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**ENVIRONMENTAL MANAGEMENT SYSTEMS
AND THEIR APPLICATION IN PUTTING THE
ENVIRONMENTAL POLICIES OF POLISH MUNICIPAL
WASTE TREATMENT FACILITIES INTO PRACTICE**

by

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ABSTRACT

While much is known about ISO 14001 and EMAS environmental management systems in general, comparatively little knowledge is about the application of these management instruments in non-industrial sectors, including the municipal waste sector. Consequently, the intention of this paper is to assist municipal waste treatment facilities with the development of environmental management systems in which the continual improvement of environmental performance can be coupled with an increased economic efficiency and quality of delivered services. For this purpose, a manual that provides sample policies, programmes and approaches to the successful realisation of the ISO 14001 environmental management system was written.

Due to more stringent requirements for the sound management of municipal solid waste, a growing number of Polish municipal waste treatment facilities have implemented or intend to implement the ISO 14001 system. By the end of 2005, 25% of facilities were formally certified to the ISO 14001 EMS, 60% of which have integrated it with the ISO 9001 QMS. The facilities, despite encountering a number of difficulties, for instance during the identification and assessment of significant environmental aspects, are also gaining numerous benefits, resulting in an improved environmental performance. *Ipsa facto*, 37.5% of municipal waste treatment facilities in Poland have admitted that the environmental-improvement potential of EMSs is higher than economic-human costs related to its introduction and operation.

All the presented information, if other sources are not adequately referenced, are based upon the author's research, encompassing quantitative and qualitative study methods, conducted among municipal waste treatment facilities in Poland in years 2004 – 2006. The response rate of 68% guarantees credibility of the collected data.

Key words: Environmental management system, ISO 14001, EMAS, municipal waste treatment facility, sustainable development



ZUSAMMENFASSUNG

Während bereits gute Kenntnisse allgemeiner Natur zu Umweltmanagementsystemen nach ISO 14001 und EMAS vorliegen, weiß man vergleichsweise wenig über die Nutzung dieser freiwilligen Managementinstrumente im Dienstleistungssektor, einschließlich des Sektors für die kommunale Abfallwirtschaft. Aus diesem Grund ist das Hauptziel der vorliegenden Arbeit Betrieben der kommunalen Abfallwirtschaft eine Unterstützung im Prozess der Einführung eines Umweltmanagementsystems zu geben. Damit soll außer einer kontinuierlichen Verbesserung der Umwelleistung auch die Rentabilitätssteigerung der Unternehmen und die Qualitätsverbesserung der Dienstleistungen erreicht werden. Zu diesem Zweck wurde ein praktischer Ratgeber geschrieben, der beispielhaft Verfahren, Programme und Herangehensweisen zur Einführung der ISO 14001 zeigt.

Steigende Anforderungen an die Kommunalabfallwirtschaft führen dazu, dass in Polen immer mehr Betriebe der Kommunalabfallwirtschaft das System ISO 14001 eingeführt haben oder dies beabsichtigen. Bis zum Ende des Jahres 2005 haben 25% aller Betriebe der kommunalen Abfallwirtschaft das Zertifikat ISO 14001 erlangt, wobei 60% davon dieses mit einem Qualitätsmanagement-System nach ISO 9001 integriert haben. Die Erfahrungen zeigen, dass die Betriebe, die das System eingeführt haben, viele Vorteile dadurch gewonnen haben, z.B. durch die Steigerung der Umwelleistung, obwohl ihnen dabei auch Probleme widerfahren sind, z.B. bei der Identifizierung und Bewertung der Umweltaspekte. Faktisch haben 37,5% der Betriebe der kommunalen Abfallwirtschaft in Polen, die das System ISO 14001 besitzen, die Vorteile zum Schutz der Umwelt höher bewertet als die sozio-ökonomischen Aufwendungen zu seiner Einführung und Aufrechterhaltung.

Alle in der Dissertation enthaltenen Informationen basieren, wenn keine andere Quelle angegeben ist, auf der Forschung, die vom Verfasser in Betrieben der Kommunalabfallwirtschaft in Polen in Jahren 2004-2006 durchgeführt worden ist. Hierzu wurde die Methode des standardisierten Fragebogens und des direkten Interviews eingesetzt. Die Rücklaufquote von 68% der Befragungen gewährleistet die Glaubwürdigkeit der Ergebnisse.

Schlüsselworte: Umweltmanagementsystem, ISO 14001, EMAS, kommunaler Abfallwirtschaftsbetrieb, Nachhaltige Entwicklung

STRESZCZENIE

Podczas gdy aspekty natury ogólnej związane z wykorzystaniem systemów zarządzania środowiskowego, ISO 14001 i EMAS, zostały już dość dogłębnie zbadane, stosunkowo niewiele wiadomo jest na temat wykorzystania tych woliwanych instrumentów samoograniczenia oddziaływania na środowisko w sektorze usług, włączając sektor gospodarki odpadami komunalnymi. Dlatego nadrzędnym celem niniejszego projektu badawczego jest pomoc zakładom zagospodarowania odpadów komunalnych w procesie wdrażania systemu zarządzania środowiskowego, tak by rezultatem ciągłego doskonalenia systemu było nie tylko zminimalizowanie oddziaływania na środowisko, ale również wzrost rentowności przedsiębiorstwa oraz poprawa jakości świadczonych usług. W tym celu opracowano praktyczny poradnik prezentujący poszczególne etapy wdrażania.

Rosnące prawne i społeczne wymagania względem gospodarki odpadami komunalnymi sprawiły, że z roku na rok przybywa zakładów zagospodarowania odpadów komunalnych w Polsce, które wdrożyły lub zamierzają wdrożyć system ISO 14001. Do końca 2005 roku, 25% wszystkich zakładów zagospodarowania odpadów komunalnych uzyskało certyfikat ISO 14001, z czego 60% posiadało dodatkowo system zarządzania jakością ISO 9001. Doświadczenie pokazuje, iż zakłady, które zdecydowały się podjąć próbę wdrożenia systemu, pomimo napotkania wielu problemów np. podczas identyfikacji i oceny aspektów środowiskowych, uzyskały również szereg korzyści. Fundamentalne znaczenie ma stałe optymalizowanie działań na rzecz ochrony środowiska. 37,5% zakładów zagospodarowania odpadów komunalnych w Polsce posiadających system ISO 14001 oceniło stosunek korzyści do kosztów związanych z jego wdrażaniem i funkcjonowaniem pozytywnie. *Ipsa facto*, sami instytucjonalni użytkownicy środowiska zweryfikowali tezę, że systemy zarządzania środowiskowego stanowią użyteczny instrument poprawy efektywności funkcjonowania organizacji.

Wszystkie informacje zawarte w tej dysertacji doktorskiej, jeżeli nie podano innego źródła, oparte są na badaniu przeprowadzonym wśród zakładów zagospodarowania odpadów komunalnych w Polsce w latach 2004 – 2006. W strukturze procesu badawczego wykorzystano technikę standaryzowanego kwestionariusza oraz wywiadu bezpośredniego. Uzyskana zwrotność na poziomie 68% gwarantuje wiarygodność otrzymanych wyników.

Słowa kluczowe: System zarządzania środowiskowego, ISO 14001, EMAS, zakład zagospodarowania odpadów komunalnych, zrównoważony rozwój



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ABBREVIATIONS

BAT – Best available techniques

Eco-certificate – Certificate to the ISO 14001 system

EMAS – Eco-Management and Audit Scheme

EMS – Environmental management system

ISO – International Organisation for Standardisation

MSW – Municipal solid waste

MWTF – Municipal waste treatment facility

NACE Code – Classification of Economic Activities in the European Community

PCA – The Polish Centre for Accreditation

RV – Recovery value

SWOT – Strengths, Weaknesses, Opportunities and Threats

Chapter I

INTRODUCTION



I.1. Defining the problem

Organisations in all spheres of activity (manufacturers, retailers, utilities, service companies, et cetera) are experiencing a growing pressure to demonstrate high standards of environmental performance. Presently, not only the authorities, but also the public are exhorting organisations to take responsibility for actual and potential environmental impacts associated with their activities. This gives rise to the question: how to put environmental issues at the forefront of policies in the most advantageous manner? Organisations have miscellaneous tools to meet this challenge.

Environmental management systems are one of the instruments that offer assistance to organisations wishing to make their own response to the on-going process of environmental degradation. Environmental management systems were designed in the last decade of the 20th century as a business community reaction to the international agenda of sustainable development. Sustainable development is perceived as a “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. (the Brundtland Commission, 1987). Most commonly applied environmental management systems are the international ISO 14001 standard and the EU Eco-management and Audit Scheme (EMAS).

Present knowledge on environmental management systems is largely restricted to experiences gained from industrial organisations. Since the year 1996 and 2001, though, ISO 14001 and EMAS respectively have been open to all sectors of economic activity, including service organisations and local authorities. Consequently, an application of environmental

management systems in non-industrial businesses requires equally thorough investigation. Municipal waste treatment facilities, whose operation involves technical, environmental, economic, social and political factors, form a very attractive study area.

Over the last fifteen years, the municipal waste sector in Poland has undoubtedly made great progress in strengthening its operation. No longer are the perplexing waste problems undervalued. Furthermore, they are being recognised and brought into light, for instance, under environmental regulations coming into force. Despite that, the growing material consumption, lack of social co-operation, and considerable delay in developing sustainable waste management technologies are still causing environmental degradation. Currently the prime challenge of municipal waste treatment facilities in Poland is hence to integrate conventional methods of municipal waste management that already exist with modern ones. Designing a municipal waste sector, which provides locally appropriate levels of service at the lowest possible cost, while simultaneously supporting the process of waste reduction, needs however methodological, anticipative and decisive action.

Due to the universal character of environmental management systems, they can be implemented in many different ways depending upon the specificity of the precise sector and the needs perceived by the managers (Nath et al, 2001). Consequently, every sector, thereby the municipal waste sector in Poland has to customise environmental management systems to suit its local economic, technological, and social opportunities and barriers.

This work is designed to examine the general applicability of environmental management systems in improving the environmental performance of municipal waste treatment facilities. In addition, it is a continual search for examples of a good practice of tailoring each step of ISO 14001 to make the whole system operate effectively. Providing facts and figures, the former supports the development of environmental management systems in which continual environmental improvement is coupled with the benefits of a municipal waste treatment facility and society.

I.2. Aim and hypotheses of the research

The primary aim of this research is to support the development of environmental management systems in municipal waste treatment facilities in which the continual improvement of environmental performance can be coupled with an increased economic efficiency and quality of delivered services. The investigation is based upon a case study of Polish municipal waste treatment facilities.

