on a watercourse. Furthermore, it can be seen that the system has made use of existing information about the object in order to generate a relevant inspection list based on inspection lists for objects with similar characteristics. In this case, it is a sewage system, and thus soil type databases, for example, have been used. Finally, there is also information about common faults for similar objects that was retrieved from avloppsguiden.se. This happened to be the most relevant database in this particular case. However, the inspector is not satisfied with the inspection list that was automatically created because he/she feels that some points that are important to his/her further assessment are missing. In the box labelled “New inspection point”, he/she therefore, in turn, adds the points that are considered to be missing with respect to overfill alarms and watertightness: “The tank has a functioning overfill alarm installed” and “The tank and supply lines are watertight”.

Figure 10.1: The developed computer system prototype contains a number of more or less well-developed views with associated tabs. There are different entry points for different agents, such as inspectors, municipal leaderships, national follow-up etc. The figure shows the “Inspection” tab, in which the inspector has the opportunity to consider the collected data material before proceeding with his/her assessment of the case.

The idea is that the inspector should now feel sufficiently prepared to go out and conduct the inspection. To support the work, he/she takes the object-specific inspection list. The actual collection of data is not supported within the framework of the developed analysis prototype. This is due to the inspectors pointing out at the research programme's workshops that the inspection element itself would not benefit from, but would rather be disrupted by, computer support because the focus during the inspection itself must be on the actual interaction with the operator. The earlier phases of the research programme did also develop a mobile application for data acquisition, but from the user-centred perspective, it thus appears to belong to the future.

The “Inspection” tab, that is, the tab selected in Figure 10.1, in fact relates to what happens when the inspection has already been completed and the result in terms of measured values for the various inspection points has been added to the system. (How the points were entered in the database depends on the form in which the inspector had the inspection list; maybe these were notes on paper that have to be entered, or the points may already have been uploaded from a handheld computer of some sort). Besides the new case management posts in the timeline, the inspection points (which now also include the points added by the inspector) have now been filled out, and it is possible to form a further opinion by means of the various GIS layers. As seen in Figure 10.1 marked “Avvikande”, two inspection points deviate relative to the normal picture. The objective of this view has thus been to give the inspector a better picture of the inspected object, which is closed by a transition to making an assessment of the specific case in the next step.

The next tab named “Compare” shows a number of similar cases from the rest of the country together with various statistics relating to time spent, how the municipality in question differs from the rest of the country etc. Similar cases are presented along with percentages that show how similar they are to the current case with respect to the completed inspection list. Similarity thus means similarity at the inspection point level regarding the inspection points included in the list and the values that have been measured or otherwise indicated for the points in question. This definition of similarity naturally follows from the previous parts of this chapter that have mainly related to the importance of observing the distinctive features that are characteristic of a particular situation in order to discover similar (data) patterns. By contrast, the assessments themselves are not used for calculating similarity. These assessments are accessed via links to the relevant decision documents in the case management system and instead aim at providing the inspector with a basis for decision-making. In the present case of the sewage system, three similar cases have been found, one of which is very similar. By accessing the decision documents for the three cases, the inspector gains a good picture of the situation in Sweden and is able to check that he is thinking correctly.

The second to last tab is called “Decision” and mainly relates to translating the previous insight into a decision and performing the necessary exercise of authority. The details of the case in question suggest that the sewage system should be replaced, but that it need

not be done immediately; it will suffice for it to be done within two years. To produce the decision documentation, the inspector makes use of the previous decision documentation for similar cases. In this case, the planned decision is first communicated both to the property owner and to the notifier, who subsequently submit their comments. After this, the actual decision can be communicated. Case management is illustrated in the time line of the system.

The last tab relates to evaluation and feedback to the municipal leadership [inte så bra – menar ni the municipal council?] as a basis for a more systematic evaluation which can then influence the planning work (which, in turn, constitutes a basis for the first tab in the system as above).

10.9 Evaluation

To evaluate the developed prototype and the ideas relating to work with inspection points, inspection lists, similar cases etc., an evaluation session was organised in the early autumn of 2012, at which participants went through and discussed the prototype step by step. The evaluation was based on the same sewage system notification as described in the above case study and since the prototype was developed on the basis of inspector needs, practising inspectors were invited to participate. These were then asked to work in pairs on the sewage system case using the prototype. The overall purpose of the evaluation was to investigate whether the concept supports the inspector's future practice, and the expected result was to obtain feedback regarding the functions provided, how the prototype can support the inspector's practice and process, and regarding the concept as a whole.

The participants were generally positive about the concept as a whole, even though the programme representatives had explicitly asked to receive “fierce criticism”. Things that were discussed in more detail related to the benefits of comparing themselves to the rest of Sweden, the ownership of and work related to inspection points and the importance of the central government not imposing systems on the operational EIE agencies. Functions that were particularly appreciated were the link between the advance generation of an inspection list which is then used to produce similar cases, the list of “common faults” and the visualisation of deviations.

