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This is the published version of a chapter published in *Efficient Environmental Inspections and Enforcemen*.

Citation for the original published chapter:

Artman, H., Edlund, L., Herzing, M., Jacobsson, A. (2016)

Chapter 1 Introduction

In: Herzing, M., Jacobsson, A. (ed.), *Efficient Environmental Inspections and Enforcemen* (pp. 246-). Naturvårdsverket

Rapport / Naturvårdsverket

N.B. When citing this work, cite the original published chapter.

Permanent link to this version:

<http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-239622>

Chapter 1 Introduction

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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 committees¹ 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 responsible 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 enrich 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 implementing 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.

1.5 References

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