To achieve the aim of the research, the following research objectives have been established:

- To investigate the implementation status and to assess a prospective market for ISO 14001 and EMAS EMSs' application by Polish municipal waste treatment facilities.
- To identify the reasons for the decision to implement EMSs by Polish municipal waste treatment facilities.
- To evaluate the scope of indispensable changes that Polish municipal waste treatment facilities have to introduce in order to be formally registered to ISO 14001 or EMAS EMSs'.
- To recognise the primary difficulties concerning the process of EMS's implementation and maintenance by Polish municipal waste treatment facilities.
- To specify potential costs and benefits of developing an environmental management system to Polish municipal waste treatment facilities.

- To determine an effectiveness of EMSs in addressing the concept of sustainable development of Polish municipal waste treatment facilities.

The foremost hypothesis put to the test in the research:

Considering these three crucial parties concerned with the operation of a municipal waste treatment facility – a municipal waste treatment facility itself, the authorities and society – and presupposing that the **municipal waste treatment facility** is primarily interested in maximising its profit, the **authorities** need to guarantee regulatory compliance, **society** has an interest in obtaining good quality environmentally friendly products and services; All these aspects are being tackled by environmental management systems. Ipso facto eco-certificates lead to benefits from an environmental, financial, legal and social standpoint.

Further research hypotheses put forward for verification:

- In Poland, there is small but dynamically growing number of municipal waste treatment facilities that are formally registered to environmental management systems.
- The challenge to be up to the growing standard of environmental protection is an essential reason for the decision to implement EMSs by Polish municipal waste treatment facilities.
- The prioritisation of environmental aspects is performed more on the strength of legal requirements than environmental or social responsibilities.
- Due to the high costs of the process of EMS's implementation, a lack of financial resources is a major limiting factor for a broader ISO 14001 and EMAS EMSs' application by Polish municipal waste treatment facilities.

- The experiences of Polish municipal waste treatment facilities show that EMSs assist non-industrial organisations in translating a genuine understanding of sustainable development into daily activities.

The study has both theoretical and practical contributions to current knowledge. On the one hand, it rectifies the general scarcity of literature resources devoted to the present changes being undergone by non-industrial organisations, regarding the introduction of environmental management systems. This applies in particular to organisations coming from the field of environmental protection, notably municipal waste treatment facilities. On the other hand, it has a significance to users by helping them to make a decision for potential ISO 14001 or EMAS project and to mitigate difficulties, which evolve during the process of ISO 14001 implementation. The aspiration of this research is, therefore, to highlight issues that might be of prime importance for the future improvement of a situation with respect to the application of environmental management systems in the municipal waste sector.

Chapter II

STATE OF THE ART



II.1. Fundamental aspects of environmental management systems

Managing environmental aspects in organisations has been becoming an increasingly complex and challenging assignment. A strong competitiveness on the market, new demands of governmental regulatory agencies and increasing public expectations are just a few factors creating the need for some management instrument to effectively deal with organisations' impacts upon the environment. To fulfil these expectations, an environmental management system (EMS) has been proposed. The foundation of a successful EMS is undoubtedly an understanding of its crucial characteristics, which will be presented in this chapter.

There are various definitions of an environmental management system; the three most commonly quoted are presented below. The first one is taken from the bestseller of Nath et al (1998) that defines EMS as a problem identification and problem solving tool, which provides organisations with a method to systematically manage their environmental activities, products and services and helps to achieve their environmental obligations and performance goals. The next one, proposed by the International Organisation for Standardisation at their web page, characterises EMS a part of an organisation's overall management system that includes an organisational structure, planning activities, responsibilities, practices, procedures, processes and resources used for developing and implementing its environmental policy and managing its environmental aspects. Finally, the third one of the European Commission for the Environment describes EMS as a tool that provides a systematic way of addressing and managing immediate and long-term impacts of an organisation's products, services and processes on the environment and gives order and consistency to address environmental concerns through the

allocation of resources, assignment of responsibility and ongoing evaluation of practices, procedures and processes.

The analysis of the above presented definitions provides the answers to essential questions related to environmental management. These definitions elucidate, though, what the role of EMS is, how EMS is to be implemented and operated successfully and lastly why organisations ought to have EMS in place? In brief response to these questions, it can be concluded that a key concept of all environmental management systems is to manage an organisation's activities, products and services that can interact with the environment, in a systematic manner to achieve environmental obligations and performance goals. If the concept of continual improvement, indirectly expressed in the definitions is added then we have a completed definition of environmental management systems of this research.

To diagnose complex environmental problems and to propose adequate solutions organisations most often apply the ISO 14001 international standard – the core standard of the ISO 14000 series – and the EU Eco-Management and Audit Scheme. Despite many similarities between these two environmental management systems as regards their implementation and operation, there are also some differences between them. They, however, will be the subject of further chapters.

II.1.1. Historic profile

In line with Boba (2005) environmental management systems have their roots in an environmental strategy for pollution prevention. The concept of pollution prevention was introduced by United Nations Environment Programme (UNEP) – Industry and Environment Programme Activity Centre in 1989. Since then it has been incorporated into most of the national environmental policies worldwide, becoming their leading principle. According to UNEP pollution prevention approaches mean the continuous application of practices that reduce or, if achievable, eliminate the creation of pollutants at source. This applies to production processes,

products and services through, among others, prudent management of raw materials, energy and water during production; incorporating environmental concerns into the designing of products and delivering services of low environmental impacts. The main idea behind pollution prevention is therefore to minimise or avoid entirely the creation of pollution since it is less expensive and more effective in protecting the environment than treating them after they have been created (at the end-of-pipe). Consequently, the aim of introducing the strategy for pollution prevention is to increase eco-efficiency and to reduce risk to people and the environment.

The United Kingdom is the cradle of environmental management systems (see table II.1.1). The first British Standard 7750 (BS 7750) was introduced by the British Standards Institution (BSI) in 1992. It was subsequently reviewed and revised to a new issue in 1994. BS7750 is the national standard that can be applied by organisations coming from all sectors of economic activity, including local government agencies and non-profit organisations, only if they operate in the United Kingdom. This standard makes an explicit requirement for the continuous improvement of environmental performance (Cascio at al, 1996). This means that organisations to be eco-effective must systematically evaluate their performance and define policy, practices and targets to be achieved.

At around the same time as in 1993, Eco-management and Audit Scheme (EMAS), the European standard was published following regulation 1836/93 of the Council and the European Parliament. Due to the necessary period for designating national Competent Bodies and Accreditation Bodies, EMAS has been available for participation by organisations from 1995. It was originally restricted to industrial organisations operating in the European Union and the European Economic Area – Iceland, Liechtenstein and Norway. In 2001, however, the scope of the standard was extended to all sectors of economic activity, including public and private services. Similar to the BS 7750 standard, EMAS is a management tool for organisations to evaluate, report and improve their environmental performance on a continuous basis (the European Commission).

Both the British Standard and the European Scheme have considerably influenced the ISO 14001 standard, defining the first international environmental management system. The ISO 14001 standard was developed by the Technical Committee TC 207 of the International Organization for Standardization ISO/TC 207 in 1996. The aim of ISO 14001 was to provide organisations with a framework around which to develop a flexible approach to environmental management, irrespective of economic activity and localisation. Consequently, the ISO 14001 standard is applicable to industrial and non-industrial organisations worldwide that want to continually review and improve their environmental performance. In order to enhance the understanding of ISO 14001 requirements, some clarification and terminology changes were introduced to the standard by ISO/TC 207 in 2004. There are no substantial modifications in the new standard, though, since their primary intent was to ensure a greater alignment between ISO 14001 and ISO 9001 quality management system. All organisations holding certificates to ISO 14001:1996 were obligated to make the necessary adjustment to the new issue of ISO 14001:2004 by May 2006.

In line with the strategy for pollution prevention, the Polish government has been actively promoting the application of volunteer management instruments by a number of legal and administrative actions. As a result, in 1998 the Polish Committee for Standardisation – the member body of the International Organisation for Standardisation published the Polish version of the ISO 14001 standard - PN-EN ISO 14001:1998. In 2005 the standard was replaced by PN-EN ISO 14001:2005 to make it compatible with the original one issued by ISO/TC 207 in 2004. The Polish standard follows the same format and is open to all types of organisations, irrespective of their localisation, business activity and ownership structure. EMAS is an even more recent eco-management instrument in Poland, since it was incorporated into Polish legislation by the Act of 12th March 2004. The truth is though that the scheme has been available for participation by companies since Poland's accession to the European Union on the 1st of May 2004. Therefore, Poland is still organising the national system of eco-management and audit.

Table II.1.1. Environmental management systems – historic overview

YEAR	STANDARD
1992	BS 7750
1993	EMAS I
1996	ISO 14001
1998	PN-EN ISO 14001:1998
2001	EMAS II (amendment)
2004	EMAS Act of Polish Parliament
2004	ISO 14001 (amendment)
2005	PN-EN ISO 14001:2005

II.1.2. Implementing EMSs

Environmental management systems are designed to provide a systematic approach to the overall environmental performance of organisations worldwide. The value of EMSs is hence in promoting the uniform approach (lingua franca) for continual improvement in organisations wishing to fulfil the steadily raising requirements of environmental protection. This is not a one-time process that an organisation goes through, but it is a formal structure that needs to be periodically reviewed, improved and audited. The core of the environmental management model is the ‘continuous improvement circle’ called also ‘Plan-Do-Check-Act circle. The crucial elements of this circle are developing an environmental policy and planning the environmental management system, and then implementing it (see figure II.1.1). Afterwards the system is checked to make sure it is functioning properly and if necessary corrective actions are introduced. Finally, the environmental management system is reviewed by the managers at planned intervals. If any of these elements – building blocks is missing, the continual improvement is no longer achievable.