The fundamental concept of working with inspection points and the advantages yielded by some form of common database solution in terms of legal certainty, statistical processing, decision support, being spared “the survey nightmare” etc. was embraced by the participating inspectors. However, the ownership of inspection points (and data in general) is a sensitive issue that gave rise to discussion and calls for consideration. Here, there was initial disagreement related to municipal autonomy. The research programme presented the view that information management and autonomy are, and should be, separate things, which the participating inspectors were able to agree with. Perhaps the most interesting observation was that the inspectors found it easy to identify new and

reformulate old (less good) inspection points and seemed to embrace the inspection points as a living material that can be continuously improved and adapted as needed.

A series of proposals for improvement and change regarding various types of prototype details was raised during the evaluation day. One proposal is that it should also be possible to use the timeline as their own work material and not only for what relates to the actual case management. Here, the inspectors specifically sought the ability to work with material that is not archived, but is instead discarded when the case is concluded. The explanation for this was that they would otherwise need to take parallel notes regarding things that ultimately prove irrelevant to the case in question. Other comments on details are related to the actual design of the web interface regarding, for example, the ability to highlight especially important information or a recycle bin icon to easily remove inspection points, titles etc.

The evaluation was based on an actual case concerning a leaking sewage system, a case that is dealt with locally at the municipal level. Since municipal processes and procedures are different, the local perspective has repercussions with respect to contact with the operator and also to the exercise of authority itself. This is illustrated by one interesting observation that emerged from the evaluation, i.e. that the evaluation case involved the decision being sent for review to the various agents before it was finally established. According to the participating inspectors, this was not particularly common (if at all existent) in their home municipalities. However, the evaluation was based on data showing that in other municipalities, the practice was to handle cases in this way. Such differences could be considered to be desirable municipal autonomy or maybe a sign of an unwanted disparity that gives rise to different treatment. Quite regardless of the perspective taken, according to the research programme, it is important that differences are made visible from a national point of view and form the basis for further discussion. This is not the case today as data is only available locally at the operational EIE agencies.

10.10 Summary

This chapter has placed EIE in contrast to modern information management and discussed how information and communications technology (ICT) could be used to renew, streamline and pursue a more proactive EIE at the operational level, while meeting other more global information management aspects. As a basis for what ICT linked to nationally available data could contribute, the chapter attempts to place EIE data in a broader perspective by discussing the very important development of environmental indicators. This then paves the way for defining the concepts of “inspection point” and “inspection list”. These concepts are fundamental for the further work of developing a more concrete system vision.

A user-centred method, starting with the inspector's practice, has constituted a basis for this work. This has had repercussions for the presented vision of how the scenario developed in Chapter 9 could be made tangible. The concept was developed through the

use of computer-based research prototypes that demonstrate some of the ideas in which the research programme has resulted. The chapter has presented these in more detail.

Absolutely crucial to the gains presented in the chapter is the availability of data at different levels and hence, the research programme proposes that a common database solution should be developed. At the same time, the problem of inaccessible data is complex and cannot be easily resolved by procuring the first available "business intelligence solution" as would a company. It is rather a matter of adopting a holistic approach that combines the different perspectives and governance issues related to the system.

10.11 References

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Chapter 11
Future possibilities for analysis

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In a number of reports, EMT has shown how statistical and econometric analyses can be carried out on environmental sanction charges data. With greater data accessibility, similar analyses could be performed on a wider range of outcome variables.

The survey conducted by EMT in the autumn of 2011 (see Chapter 2) mapped various relevant factors concerning municipal environmental inspections and enforcement (EIE). It would therefore be valuable to carry out regular follow-ups. However, surveys are hardly ideal for several reasons. Surveys are time-consuming, with the response rate suffering as a result. In addition, many responses are subjective and based on estimates. If data were instead to be collected directly in connection with inspections and other enforcement activities, as presented in Chapters 9 and 10, the reliability would be likely to increase and time would be saved.

The following sections present different types of analysis that would be of interest in the future and that would be facilitated by improved data accessibility.

11.1 Professional judgements

The inspector's tasks include making sophisticated judgements. It is important for further development of the profession to investigate how, more precisely, environmental inspectors reason in their decision-making. This is significant because such knowledge will help to further develop Sweden's higher education of inspectors. It will also help provide currently active inspectors with even better in-service training. Increased knowledge of how the professional judgement process takes place will also increase the status of the profession itself. More research on how environmental inspectors' professional judgements are made will enable this occupational group to lead the development of the Swedish exercise of authority in general.

There are some areas that will be highlighted as particularly important from a research perspective. First, an important question is how inspectors think and make judgements during the actual inspection. Second, how are all components put together before the formal decision is made? It is a process that requires considerable experience. It is important to examine how this competence develops over the first few years of an inspector's career. This will enable us to find out what support young inspectors need to develop this competence properly. Inspectors operate under sometimes unclear or conflicting goals, with demanding communication and judgements in several different areas. In other words, many different skills are required for inspectors to become good at

their profession, but also to feel that they master the profession and are willing to remain in it. In this research programme, we have only begun the work by examining which judgement dimensions are part of their professional judgements.

In terms of efficiency and professional judgements, it is a very complex matter. What we would like to emphasise here is that the inspectors' judgements are important for efficiency in more than one way. If it is possible to strengthen their competence in making well-reasoned judgements that can stand up to a judicial review and that are both accurate and understandable to the operator concerned, this will contribute to an efficient EIE. But to be able to do this, we need to gather more knowledge about how the inspectors actually make their professional judgements and how they develop over time.

11.2 MI's influence on operators

The training sessions in Motivational Interviewing (MI) held in four municipalities have been evaluated by the participating inspectors. This was done by having the inspectors themselves fill in surveys where they estimated how they perceived the implementation of an inspection and how applicable the method is for the inspection work. This has made it possible to see whether the MI training programme has had any effect on how the inspectors experience their meetings with operators and whether they perceived the training to have been beneficial for them. Inspection conversations were also recorded and then coded to see the extent of the influence of MI training on inspectors' communication.

Thus, it has been possible to measure the effect of the MI training on inspectors and their communication. This study found that the inspectors assessed MI to be useful and that they developed their MI competence after the MI training programme. However, this says nothing about whether the operators have been influenced in their environmental work. A next step would therefore be to investigate whether there are differences in behaviour between operators who have met an inspector with high MI competence and operators who have met an inspector with low MI competence. For example, an analysis could be performed of outcomes such as injunctions, filed prosecutions and environmental sanction charges over time to determine whether the MI training has an effect on operators and whether this effect is permanent.

There is thus a need to investigate the relationship between MI exercise/MI behaviour and the operators' environmental behaviour/environmental effect. However, at present there is no indicator of whether MI influences operators towards better environmental behaviour. Future studies could provide answers to the following important issues:

- Does a higher MI competence of inspectors lead to improved environmental behaviour among operators?
- What degree of MI competence is a reasonable and sufficient level of ambition?
- When is it appropriate or less appropriate to use MI in the work of the inspector?
- Which MI skills are most critical to influencing operators' environmental behaviour?

- Which MI variables should improvements focus on?
- What is an appropriate design for MI training in light of the experience from this study and EMT in general?

11.3 Evaluation of EIE

The following areas are among those we have identified in the work and that deserve further attention:

1) *How do different financing models affect the performance of EIE?* A recurring theme in the previous interview studies is the lack of resources experienced by inspectors in their work. Furthermore, our own research has yielded indications that the financing of EIE activities may influence the inspection and enforcement work itself, such as requirements on the degree to which EIE costs are recovered. To provide the best possible conditions for efficient EIE, an adequate level of resources must be provided without the financing requirements having too great an impact on how inspection and enforcement are conducted. Further research is needed on different financing models for EIE.

2) *How does the organisational design of the operational EIE agency affect the conditions for a legally certain and efficient EIE?* Both previous studies and EMT's research have highlighted how various organisational aspects of the operational EIE agencies influence the work of EIE. A common problem in achieving an efficient and legally certain EIE is the mixture of environmental and business interests at lower levels of operational EIE. For this reason, it is relevant to investigate different models for a reasonable separation of environmental and business interests at the local (municipal) and regional (county administrative board) levels. Chapter 3 of this report demonstrated, for example, that the number of environmental sanction charges that a municipality issues is influenced by its political governance. With access to data concerning a host of other variables, it is now possible to refine this analysis. The aim is to investigate whether the same pattern applies to the number of injunctions and prosecutions filed by a municipality and to map exactly what the link between political governance and the use of environmental sanction charges and other outcome variables is.

3) *Continue work to identify indicators for following up the efficiency and legal certainty of EIE.* However, this presupposes an improved data situation. As previously mentioned, Swedish EIE has a greatly decentralised structure with several hundred operational EIE agencies. To secure a reasonable degree of legal certainty and efficiency, there is a need for information that can give the EIE guidance agencies a reasonable chance to follow up and coordinate the operational EIE. To identify reasonable indicators that can be used for follow-up and coordination, there is a need for research on actual data, which is largely missing today.

4) *Empirically investigate possible variations in operators' work towards the environmental objectives.* If the EIE agencies' knowledge concerning the incentives for the activities were to be improved, EIE would probably become more efficient as

resources would be focused on those areas where the need is greatest. A prerequisite for this is to use models to systematically make sense of different agents' incentives, and the interaction between them, in order to then use consistently collected data to empirically test the theoretical predictions.

An important question here is to investigate which incentives are most essential with respect to the environmental work of operators. This may, for example, be done through surveys to operators with questions such as: How important are legislation and enforcement as compared to market incentives (such as environmental demands from customers)? What is more deterring, punishment or negative publicity? A similar U.S. study is reported in Gunningham et al (2005). Such a study may, for example, enable us to identify differences in incentives between different industries, company sizes etc.

Another way of empirically investigating how operators react to different incentives is to measure their environmental behaviour through different outcome indicators. This avoids the problems with surveys that we have already mentioned. Two possible outcome indicators of this kind are the use of emission data from SMP and the use of some type of judgement criterion that inspectors report. Examples of the latter indicator may be assigning operators a higher or lower classification according to SALAR's risk and experience assessment tariffs. A third indicator, as already mentioned, is the number of formal follow-ups of deviations, such as injunctions, environmental sanction charges or filed prosecutions. A prerequisite for an analysis using these indicators makes it possible to link various EIE initiatives to outcome indicators at the operator level. One example is to simultaneously estimate the probability of individual operators being inspected and the probability of the same operator receiving a formal follow-up (or receiving an assessed reduction of its environmental risk according to SALAR's tariffs). A similar study has been conducted on Flemish data by Rousseau (2007).