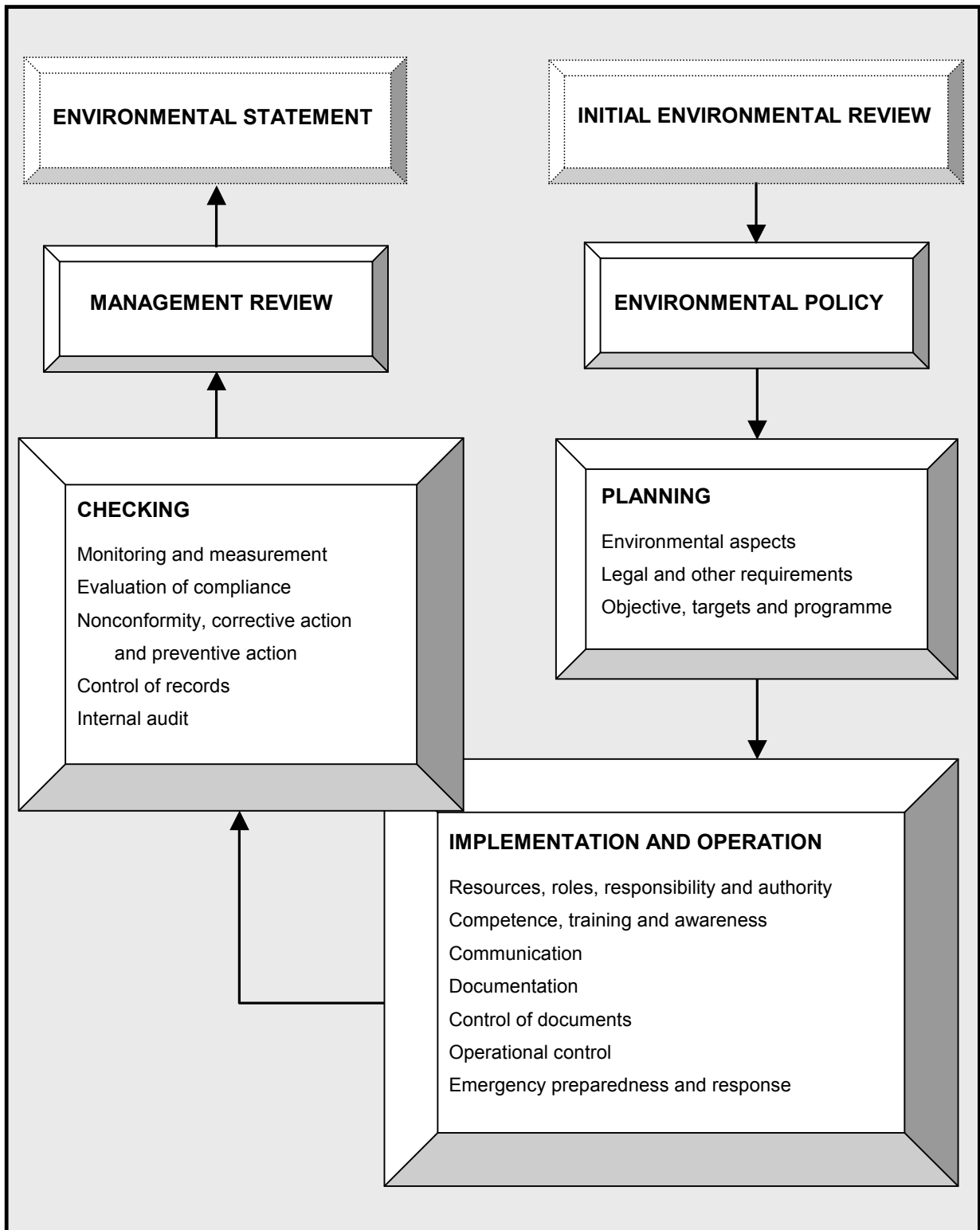


Figure II.1.1. Model of environmental management

Essentially for ISO 14001 certification and EMAS registration, the steps to having the environmental management system in place are parallel. As specified in the ISO 14001:2004 standard, the ISO 14001 implementation requires from an organisation to establish an action plan that falls into a number of categories (see table II.1.2). EMAS goes beyond the scope of the ISO 14001 standard since it includes some other specifications for continuous improvement of environmental performance. The first one is an initial environmental review – a comprehensive analysis of the environmental impacts caused by an organisation's activities (direct and indirect), regarding, for instance, waste production, use of energy and the consumption of raw materials. Under the EMAS requirements, organisations are not responsible solely for their environmental impacts, but also for the environmental impacts of organisations they co-operate with through production stages, transportation, supply et cetera. Organisations, which have already been ISO 14001 certified, are exempt from conducting the initial environmental review.

Another supplementary EMAS specification is an active involvement of employees in the implementation process. Therefore, to ensure the success of the environmental initiative, organisations ought to engage workers at all levels of the organisation – from top management to those working in administrative and on production lines. Employees are to be, in particular, involved in the analysis of the state of the art of the environmental performance, the formulation of environmental policy, working groups for the environmental action programme, an auditing process and the elaboration of an environmental statement. Organisations need to have evidence of workers' active participation in EMAS. The next fundamental EMAS requirement is a documented legal compliance. Consequently, substantial work needs to be undertaken to correct any non-compliances before EMAS is functioning successfully. The legal compliance constitutes a minimum obligation since organisations are strongly encouraged to beat a permissible level of environmental pollution. To achieve this, it is highly recommended to establish procedures for identifying applicable legal requirements related to the organisation's environmental aspects.

Finally, EMAS goes beyond the requirements of ISO 14001 in that it requires publication of an environmental statement that describes the environmental efforts of an organisation towards achieving the continual improvement of environmental performance. Doing so, it offers an opportunity to communicate publicly successes, problems and objectives in the field of environmental management. Thanks to providing all of the above information, it supports an active environmental information dialogue with all interested parties.

Table II.1.2. General requirements of ISO 14001 according to the ISO 14001:2004 standard

REQUIREMENTS	COMMENTS
ENVIRONMENTAL POLICY	A statement by the organisation of its intentions and principles, defined by top management, in relation to its overall environmental performance – provides a framework for action and for setting of the environmental objectives and targets. Key elements of the environmental policy are: a commitment to: continual improvement, pollution prevention and comply with relevant regulations.
PLANNING	
Environmental aspects	The organisation shall identify the environmental aspects of activities, products and services within the defined scope of the EMS that it can control. The organisation need to ensure that significant environmental aspects are determined.
Legal and other requirements	The organisation shall have procedures for identifying and communicating any applicable legal or other requirements related to its environmental aspects.
Objective, targets and programme(s)	The organisation shall maintain documented environmental objectives and targets. The objectives and targets shall be measurable and consistent with the environmental policy. An environmental management programme provides a comprehensive framework for achieving the objectives and targets. It includes designation of responsibility, the means and time-frame by which they are to be accomplished.
IMPLEMENTATION AND OPERATION	
Resources, roles, responsibility and authority	Resources including human resources, organisational, infrastructure, technology and financial need to be ensured. Responsibilities and authorities (including top management representative) shall be also appointed in order to facilitate effective environmental management.
Competence, training and awareness	The organisation shall provide an appropriate educational training to all personnel that perform tasks having a significant environmental impact and retain associated records.

Communication	The organisation shall establish procedures for internal communication among the various levels, and functions of the organisation. External communication is optional.
Documentation	Environmental management system needs to be documented. The documentation shall ensure the effective planning, operation and control of processes related to the significant environmental aspects.
Control of documents	Documents required by the environmental management system shall be controlled to keep them updated, legible and ready available.
Operational control	The organisation shall identify and plan the operations that are associated with the identified significant environmental aspects consistent with its environmental policy, objectives and targets.
Emergency preparedness and response	The organisation shall identify potential emergency situations and potential accidents that can have an impact on the environment and how it will respond to them. The procedures for the emergency situations identification shall be reviewed and test periodically.
CHECKING	
Monitoring and measurement	The organisation shall establish a procedure to monitor and measure, on a regular basis, the key characteristics of its operations that have a significant environmental impact.
Evaluation of compliance	The organisation shall establish a procedure for periodically evaluating compliance with applicable legal requirements.
Nonconformity, corrective action and preventive action	The organisation shall establish a procedure for dealing with actual and potential nonconformities and for taking corrective and preventive actions.
Control of records	The organisation shall maintain records to demonstrate conformity to the requirements of the EMS as well as establish procedures for the identification, storage, protection, retrieval, retention and disposal of records.
Internal audit	The organisation shall ensure that internal audits of the environmental management system are conducted at planned intervals. The internal audits should provide information whether the environmental management system complies with the requirements of ISO 14001 standard. Auditors' selection and conduct of audits shall ensure objectivity and the impartiality of the audit process.
MANAGEMENT REVIEW	Top management shall review the organisation's environmental management system, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness. Reviews shall include assessing opportunities for improvement and the need for changes to the environmental management system, including the environmental policy and environmental objectives and targets. Records of the management reviews should be maintained.

II.1.3. Certified organisations

It is very difficult to provide a reliable database of organisations certified to environmental management systems since there is a lack of any compile registers of such organisations. Organisations having the ISO 14001 standard have no obligation to inform any external parties of their certification. Consequently, databases of eco-certified organisations are based primarily upon information provided from accreditation and certification bodies that contribute on a volunteer basis. There might be, therefore, some divergences in the data on issued ISO 14001 certificates amid research institutions. With regard to EMAS, the situation is far better since all companies that complete the validation process successfully are listed in the formal register of EMAS organisations. A database of Polish EMAS registered companies is publicly available online at page <http://www.emas.mos.gov.pl/web/act/listOrgs.htm>. The Ministry of the Environment is responsible for bringing it up to date.

Quoting the data of the International Organisation for Standardization, there were 111,162 organisations being ISO 14001 certified worldwide by the end of 2005 (see table II.1.3). Although they come from different sectors, the majority is of industrial origin. European organisations represent 43% of the total number. This gives 47,837 organisations certified to ISO 14001 in Europe by December 2005. Poland with 948 eco-certified organisations is in 11th place in Europe behind such European countries as Spain, the United Kingdom or Germany having a stronger tradition of standardisation (see figure II.1.2). The first certificate to PN-EN ISO 14001:1998 – the Polish equivalent of ISO 14001 was issued in 1998. Since then the steady growth in certification can be observed (see figure II.1.3). The recorded decrease in the number of eco-certified organisations in the year 2000 is rather a calculation error of the International Organisation for Standardization than a real slump. According to many other resources, though, including Pochyluk (2000) there were 100 organisations with the valid PN-EN ISO 14001:1998 certificate in Poland at that time. Regardless of which statistical data is quoted, there is a considerable potential for the implementation of the ISO 14001 standard in Poland in comparison with other European countries.