A third method to investigate operators' incentives is to use an experimental method. Here, one or more operator groups are selected for exposure to some type of treatment at the same time as a control group does not receive such treatment. This treatment could be a special type of inspection and enforcement (e.g. MI, as already mentioned) or a bonus system for environmental work or a penalty system, such as the publication of a "black list" of negligent operators. The participants in this experiment (or rather the effect of the treatment) can then be evaluated on the basis of one of the above-mentioned outcome indicators.

A better understanding of what motivates operators to work towards the environmental objectives and to comply with legislation is an important prerequisite for being able to define and evaluate different EIE practices. Based on different EMT models, we can formulate a number of specific hypotheses about EIE practices that are tested on EIE data. The analysis may then, for example, be used to evaluate the effect of announced and unannounced inspections, the presence of information in the inspection and enforcement work, the use of different types of follow-up for verified deviations, such as injunctions, conditional fines, environmental sanction charges, prosecution etc. The mapping of

operators' incentives can also help identify efficient EIE practices that do not only lead to achieving the environmental objectives, but also contribute to reducing the costs for operators as much as possible.

11.4 Future statistical analysis

The statistical analysis presented in Chapter 3 shows how data that is collected consistently over time can be used. Using available data on environmental sanction charges, it was possible to investigate recidivism and political influence.

Measuring efficiency would require a large number of indicators for resource use, goals, activity and outcome. Which indicators are relevant or not (see Chapter 12) can be discussed, but it is always better to have access to as many indicators as possible. Using statistical methods, it is then possible to identify the most relevant indicators.

Such a method is *Exploratory Factor (Principal Components) Analysis – EFA*. The method combines the original variables (indicators) to create new uncorrelated components. The differences in these components consist of the difference in the strength of their links to the original variables and can therefore be ranked in terms of the degree to which they explain an outcome. This means that the components with the lowest degree of explanation can be removed without much loss. The number of variables can thereby be significantly reduced. Obviously, this method entails a balance between using as much information as possible and the cost of managing this information (in terms of time or difficulty of interpretation).

Indicators could be created by selecting the components with the highest explanatory value and ignoring the remaining components, provided that data for a great variety of indicators is available.

11.5 Summary

This chapter has presented different issues and analytical tools that can be employed to study and develop Swedish EIE. Some of the topics addressed here are a follow-up of the subprojects that have taken place within the framework of EMT. It would be of great interest to investigate the effect of the MI training programme over a longer period and on the operators. Similarly, it would be desirable to continue the exploration of decision-making and professional judgements in the inspection and enforcement work. With respect to measuring inspection and enforcement outcomes, an important prerequisite is the introduction of an information system to increase the range, quality and continuity of EIE data. Chapters 9 and 10 present a prototype of such an information system.

Regular and consistent data collection has the added benefit of enabling researchers and/or other stakeholders in Swedish EIE to take advantage of sudden changes in EIE conditions, such as changes in EU legislation, the introduction of new inspection and enforcement tariff systems etc. Those interested can then carry out ex ante and ex post analyses as data has been collected both before and after the change. This significantly

increases “research effectiveness” as sudden and unexpected changes can be quickly analysed.

Another important aspect of an information system worth emphasising concerns how the information will be used. One area of application is research and learning, such as how well different EIE practices are applicable for different types of activity over time. Another, and potentially more controversial, area of application is the follow-up and evaluation of operational EIE agencies. The specific choices of indicators and key figures could have strong incentive effects on operational EIE agencies, which may potentially counteract the objective of the Swedish Environmental Code. A closely related example of this phenomenon is, as discussed in the media, the sobriety controls conducted by the police, where the number of tests and not their effect has been the governing principle. Key figures must be used with caution, and the possible incentive effects they might cause must always be taken into consideration.

11.6 References

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CONCLUSION

Chapter 12
More efficient environmental inspections and enforcement

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In the context of EMT, environmental inspections and enforcement (EIE) have been analysed from different scientific perspectives. This is also reflected in how the concept of efficiency is used in the different chapters of this report. External and internal efficiency, which are defined in the introductory chapter, have been the natural reference points in each chapter. This chapter summarizes the results of EMT's work, with particular focus on the factors influencing the efficiency of Swedish EIE.

The following section addresses the importance of competence and professionalism for efficiency. Section 2 concerns efficiency and usefulness [se kommentar i det avsnittet], based on the prototype for an information system presented in chapter 10. Section 3 discusses the prerequisites for being able to measure the supervisory work. Section 4 describes the ability to measure supervision performance. Section 5 concludes and summarizes the report.

12.1 Efficiency through competence and professionalism

To do the right things at a local office (external efficiency) and to do things right (internal efficiency) you must have the right *competence* and use your *professionalism.* Competence can be defined as the application of knowledge, skills and behaviour. Competence is relative and is about how well you can apply knowledge and do a job. By formal competence, one usually means the education or experience that is required and can be measured, in the same way as knowledge, i.e. if you have the knowledge, expertise and ability to perform something. By social competence, one usually means how well you can "handle people" and how well you work in a team. By professionalism, one usually means implementation, purpose and properties that characterize a profession.

In order to use the concepts of competence and professionalism in terms of efficiency and in order to measure their importance for the result of supervision, a discussion is needed to establish what the meaning of a concept really is and what it means for the field EIE. Based on the observations and interviews made within the framework of the programme, we have compiled a number of aspects of the environmental inspectors' (and managers') competence and professionalism at different levels.

We have found two parts or perspectives of the competence needed to carry out inspections: individual competence and team competence. Individual competence can be

divided into both the general basic competence that everyone should have and specialist competence. Basic competence concerns e.g. knowledge relating to environmental legislation and the administrative law as well as language skills so that clarity and correctness are achieved, e.g. so that decisions can be used in a possible hearing. This requires a common nomenclature that is actually in use so that everyone agrees on the concepts at the national level and use the correct terminology and formulations for different types of paper work, for example, formal decisions. Special competence is about ensuring that at least someone in the office has expertise in a specific field, e.g. private sewers, nursery schools, chemicals or technical support systems.

We have also described competence as something common, i.e. a collective competence in the office or within the team. Collective competence is the sum of all individuals' knowledge that should guarantee that the right competence is available within a municipality to ensure that the correct decisions are made, given the issues that have to be managed. Accordingly, there must be consistent competence regarding the basic choices of EIE and each employee's basic knowledge of and competence in legislation, administration and using a correct and clear language both orally and in writing. This, in turn, is about a common ground and consensus for transparency regarding laws and regulations to ensure that operators and the general public have confidence in the decisions made and how they are made.

Social competence is not just something you have, but there are methods for learning about this with respect to attitude and the achievement of objectives in your interaction with people, whether it be between operators and environmental inspectors, the environmental inspector and municipal politicians or within a team of environment inspectors. Competence in this area is about embracing methods regarding attitude and to set measurable targets for the meeting/interaction, for yourself and for the group.

Professionalism can be expressed as the characteristic way in which a person performs his/her work within the framework of his/her professional role. In terms of the environmental inspector, this concerns, for example, being professional in his/her assessments. An efficient assessment in exercising authority is very much about its being in accordance with the rule of law and consistent, but also about its being done correctly from the beginning. The latter means, for example, that it should stand up to a judicial review, so that if it needs to be used in court, it should contain all information that the court requires. An important prerequisite for a professional judgement is that we look at each individual case on the basis of its individual circumstances . It is the quality of the assessment that determines its efficiency in relation to other parameters, e.g. the time you must spend on each specific case. A detailed description of the assessment dimensions can be found in Chapter 6.

What professionalism and competence in the EIE field involves also needs to be defined and filled with content at national, regional and local levels to ensure the formation of a common understanding and transparency in procedures and decisions.

The argument about professionalism and competence may sound like a matter of course. Given that environmental inspections take place through those individuals that are appointed to carry out this task, i.e. environmental inspectors, and that EIE is spread across the country to places with different administrative, organizational and financial conditions, the definitions and the content of the concepts at all levels are fundamental for ensuring consistency and transparency.

12.2 Efficiency and usefulness

For the research field Human Computer Interaction (HCI), there is a central definition of what constitutes good usefulness, namely the ability to use a system.

THE STANDARD ISO 9241-11 DEFINES THE USEFULNESS OF A SYSTEM:

> The extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specified context of use.

This definition puts the user and the system in first place, where their interactions will achieve the objective of a given task in an efficient manner. Accordingly, the user should not need to get a "headache" over how to use the system, but the system is a means of achieving the end. We might possibly put satisfaction in parentheses, although it relates to whether the user feels that he/she has done something efficiently and effectively. Effectiveness involves the degree to which the task fulfils something for the organisation in general (external efficiency) while efficiency here concerns internal efficiency.

In most cases, a task is included in a system of other tasks that together constitute the overall objective, for example, as in the description of professional judgement above. Therefore, it becomes key to clearly describe the system boundaries that constitute the outer part of the system. Environmental inspections can have "the values of impact on the environment" as the outer boundary. However, in the EMT programme, it is not the environment that sets the boundaries, instead it is the internal consistency of environmental inspections given the Environmental Code that represent the system boundaries. In this context, you can say that all tasks that inspections consist of (conversations, check of self-inspection, etc.) are to achieve the objectives set out in the Environmental Code. In this respect, the decision support prototype is part of how you manage inspection data, and how some of the inspectors' work processes are arranged.

As mentioned above, the extent to which objectives are achieved in relation to resource usage is a common way of defining internal efficiency. The key here is what is the objective. We may possibly achieve an objective, yet have considerable resources at our disposal and therefore be inefficient if we had been able to achieve the same objective with fewer resources. The objective of EIE may be linked to, e.g., environmental quality, legislation, rule of law, coordination of efforts, administrative practices, inspections, failure rate, time and resource consumption.

The decisive factor is which objective is put at the forefront and, in some respects, this may vary depending on the user in question. At the first level, it is the inspector who needs to prepare, implement and make decisions and make an efficient follow up with the help of the system. In this case, it is largely about administrative accuracy relative to the task, i.e. using correct information as a basis for creating correct information relative to those performing the same or similar tasks. Coordination across the country, consistency and impartiality are key factors.