Table II.1.3. Growth of ISO 14001 certificates from the end of 1998 to the end of 2005

	1998	1999	2000	2001	2002	2003	2004	2005
World								
No. of issued certificates	7,887	14,107	22,897	36,464	49,440	64,996	89,937	111,162
Growth rate in percent		79	62	59	36	31	38	24
Europe								
No. of issued certificates	4,254	7,365	11,021	17,941	23,305	30,918	39,278	47,837
Growth rate in percent		73	50	63	30	33	27	22
Poland								
No. of issued certificates	15	72	66	294	434	555	709	948
Growth rate in percent		380	-8	345	48	28	28	34

(Source: The annual ISO survey of ISO 9001 and ISO 14001 certificates, 2002 – 2005)

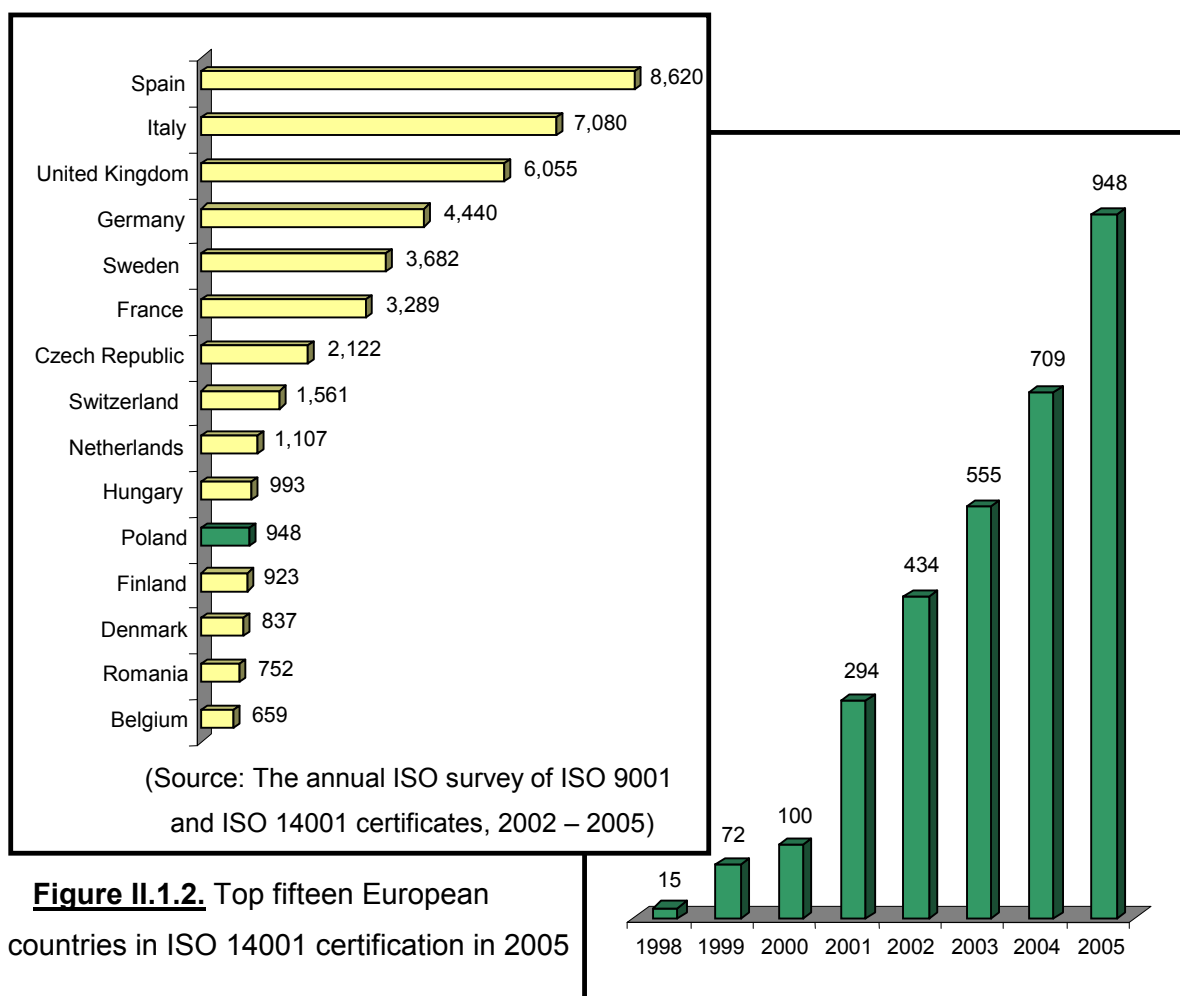


Figure II.1.2. Top fifteen European countries in ISO 14001 certification in 2005

Figure II.1.3. Annual growth in ISO 14001 certification in Poland from 1998 to 2005

According to the official statistics of the European Union, there were 3,195 organisations formally registered to EMAS by the end of 2005 (see table II.1.4). Almost half of them are of German origin (see figure II.1.4). Most of the EMAS registered organisations come from the industrial sectors (involved in manufacturing), but since mid of 2001, with EMAS opening to all other economic activities, an increasing number of companies from the service sector and local authorities have been joining the scheme too. 221 organisations from the sector of sewage and refuse disposal, sanitation and similar activities with the NACE code 90 illustrate this adequately.

Table II.1.4. Growth of EMAS registration from the end of 1998 to the end of 2005

	1998	1999	2000	2001	2002	2003	2004	2005
Europe								
No. of EMAS registered organisations	2,140	2,775	3,417	3,912	3,797	3,110	3,067	3,195
Growth rate in percent		30	23	14	-3	-18	-1	4
Poland								
No. of EMAS registered organisations	0	0	0	0	0	0	0	1

(Source: The European Commission – official statistics, 2005)

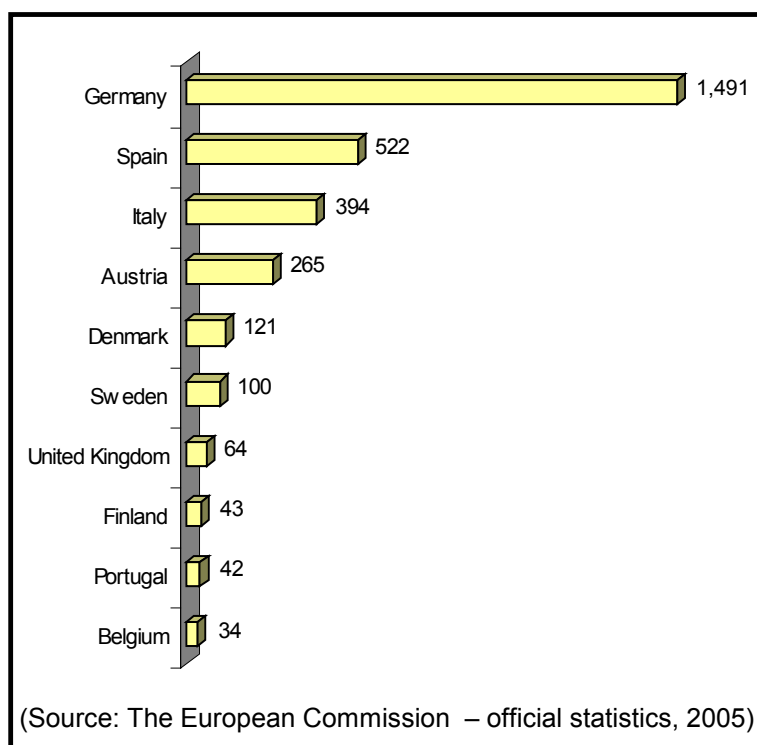


Figure II.1.4. Top ten European countries in EMAS registration in 2005

By the end of 2005, there was only 1 organisation in Poland, having a formal EMAS in place, which is BOT Power Plant Opole Plc. It represents the sector of electricity, gas, steam and hot water supply according to the distribution of organisations per NACE Code. Promising is the fact that there are plenty of multinational companies, operating on the Polish market, but officially EMAS registered in the countries where their headquarters are located.

Statistical data on ISO 14001 in comparison with EMAS implementation in Europe differs significantly (see figure II.1.5). First and foremost, ISO 14001 is more popular with the European organisations, reaching almost 48,000 of them in 2005. At the same time merely 3,200 organisations decided on EMAS registration. There are many reasons behind such a huge popularity of the ISO 14001 standard. Prime importance seems to be the fact that ISO 14001, thanks to requiring a less comprehensive evaluation of an organisation's environmental performance, generates lower costs of implementation. In consequence, more companies of medium and small size can afford it. A longer period of ISO 14001 opening to all types of organisations is of great significance as well. Polish example shows that EMAS is still in many companies at the experimental stage. Finally, many international corporations opt for implementing the system of ISO 14001 since it is a worldwide recognisable standard.

Considering trends in the implementation of environmental management systems in Europe from the end of 1998 to the end of 2005, unlike ISO 14001, EMAS shows a decreasing number in registration since 2002. The main reason for this is slow downing of new EMAS registrations in Germany. The German government has stopped subsidising the process of EMAS implementation in 2002. This, in consequence, has considerably restrained growth in new EMAS registrations and has made the EMAS prolongation unable in organisations of low income. The other factor of prime importance, according to the official EMAS statistics, is the change in the registration procedure. Under new EMAS regulations corporate registrations are possible. This might lead to a decreasing number of total registration but not necessarily to a decreasing number of sites operating according to the EMAS requirements.

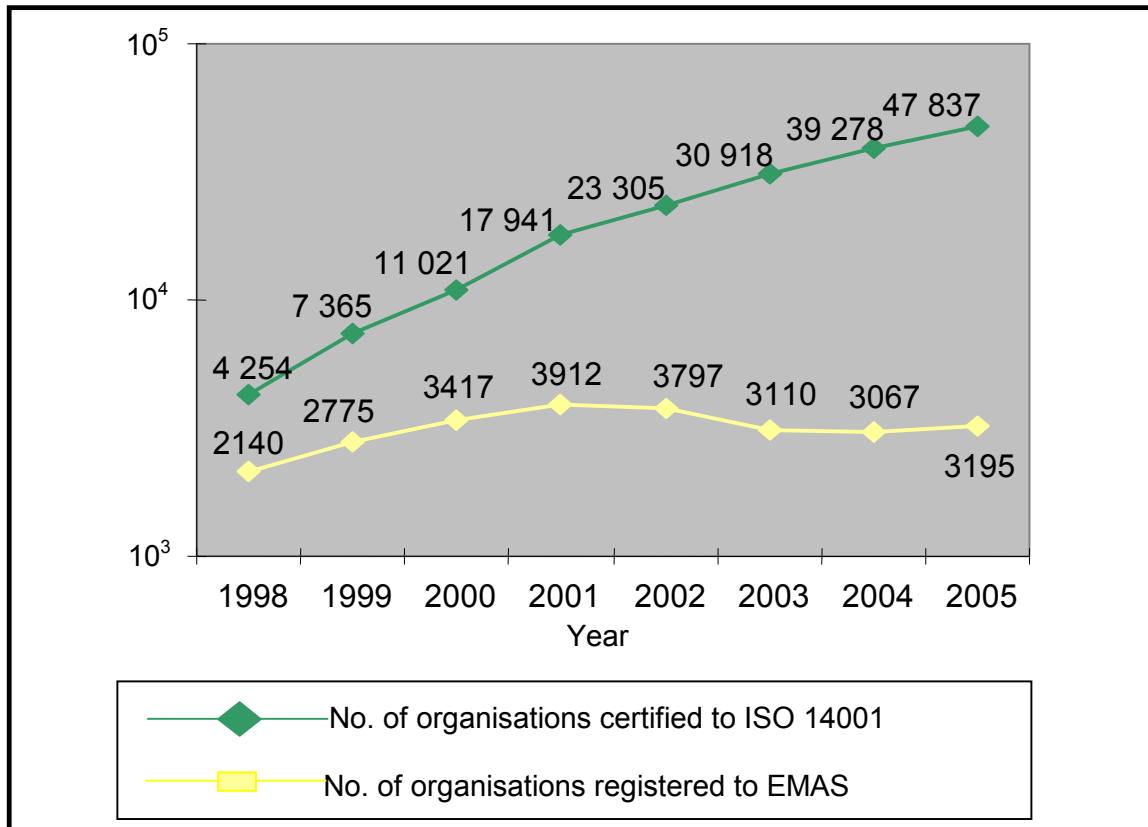


Figure II.1.5. European total of ISO 14001 certification versus EMAS registration from 1998 to 2005

II.1.4. Registration process

Although registration procedures according to the ISO 14001 standard and the EU Eco-Management and Audit Scheme are organised similarly, they are supervised differently. In the case of ISO 14001 the certification system is controlled entirely independently of Polish administration. EMAS, quite the opposite, is incorporated into national legislation and thus the Minister of the Environment is directly responsible for the organisation of the system in Poland. As a consequence the registration process to EMAS is more prescriptive but at the same time more transparent.

Organisations seeking formal ISO 14001 certification need to conduct an external audit performed by a certification body (see figure II.1.6). The certification body employs qualified auditors who evaluate EMS for conformance to the PN-EN ISO 14001:2005 standard – Polish equivalent of ISO 14001. The certification process is very time-consuming since it requires a

detailed examination of all elements of the ISO 14001 system. Once the organisation positively completes the third party audit, it is granted an ISO 14001 certificate. To ensure objectivity and relevant quality of services provided by certification bodies, they are subjected to periodical inspections by the Polish Centre of Accreditation (PCA). The PCA as a member of the European Cooperation for Accreditation operates in accordance with requirements specified in PN-EN ISO/IEC 17011:2005 (Standard Conformity assessment - General requirements for accreditation bodies accrediting conformity assessment bodies). Simultaneously, auditors working for the certification bodies are controlled independently by the Polish Centre for Testing and Certification. This double monitoring aims to guarantee impartiality and high status of ISO 14001 certificates regarding their environmental improvement potential. If quality of services offered by the certification body is unsatisfactory then this institution loses the accreditation of PCA and can no longer award ISO 14001 certificates.

According to the Act of 12th March 2004 and related to it executive decrees, the Ministry of the Environment serves the role of the Polish central competent body as regards the registration of EMAS organisations (see figure II.1.7). Consequently, the Minister of the Environment is responsible for updating the national register of EMAS organisations and sending the relevant data to the European Commission. On behalf of the Minister of the Environment at local level, governors provide assistance to all organisations interested in EMAS. They also consider applications for registration, run regional registers of EMAS organisations and pass the data on to the Ministry of the Environment. As with the case of ISO 14001, the PCA plays the role of accreditation body in Poland. This institution is responsible for accrediting environmental verifiers and making their list publicly available. By the end of 2005, there were only four environmental verifiers who have the accreditation of the PCA in Poland. The verifiers' duty is to support organisations in the process of EMAS implementation and to ensure conformity to the EMAS regulations. The quality of validated EMAS is, hence, double certified – firstly by environmental verifier who places his/her name under the environmental statement and secondly by the governor who reviews the system from the administrative site.

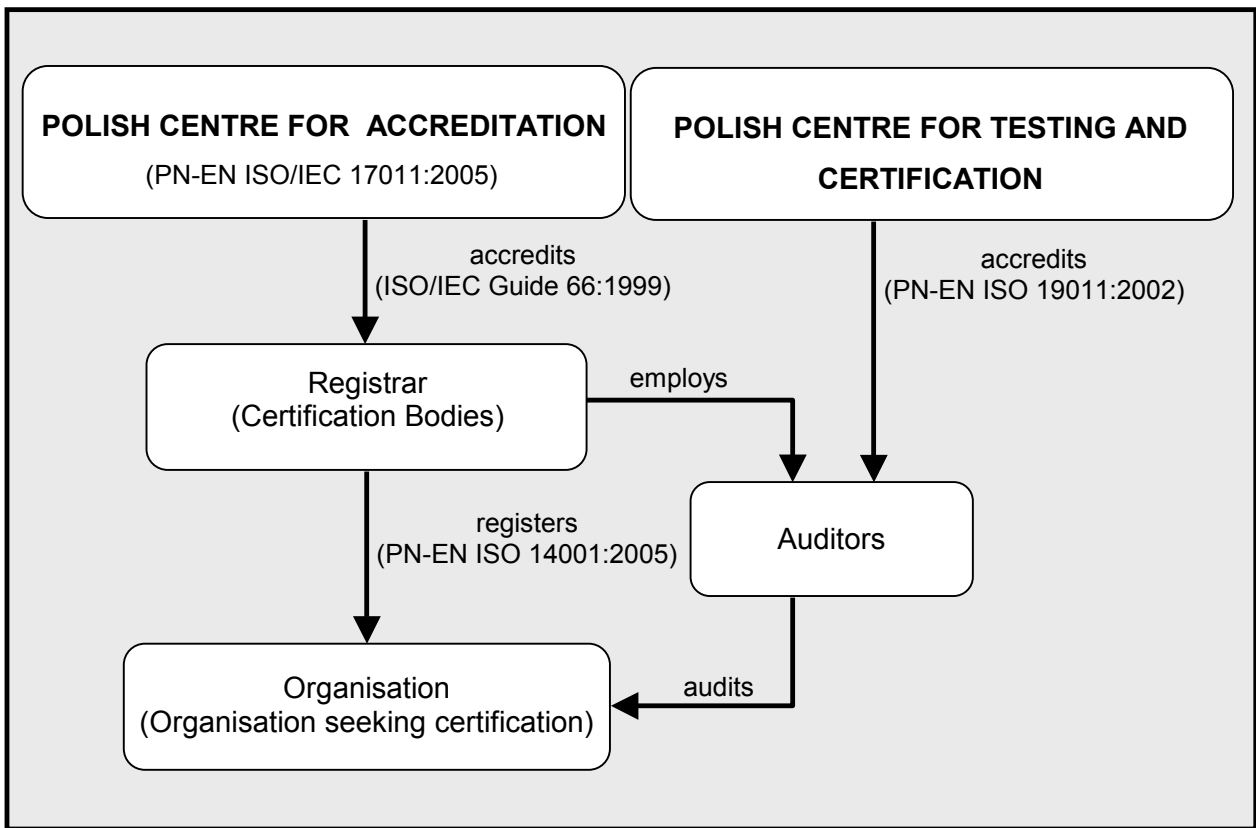


Figure II.1.6. Certification procedure to ISO 14001 in Poland

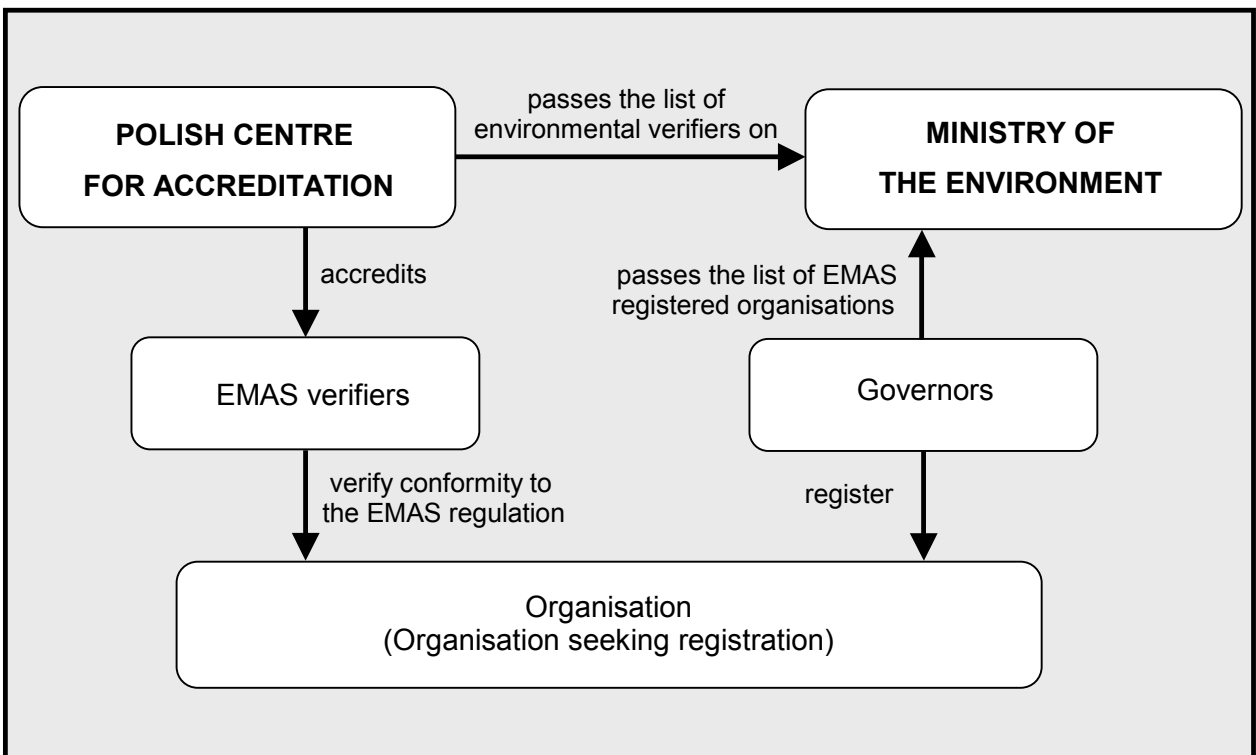


Figure II.1.7. Registration procedure to EMAS in Poland

II.2. Characteristics of the Polish municipal waste sector

From the beginning of the preparation for accession to the European Union, Poland has certainly made great progress in strengthening the system of environmental protection. Over the last 15 years, the environmental problems, though not yet completely solved, have begun to be recognised and addressed. Amidst environmental protection issues, the aspects of waste management have been treated as a priority since waste can cause pollution of all environmental components – surface and ground water, soil and air. Furthermore, waste adequately managed can bring quantifiable profits. It is hence, significant to work out a realistic and a long-term strategy that would enable a gradual and effective improvement of waste management in Poland.

Despite the fact that there are different approaches to the problems of municipal solid waste among members of the European Union, all systems are based upon the same foundations. Environmental regulations, which provide a clear definition of waste, classification of waste and characterisation of sustainable waste management techniques constitute the first pillar. Besides environmental regulations, the creation of adequate market mechanisms that would motivate materials and energy recovery from municipal solid waste is another essential element. The creation of cost-effective infrastructure for the collection and processing of municipal solid waste is the next indispensable condition. The final component of prime importance seems to be social acceptance and participation. The experiences of other countries have revealed that the municipal waste management sector can function effectively only if it incorporates all the above enumerated elements.

II.2.1. Regulations of waste management

A fundamental significance to the functioning of the system of environmental protection in Poland is the Environmental Protection Act of 27th April 2001. It has formulated leading principles of environmental protection, which are the consequence of the principle of sustainable development specified in the Constitution of the Republic of Poland (Article 5). Environmental protection in Poland is based upon the following principles:

- the principle of integrated environmental management

that implies rational protection of the environment – managing one component of the environment can not have any detrimental impacts on another component (Article 5),

- the principle of prevention

expressed as an obligation to prevent negative impacts on the environment incumbent upon all who are engaged in the activity capable of exerting such an impact (Article 6.1),

- the precautionary principle

which states – if there is the threat of serious environmental damage, lack of full scientific evidence should not be used as a reason for postponing measures to prevent environmental degradation (Article 6.2),

- the 'polluter pays' principle

defined as an obligation to bear the costs of removing any consequences of environmental pollution conferred upon everyone giving rise to such pollution (Article 7) and

- the principle of public access

that articulates the right of everyone to have access to information on the environment and its protection under conditions set out in the act (Article 9).