At the next level, the municipality, it is crucial that the assembled information from the previous year corresponds well with the following year and that the tasks are carried out in the best possible way to achieve as many objectives of the Environmental Code as possible. For example, imagine that a municipality chooses to focus on operators that have high emissions or, historically, have frequently acted incorrectly, rather than on the many operators that conducted themselves impeccably. Depending on what you consider to be efficient, the number of operators being inspected or the impact of the operators on the environment, you get completely different definitions of efficiency.

At the third level, it becomes a more nationally collected view of EIE. Once again, it is entirely dependent on what objectives are considered to be the benchmark for efficiency. Simple measures such as the number of hours per object may ignore the degree of difficulty of the specific case. For this reason, it is essential that all inspection objects have been "risk-classified", i.e. defined based on a number of criteria such as the impact of the activity on the environment during normal operations, the environmental impact in the event of failure, but also economic risks.

EIE and the activities for which inspection data provides a basis are thus an example of multi-attribute assessments where a set of attributes must be fulfilled to various degrees: different efficiency definitions are obtained depending on the objectives to be considered and to what extent they should be met.

It then becomes crucial what objectives are defined for the operation, and what resources and means that are available for this. Focusing on the inspector, our intention has been to avoid adding new tasks and increasing the use of resources. This might be called defining the efficiency negatively – it must not become worse. Furthermore, the system is designed to support the inspector in terms of reliability and safety relative to the operator's possible questions, opinions, comments, etc., and the planning and preparation of inspections.

We have also said that "data quality must be guaranteed on a local level for the degree of efficiency to be met at this and other levels". By this, we mean that it is when making the collection that you have the opportunity to determine how accurately you gather data and that it is here that you tag the data to make it available to others. For example, you can make a visual inspection to see whether something is at a reasonable distance from something else, or you can measure the distance. Tagging the gathered data is about creating opportunities for others to share it. For example, the same kind of inspection

must have the same tagging, i.e. the measurement of an incinerator must be tagged as that and not as ovens in general or by temperature expressed in the number of degrees.

12.3 Measuring the inspection work

How can we measure people's work to influence the fulfilment of the objectives of the Environmental Code, given both the structure of the Environmental Code and the Administrative Act and the prerequisites and character of the work? We assume that environmental inspectors' professionalism and competence constitute the basis on which their work rests. Thus, it is fundamental to define what constitutes professionalism and competence.

The competence that must exist at an environmental office can be defined based on individual basic competence, individual specialist competence and the group's collective competence. This means that you must ask the questions: What must everyone be capable of doing? What must someone be capable of doing? Have we covered everything we need to know with the people we have? These questions must then be broken down onto a detailed level, where the different qualities of the competence are identified, including the competence highlighted in chapters 6, 7 and 8. Therefore, we must specify what the competence consists of at the detailed level in order to be able to perform certain work and to illustrate this by putting competence into words.

However, you also need to define competence at local, regional and national levels in order to meet the specific needs of different parts of the country, while ensuring that the required competence is available at the national level to guarantee the external and internal efficiency of environmental supervision.

The different types of competence and aspects of professionalism are described in chapters 6, 7 and 8. These chapters discuss judgement dimensions, the professional vision and objectivity as components in making professional judgements and that environmental inspections are a reflective practice where modifications must be carried out for each judgement. In addition, we problematize the fact that the environmental inspector both as a profession and as an individual and a body is important for and affects the performance of EIE. Moreover, through the different types of self-assessment that the environmental inspectors made when they were trained in motivational interviewing (MI), you can measure both the communication method in itself and its impact on the effectiveness of EIE.

Competence and professionalism are complex concepts that must be specified and filled with relevant content in order to be measured. The MI study shows that competence regarding communication, listening and attitude can be measured through surveys and reflection.

12.4 Measuring outcome and efficiency

When you need to find a way of measuring the effect of EIE and efficiency, you must be creative. We cannot see that there is any single way of measuring or any single measure. Instead, you must measure the efficiency, external and internal, in different ways, both qualitatively and quantitatively, from both self-assessment and "hard data" and also set the different measurements in relation to each other and to the objectives of the Environmental Code and other objectives of an operator. The key is to find what we want to measure (objective) and then find ways of making the measurement.

According to chapter 1. § 12 of the Ordinance on Environment Inspections and Enforcement, an operational inspection and enforcement authority shall "[...]*annually follow-up and evaluate their inspections and enforcement.*" The aim is to ensure that inspections are performed efficiently and according to rule of law. How an operational inspection authority should follow up its inspection activities is, according to our knowledge, not more precisely defined in laws, regulations or other key documents. Moreover, the concept of efficient EIE lacks a uniform definition at the national level in Sweden. A prerequisite in order to be able to express an opinion on efficiency is that the outcome of EIE is measured and set in relation to objectives and resource usage which, in turn, presupposes that the data is collected in a consistent manner over time. The difficulties with the availability of comparable data have been highlighted in different chapters of this report and have also been recognized in previous studies (e.g. Cloudberry, 2008). These problems are partly due to EIE being performed by so many agencies, partly to the relevant databases being inaccessible and lacking harmonization (which is described in chapter 5).