Apart from the Act of the Environmental Protection providing a legislative framework for making a rational use of the environment, the Waste Act of 27th April 2001 is the main legislation related to the management of municipal waste in Poland. The Waste Act with its successive amendments has required a profound change in the sector of waste management and thereby the introduction of new technological and economic practices.

In accordance with the Waste Act (Article 3.1) waste is any object that is abandoned or that its holder intends to or is obligated to abandon. Municipal waste is a segment of waste that comprises all household wastes as well as waste coming from other waste producers that, due to their composition, are similar to waste originating in households. The term “other waste producers” encompasses commercial and institutional establishments, for instance commerce and trade, small businesses, office buildings, schools and hospitals, and municipal services, for instance waste from parks, the sweeping of streets and maintenance of gardens. Depending on the consistency of municipal waste, they are classified as sewage and municipal solid waste (MSW). The latter that constitutes a solid fraction of municipal waste are the subject of this work.

The Waste Act has introduced into national legislation a universally adopted hierarchy of preferred waste management approaches. All actions giving rise to, or capable of giving rise to, the generation of waste should be planned and managed in such a way as to:

- prevent generation of waste, if unfeasible, than limit the negative impact on the environment as products are made, used and finally disposed of (Article 5.1),
- assure waste reuse and raw materials recovery in line with the principles of environmental protection, if it is impossible to prevent waste from being generated (Article 5.2),
- enable safe disposal of waste in line with the principles of environmental protection, if it is impossible to prevent the generation of waste, or allocate them for reuse and recovery (Article 5.3). Prior to waste being placed in a landfill site, it should be subjected to a process of physical, chemical or biological transformation.

With regard to MSW, a substantial reduction in waste generation is very difficult to achieve. It requires, though, extensive changes in consumption patterns thereby high public environmental awareness as well as lessening of material intensity during production and packaging of goods. As these two are unlikely to be succeeded in the near future, sound collection, transportation, processing and the disposal of MSW is crucial.

The Waste Act defines the responsibilities of waste holders, which according to legislation are municipal waste treatment facilities (MWTFS) operating in Poland. In line with the waste hierarchy, MWTFS that are in possession of municipal solid waste are obligated to ensure their recovery (Article 7). Unless it is possible from local technological or economic circumstances, MSW ought to be treated, inter alia, to reduce use of capacity of a landfill site. Ultimately, only when all the above enumerated options fail, can municipal solid waste be deposited at a sanitary landfill site. The disposal of waste must be designed and operated so as to minimise the threat to the environment, in particular surface water, groundwater, soil, air and human health. The Ministry of the Environment in its Decree of 9th December 2002 has established the monitoring procedures for landfill sites. Whilst in operational phase, a sanitary landfill site's environmental quality monitoring ought to be conducted every 3 months as regards surface and ground water whereas leachate and landfill gases should be checked every month. Operating a landfill site requires paying environmental fees related to the use of the environment. The quantity and method of calculation and payment of environmental fees are regulated by the Act of the Environmental Protection (Articles 284 – 297) and the Decree of 9th October 2001 issued by the Cabinet. For example, for landfilling 1 tonne of commingled MSW, a waste holder needs to pay 13.8 Polish zlotys of the environmental fee. The use of the environment without scope of an operating permit is subject to a financial penalty imposed by an Inspector of Environmental Protection. The amount of the penalty is a multiple of the environmental fees.

A thorough analysis of the legislation on waste management has shown that the process of transposition of European Union requirements into the Polish legal system is nearing its completion. This was confirmed in a report by the European Commission saying that “as opposed to many other areas – work on legislation in the field of environmental protection in Poland did not need any acceleration, and that there were no delays” (Lityńska, 2006). A much more difficult task, though, will be to transfer the spirit of legal changes to well-established practices among both producers and holders of municipal solid waste.

II.2.2. Generation and composition of MSW

According to the Polish Central Statistical Office, 133,789 thousand tonnes of waste was generated in Poland in 2004. Of this, 9,759 thousand tonnes (approximately 7.5%) was municipal solid waste. The remainder was industrial waste, mainly mining, engineering and agricultural food. Most municipal waste (approximately 70%) comes from residential areas. Other sources of municipal waste are commercial and institutional establishments (approximately 25%) and municipal services (approximately 5%).

There are special variations in the generation of municipal solid waste in Poland. The most apparent is the difference in the accumulation of MSW between rural and urban areas, namely cities are responsible for 85% of the total amount of MSW. In addition the population of Poland is distributed unequally and, consequently, the counties with the largest population have the highest levels of municipal solid waste production. The regions of Mazovia, Silesia, Wielkopolskie and Lower Silesia, inhabited by more than 3 million each, are the largest contributors to the generation of MSW in Poland. Together, they are responsible for almost 50% of the national generation of municipal solid waste. On the other hand, Swietokrzyskie, Opole and Lubuskie counties are the smallest MSW producers on a country scale.

Converting the level of municipal solid waste production into kg per capita per year, an estimated 256 kg of municipal solid waste was generated per person in Poland in 2004. In comparison with previous years, this is a decreasing trend having its roots in the changes in leaving and consumption patterns. Due to the rapid expansion of central heating in recent years, the fraction of MSW that is emitted after the combustion of coal and wood, primarily ashes, was largely eliminated. Moreover, the composition of packaging waste is altering as people are buying products in light plastic bottles and tetra packs instead of glass bottles. Although Poland is able to achieve an average level of municipal solid waste production below 300 kg per capita, and thus fulfils its commitments to the European Union, there are counties which have a considerably higher ratio of MSW accumulation. These are Lower Silesia,

Mazovia and West Pomerania that exceed the average level of municipal solid waste production per capita per year by more than 50 kg. This reflects a relatively high economic development of these regions since they are largely inhabited by people on higher-incomes.

According to Rosik-Dulewska (2002), the composition of municipal solid waste in Poland demonstrates a wide fluctuation in time and space. Consequently, the type and fraction of individual components that constitute a stream of MSW depend largely upon the season of the year and geographical location (countryside or city). Basically, municipal solid waste from urban areas contains more food remains and paper but less fine powdery materials (ashes and minerals). A higher percentage of food and yard waste is noticeable also in summer and autumn in comparison with winter and spring. By the National Waste Strategy for Poland (2002), Polish municipal solid waste has typical distribution of components for middle-income countries. Poland, characteristically though, has a high percentage of building waste (construction and demolition waste) (approximately 10%) in the total stream of MSW, which is a result of the rapid growth of the building industry in Poland.

Analysing the composition of municipal solid waste in Poland as a potential source of secondary raw materials, the following waste categories can be distinguished:

- dry recycable materials – paper and cardboard, plastics, glass, metals, textiles – constituting 45%,
- food and yard waste used mainly as compostable materials – constituting 21%,
- building waste being processed to obtain crushed rubble for use in civil engineering – constituting 10% and
- remaining waste, for instance ashes, having a low utility value – constituting 24%.

The observed changes in the composition of MSW in Poland have been indicating a systematic increase in the percentage of packaging waste. The quantity of food and yard waste is expected to stay at the same high level. Finally, it is anticipated that ashes and residues remaining from the combustion of coal are the only fraction of MSW continuing to decrease.

Table II.2.1. Generation of municipal solid waste in 2004

County	Total [in thousand tonnes]	Total [in kg per capita per year]	From residential areas [in thousand tonnes]
Lower Silesia	926	320	661
Kujawsko-Pomorskie	447	216	335
Lublin	313	143	234
Lubuskie	284	281	208
Lodz	661	256	411
Malopolskie	611	188	406
Mazovia	1610	313	973
Opole	271	257	202
Podkarpacie	379	181	263
Podlasie	293	244	215
Pomerania	612	279	375
Silesia	1304	277	907
Swietokrzyskie	179	139	126
Warmian-Mazurian	339	237	234
Wielkopolskie	1003	298	683
West Pomerania	528	312	369
Poland	9759	256	6602

(Source: Environmental Protection - Statistical Yearbook, 2005)

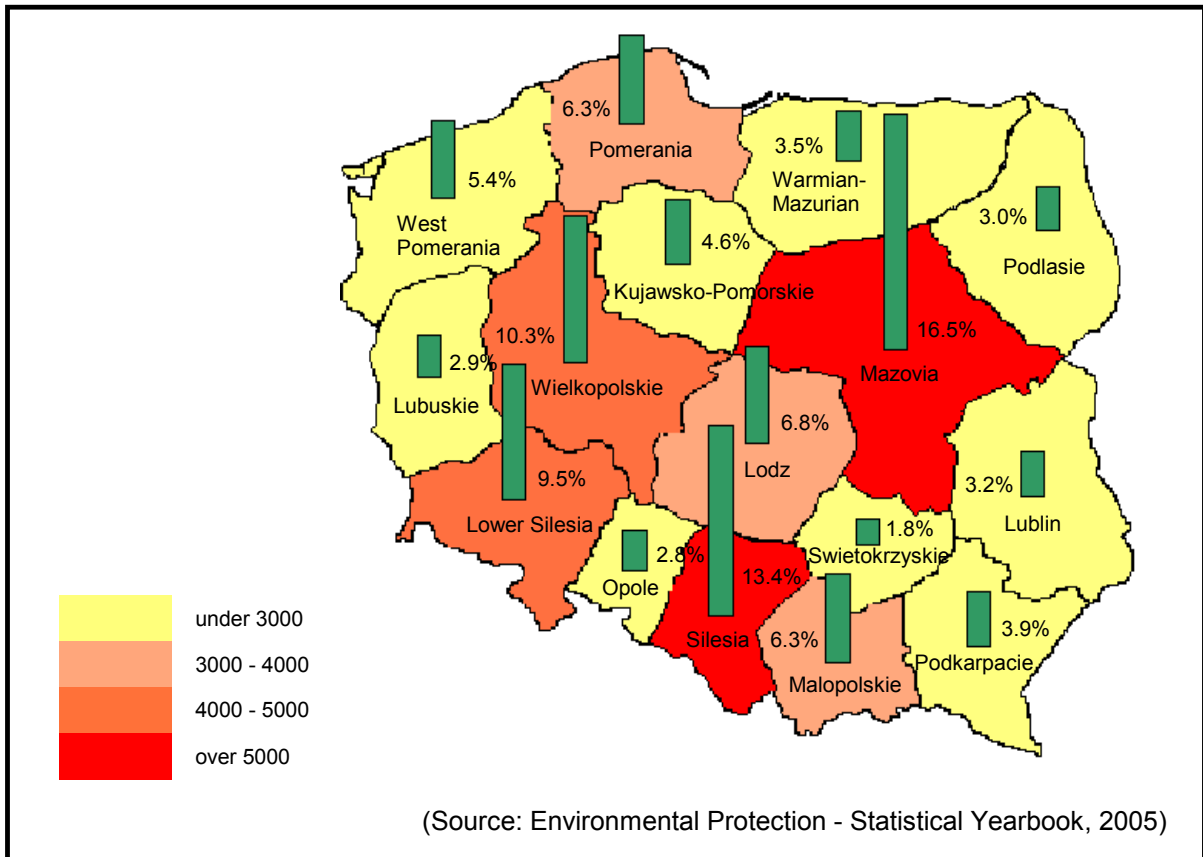


Figure II.2.1. Generation of municipal solid waste by county in 2004

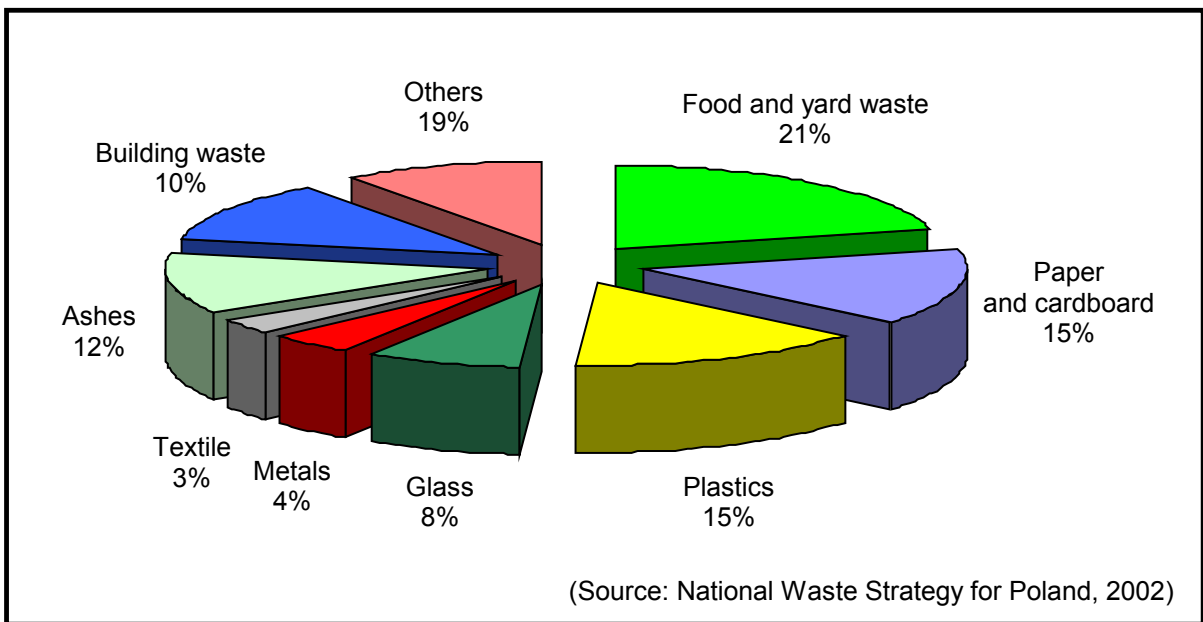


Figure II.2.2. Average composition of municipal solid waste in Poland

II.2.3. The system of MSW collection, transformation and disposal

According to the Polish Central Statistical Office, out of 9,759 thousand tonnes of MSW generated in 2004, 243 thousand tonnes were separately collected (see figure II.2.3). This represents solely 2.5% of the total production of municipal solid waste. The percentage of total amount of materials recovered from MSW varies in Poland, though, from about 1.1% in the region of Lubuskie to 3.8% in the region of Pomerania. As in previous years, paper and cardboard, glass and plastics were the main streams of materials selectively collected at source. The biggest share in the separate collection was glass waste, amounted to 73 thousand tonnes and waste paper representing 67 thousand tonnes. In addition, people have been given an opportunity to separately collect metals, textiles and bulky waste. At the figure II.2.3, they are depicted as others and are estimated together to be 72 thousand tonnes.

The system of the collection of municipal solid waste has largely improved over the last few years. In 2004, MSW was collected from 90% of Polish households and containers for separate MSW collection were provided for up to 81% of Polish communes (Ministry of the Environment, 2005). In comparison with 2000, it is undoubtedly considerable progress since the regular system for separate MSW collection was offered to only 30% of Polish communes at that time. Unfortunately improvements in the infrastructure have not been followed by rising quantities of materials recovery from MSW. Thereby, the highest amounts of selected dry recyclables are not automatically reached by counties with well established systems for separate MSW collection. The county of Opole exemplifies it very well since this region was able to select 3.3% of the total production of MSW in 2004 despite having very poor infrastructure for MSW collection (see figure II.2.4). Conversely, the county of Lubuskie, which was one of the initiators of the separate MSW collection in Poland at the beginning of the 1990's, achieved a recovery rate of 1.1% of dry recyclables in 2004. The largest amounts of separately collected MSW are in the counties of Mazovia and Silesia amounting to nearly 40 thousand tonnes yearly. Just behind them are the counties of Lower Silesia, Pomerania and Wielkopolskie with an average portion of selected dry recyclables of 24 thousand tonnes.

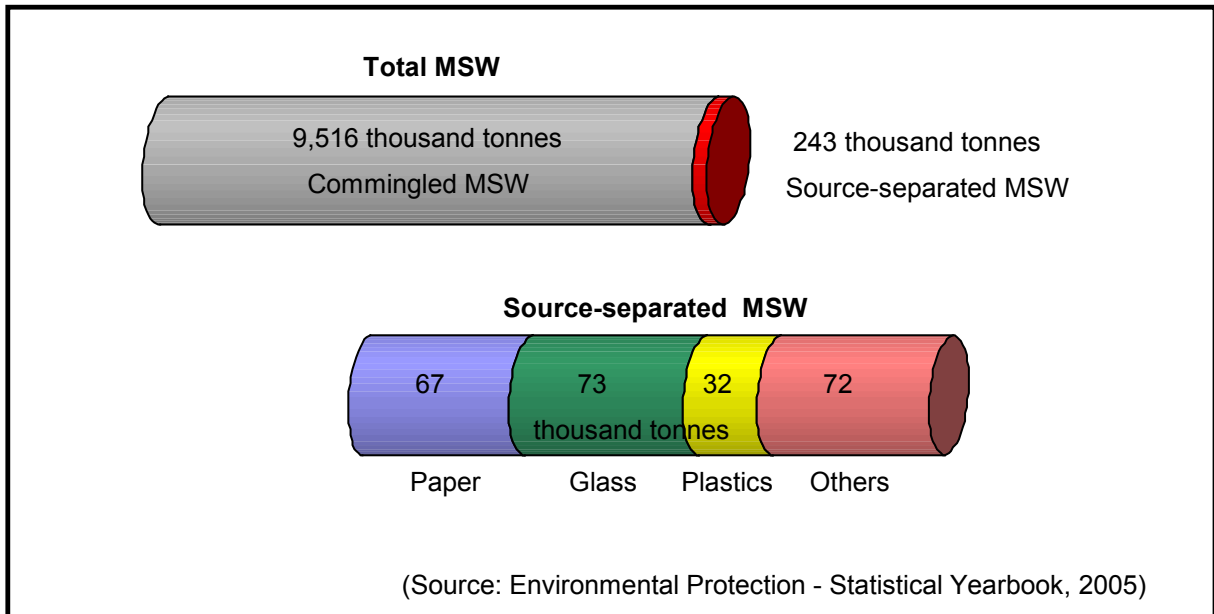


Figure II.2.3. Collection of municipal solid waste in Poland in 2004

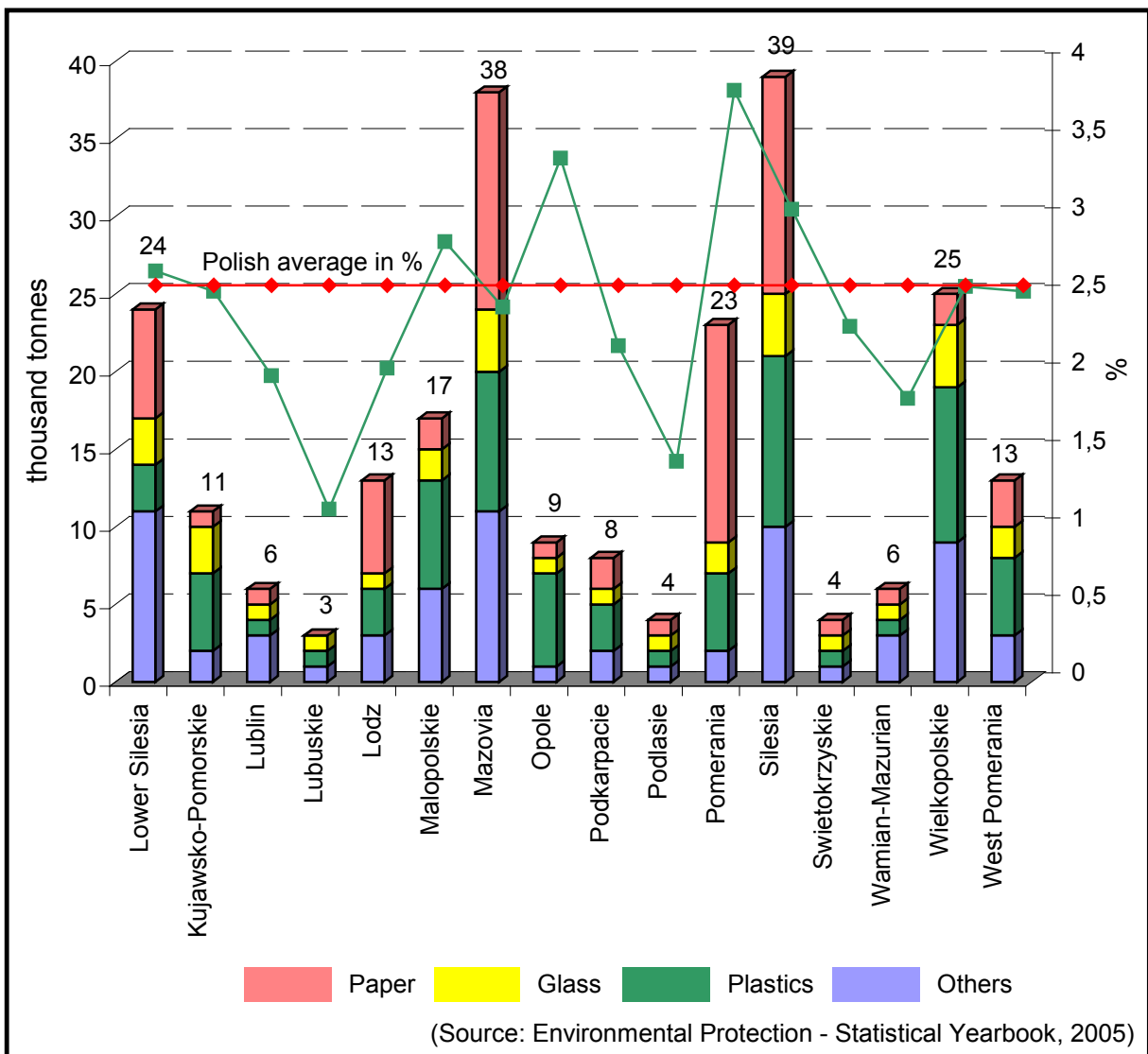


Figure II.2.4. Source-separated municipal solid waste by county in 2004

The applied system for the collection and transportation of municipal solid waste in Poland does not differ from European standards. The additive system being a combination of off-site collection of dry recyclables and on-site collection of commingle waste is the most frequently applied on account of the types of residential dwellings in Poland. Typically, large stationary containers for commingle waste are placed in the near neighbourhood of medium-rise and high-rise apartments, which are emptied mechanically using vehicles equipped with an unloading mechanism. Next to an area of commingle waste storage, drop-off centres for dry-recyclables are located. In many communities, these are easy-access ‘igloo’ containers of 2.5 m³ capacity (see figure II.2.5) or open-top containers of 1.1 m³ capacity, enabling separate collection of glass, paper, and plastics together with metals. A refuse collection takes place weekly or fortnightly depending upon the types of buildings to be served. The collection of bulky waste is organised a few times a year and inhabitants are informed in advance about its date and form.