Yet even if the data supply situation were better, it is not entirely obvious how efficiency should be measured. The difficulties in measuring inspection and enforcement results are discussed in detail in Nordin (2008) which states that research concerning performance measures in inspection activities has often focused on the measurement itself and not on the context in which the measurements are used and what is easily measurable (resource usage and performance) rather than effects and achievement of objectives. Nordin points out the difficulty in formalising knowledge-heavy inspection and enforcement activities, where the balance between autonomy and administrative control is of particular importance as the enforcement of regulations and their application depends on an interaction between the inspection authority and the regulated object. Therefore, complex activities like EIE cannot be represented by simple performance measures. The performance measures that are used will therefore not capture all aspects of the inspection staffs' activities. The use of performance measures can then lead to the inspection and enforcement staff putting too much emphasis on aspects that are measurable, while other equally important parts of EIE may be neglected. Similarly, the operators' motives can be affected.

As pointed out by Nordin (2008), there are risks involved when using measures of inspection activities and outcomes. If environmental inspectors were only evaluated based

on how many inspections they perform annually, there is a great risk that they prioritise quantity instead of using their professionalism to conduct rigorous inspection and enforcement work. If, on the other hand, inspectors were assessed by the number of ESCs they have issued, there is a risk that they would become overzealous in their enforcement work and the quantity would suffer as they can focus on inspection objects where breaches are assumed to be easy to detect or difficult to refute. Accordingly, in order to evaluate inspections and enforcement, several measures need to be taken into consideration.

Within the framework of IMPEL (European Union Network for the Implementation and Enforcement of Environmental Law) a project was carried out where ten indicators for environmental inspections were evaluated. The findings reported in IMPEL (2010) were always to have a wide range of indicators, and to be clear about the pros and cons of focusing on a selection of indicators. Indicators that were proposed included: the number of inspectors, the number of working hours, the number of inspections, the number of inspections performed as a ratio of the number planned, the average inspection time, etc. Many of the problems with measurability of inspections mentioned in this document are included in the report.

It is easily ascertained that outcome data in particular is extremely limited in that only a specific type of action is captured (see chapter 3). The data collection is done by different agencies, and usually only goes back a few years in time. Unfortunately, there is currently a lack of consistently collected relevant data of Swedish EIE. The value of such data is great for many reasons. First, it would make it possible to measure EIE efficiency. Second, the evaluation of such statistics would strengthen the compliance with rule of law. Third, it is needed to meet any future requirements from the EU. Last and not least, it would promote research on EIE in that evaluation and comparison as well as the testing of theoretical hypotheses would be made possible. Most crucial is that inspectors are given the opportunity of inter-organisational learning, i.e. that each inspector is given the opportunity to compare his/her assessment (formulations, concepts, decision support, etc.) with other inspectors using the same inspection points.

In the survey presented in chapter 2, it was shown that about 60% of the municipalities use some form of measure/indicator to measure the performance of their inspections. It is unclear what the remaining 40% do, which makes it difficult to compare different operational EIE authorities. In the municipalities where indicators are used, the data can, of course, be useful to evaluate the authority's inspection over time. However, for comparisons between municipalities to be possible, there must be co-produced measures that are clearly defined and collected in a consistent manner.

12.5 Summary

In this chapter, efficiency has been discussed from several different perspectives. It has partly been about describing what influences efficiency in an EIE context. And partly it has been about discussing different ways of measuring the efficiency of EIE. The latter in

particular, i.e. measuring efficiency and thus, being able to highlight what contributes towards efficient EIE, constitutes the core of the problems that characterise EIE. The complexity of inspections, which is described in detail in this report, is reflected in the difficulties in measuring its outcome.

Measuring efficiency in a meaningful way requires a deeper understanding of the complicated reality of EIE and the possibilities and limitations of a statistical evaluation of EIE. This has been the point of departure for EMT. A large part of the work of EMT and thus, a large part of this report, has been devoted to examining and analysing the complexity of EIE. Although measurability may seem to have been overlooked, not least because of the poor data-supply situation, efficiency has at all times served as a reference point.

When the Environmental Protection Agency launched the research programme *Efficient Environmental Inspections and Enforcement* five years ago, the following important points for efficient EIE were emphasized:

- EIE support and control self-inspection and the operators' responsibility.
- EIE are differentiated so that efforts are made where they are most needed.
- The EIE authority interacts with other EIE authorities.
- It is important to develop measures of EIE in general and efficient EIE in particular, for example in the form of indicators.

The first paragraph has a clear link to the inspection methodology, while the next two paragraphs concern the planning and evaluation of inspections. The last point is related to the measurement of outcomes, which requires consistent data collection over time. These four starting points reflect the division into sub-projects that was made in the call and subsequently within EMT.

The insights into the inspectors' work situation gained through the field studies of sub-project 1 have contributed towards identifying the characteristics of efficiency in the inspector's profession and professional judgements. The communication methodology – motivational interviewing – which was developed has the aim of making the meetings between inspectors and operators more efficient.

Sub-project 2 has worked to identify the mechanisms that influence stakeholders' motives. A deeper and more differentiated understanding of these motives can give a good indication of how inspection efficiency can be improved. Within the framework of sub-project 2, existing data that measures the outcome of inspections has also been collected and analysed statistically. The availability of data, collected in a consistent manner over time, is essential to evaluate and compare inspections in Sweden. The efficiency of inspections presupposes that its effect and the resources available are continuously measured and evaluated.

A major obstacle to the measurement of inspection performance and efficiency is the lack of data concerning how inspections are currently managed. Sub-project 3 has worked to

develop a prototype for an information system that is meant to support the inspector and thus, achieve a higher degree of efficiency in the professional judgements. Such a system would also facilitate the evaluation of EIE and allow comparisons between the work of different authorities. This would make it possible to identify any deficiencies in the efficiency of EIE relating to both the use of resources (internal efficiency) and the priorities made (external efficiency).

Against the background of the poor data supply situation that currently prevails, the question of which measures should be used is, to some extent, set too early. Only when there are conditions for a consistent collection of a variety of different data is it meaningful to evaluate which measures of inspection performance that are useful. Accordingly, achieving efficiency in today's EIE is about *the ability to measure rather than what should be measured.*

Creating conditions for more efficient information management would not only facilitate the individual inspector's work situation, which in itself would have an efficiency enhancing effect. It would also make possible the collection and compilation of a variety of different variables that might be of interest in order to create measures and indicators for the execution of EIE. Making it possible to measure is therefore crucial for the work to make today's EIE more efficient.

12.6 References

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Presentation of research program participants

Professor Henrik Artman (Swedish Defense Research Agency and Royal Institute of Technology) has led the subproject focusing on information management and prototype development, has co-authored chapters 1, 5 and 12, and is the author of chapter 9.

Doctor of technology Joel Brynielsson (Swedish Defense Research Agency and Royal Institute of Technology) has been responsible for information management from a computer scientific perspective, has co-authored chapters 5 and 12, and is the author of chapter 10.

Doctor of theology Lena Edlund (the research foundation ”Existens & Samhälle”) has contributed to the program’s field studies, has been responsible for analyzing the professional judgements of inspectors, has co-authored chapters 1 and 11, and is the author of chapter 6.

Research assistant Per Fallgren (Stockholm University) has handled statistical issues and data base processing.

Doctor of medicine Lars Forsberg (Karolinska Institutet) has contributed to developing the Motivational Interviewing training program and has co-authored chapter 8.

Professor Gebrenegus Ghilagaber (Stockholm University) has been responsible for statistical model selection and modelling of the correlation between the input to EIE and its results, and has co-authored chapters 3 and 11.

Research assistant Jonathan Gustavii (Stockholm University) has handled statistical issues and data base processing.

Doctor of philosophy Mathias Herzing (Stockholm University) has led the research program and has co-authored chapters 1, 3, 4, 11 and 12.

Professor Jonas Häckner (Stockholm University) has co-authored chapter 4.

Doctor of philosophy Adam Jacobsson (Stockholm University) has led the research program and has co-authored chapters 1, 2, 4 and 11.

Doctoral student Eva-Maria Jacobsson (Royal Institute of Technology) has been responsible for communication.

Associate professor Håkan Källmén (Karolinska Institutet) has been responsible for survey design and data analysis of empirical studies, and has co-authored chapters 2 och 8.

Doctor of philosophy Sinna Lindquist (Swedish Defense Research Agency) has led the subproject covering field studies of environmental inspections and enforcement and the MI study, has contributed to prototype development, has co-authored chapter 12 and is the author of chapter 7.

Doctoral student Anders Lundström (Royal Institute of Technology) has been responsible for interaction design issues in the prototype development process and for developing a mobile application.

Professor Astri Muren (Stockholm University) has co-authored chapter 4.

Doctoral student Eric Sjöberg (Stockholm University) has focused on statistical issues and has co-authored chapter 3.

Researcher Björn Thuresson (Royal Institute of Technology) has been responsible for information management and data collection activities.

Civil engineer Edward Tjörnhammar (Swedish Defense Research Agency) has been responsible for technical prototype development.

Psychologist Hans Wickström (Karolinska Institutet) has developed the Motivational Interviewing training program for inspectors and has been responsible for its implementation, and has co-authored chapter 8.

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MATHIAS HERZING AND ADAM JACOBSSON (EDITORS)

The Swedish Environmental Protection Agency (Naturvårdsverket) has financed the interdisciplinary research program "Efficient Environmental Inspections and Enforcement" ("Effektiv miljötillsyn"). The researchers are affiliated to Stockholm University, which is the responsible research institution, the Royal Institute of Technology (Kungliga Tekniska Högskolan), the Karolinska Institutet, and the Swedish Defense Research Agency (Totalförsvarets forskningsinstitut). The goal has been to develop new knowledge, thereby achieving more efficient environmental inspections and enforcement and obtaining new scientific perspectives on environmental inspections and enforcement.

The report studies methods for inspections and the communication between the inspector and the representative of the inspected facility, how the institutional framework for the inspection process works, and demonstrates the possibilities of measuring the effects of inspections and enforcement. The researchers involved in the program are fully responsible for the content of this report.

The Swedish Environmental Protection Agency will use the results as a base for its continuing efforts to improve inspection and enforcement guidance and to develop the following up and evaluation of inspections and enforcement and guidance.

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