Figure II.2.5. Easy access ‘igloo’ and open-top containers for separate waste collection

According to the Ministry of the Environment (2005), deficiencies in the relevant infrastructure are no longer the main limiting factors for the increasing amounts of separately collected waste but a lack of public involvement is a real problem. Despite the fact that this problem has been recognised, it is extremely difficult to change people's habits and to break public scepticism as to the benefits of separate MSW collection. Years of little environmental education have resulted in very poor public awareness meaning that even though people are separating municipal solid waste, the quality of materials recovered is often unsatisfactory.

Materials and energy recovery from MSW through physical, biological and chemical transformation encompasses a tiny percentage of municipal solid waste management in Poland. Following data of the Polish Central Statistical Office, for 9,759 thousand tonnes of MSW generated in 2004, only 564 thousand tonnes was recovered, giving a level of 5.8% (see figure II.2.6 and figure II.2.7). Despite such poor recovery records in Poland, many regions are far more advanced in the institution of sustainable waste management methods. The county of Mazovia that applies a mixture of techniques for materials and energy recovery exemplifies the virtues of a well organised system. Due to its dynamic modernisation of current practices, this region was able to transform more than 10% of MSW produced in 2004 (see figure II.2.8).

Regarding the aerobic biological conversion techniques applied in the management of municipal solid waste, they have still been in little use, which is contrary to the legal requirements enforced. In 2004, 234 thousand tonnes of biodegradable MSW was recovered through composting processes in Poland; this represents only 2.4% of municipal solid waste generated in this year. The largest quantity of compost was produced in the county of Mazovia (71 thousand tonnes), followed by the regions of Podlasie and Silesia, where another 100 thousand tonnes was obtained. DANO and HERHOF are the most commonly used technologies for the treatment of organic fraction of MSW in Poland. Afterwards, the process of screening is employed in order to enhance the value of the final product. In this way obtained compost is, first and foremost, applied to land reclamation, fertilisation in agriculture and gardening providing it has adequate quality.

Although chemical transformation (incineration) of municipal solid waste is according to the National Waste Strategy for Poland an acceptable method of waste management, it is hardly instituted in the country. There is only one incineration plant for municipal solid waste that operates in the region of Mazovia. In 2004, this plant processed 87 thousand tonnes of MSW, which constituted solely 0.9% of the total stream of MSW generated in Poland at that time. Despite these poor results, a substantial expansion of the incineration of MSW is soon expected since seven of the next Polish counties intend to chemically transform part of their municipal solid waste by 2013. The lack of financial resources and strong public opposition may, however, considerably restrain the construction of incineration plants.

Disposal at landfill sites is the primary method of municipal solid waste management in Poland. Historically, it has been the most socio-economically accepted method and, as a result, it still remains a very important component of MSW management. In 2004, 94.2% of municipal solid waste, 9193 thousand tonnes, was discharged into landfill sites located around the country. Hopefully, there are regions that rely on landfill disposal to a lower degree. The region of Mazovia, for instance, disposes less than 90% of MSW generated. Converting the level of average municipal solid waste landfilling into kg per capita per year, an estimated 241 kg of MSW was disposed per person in Poland in 2004. This is less than the European average, which was equal to 271 kg per capita in 2002 (see figure II.2.9). In Poland, it is common practice to monitor the stream of municipal solid waste, namely quantity and composition, before placing it in a landfill site. For this purpose, scales in municipal waste treatment facilities are installed. Afterwards, MSW is squashed to reduce its volume thus to extend the operational phase of a landfill site. All sanitary landfills in Poland are designed and are expected to operate to minimise public health and environmental impacts. They are, hence, sealed with geomembrane to minimise the infiltration of leachate into the subsurface soil, equipped with a leachate collection system and a landfill gas control system. By the end of 2004, there were 32 landfill gas energy recovery systems in Poland. The majority of them have been converting landfill gas into electric energy; only a few have been producing thermal energy. Finally, all sanitary landfills are monitored environmentally.

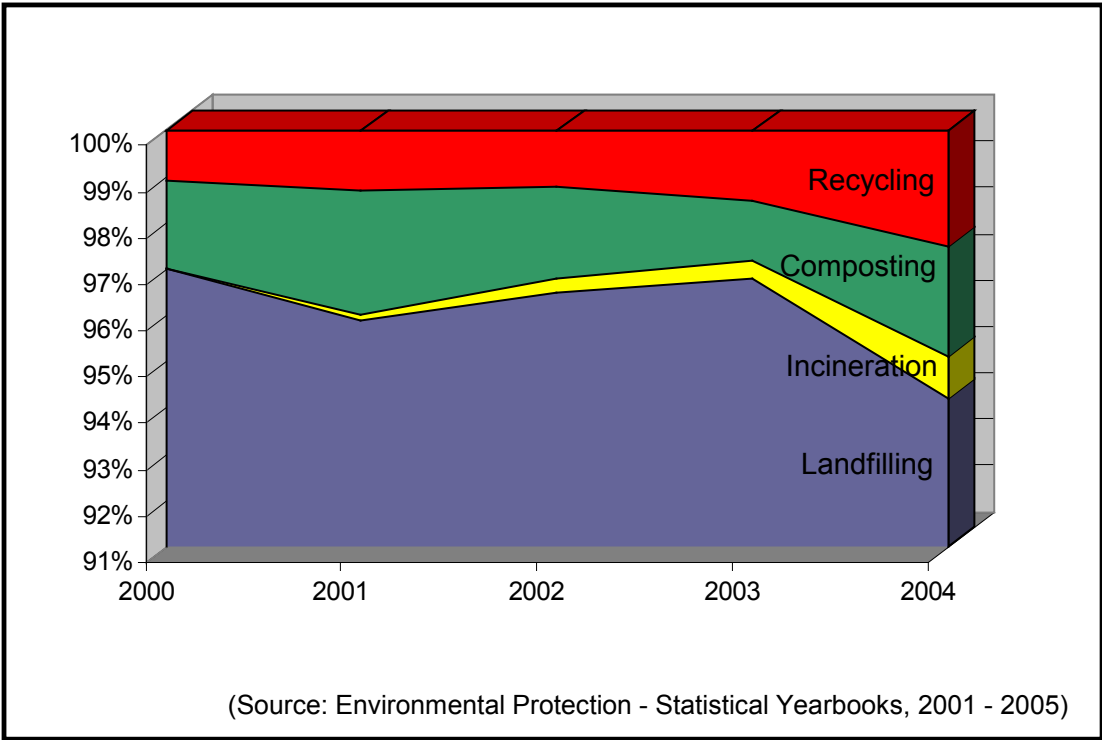


Figure II.2.6. Management of municipal solid waste in Poland from 2000 to 2004

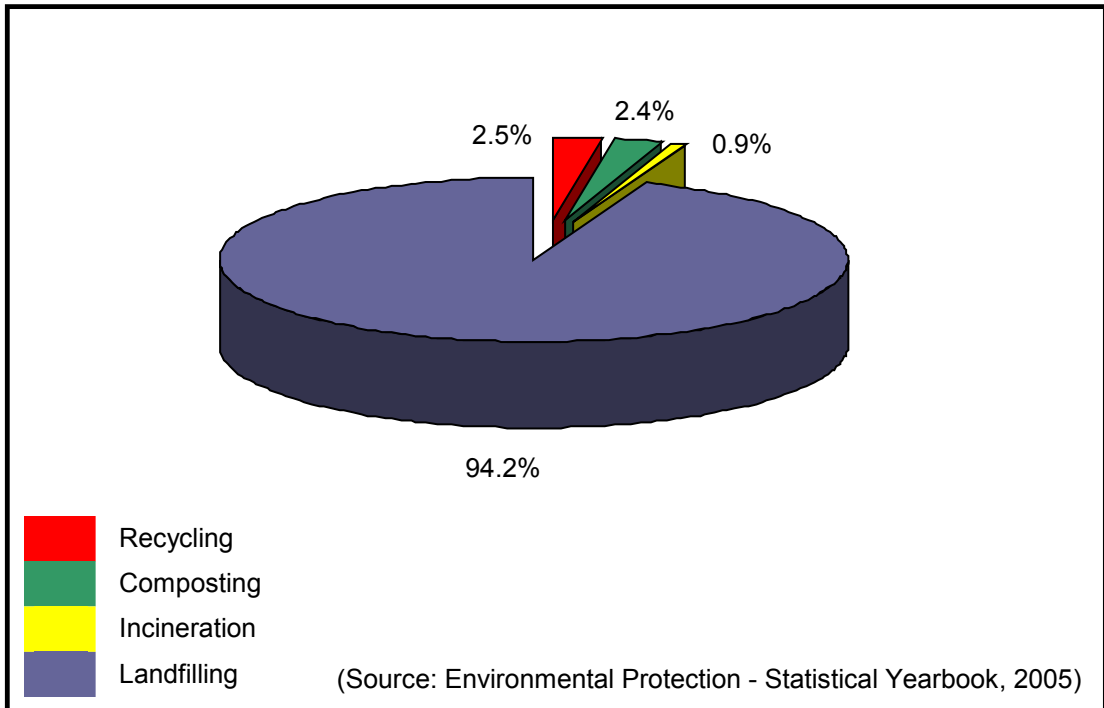


Figure II.2.7. Management of municipal solid waste in Poland in 2004

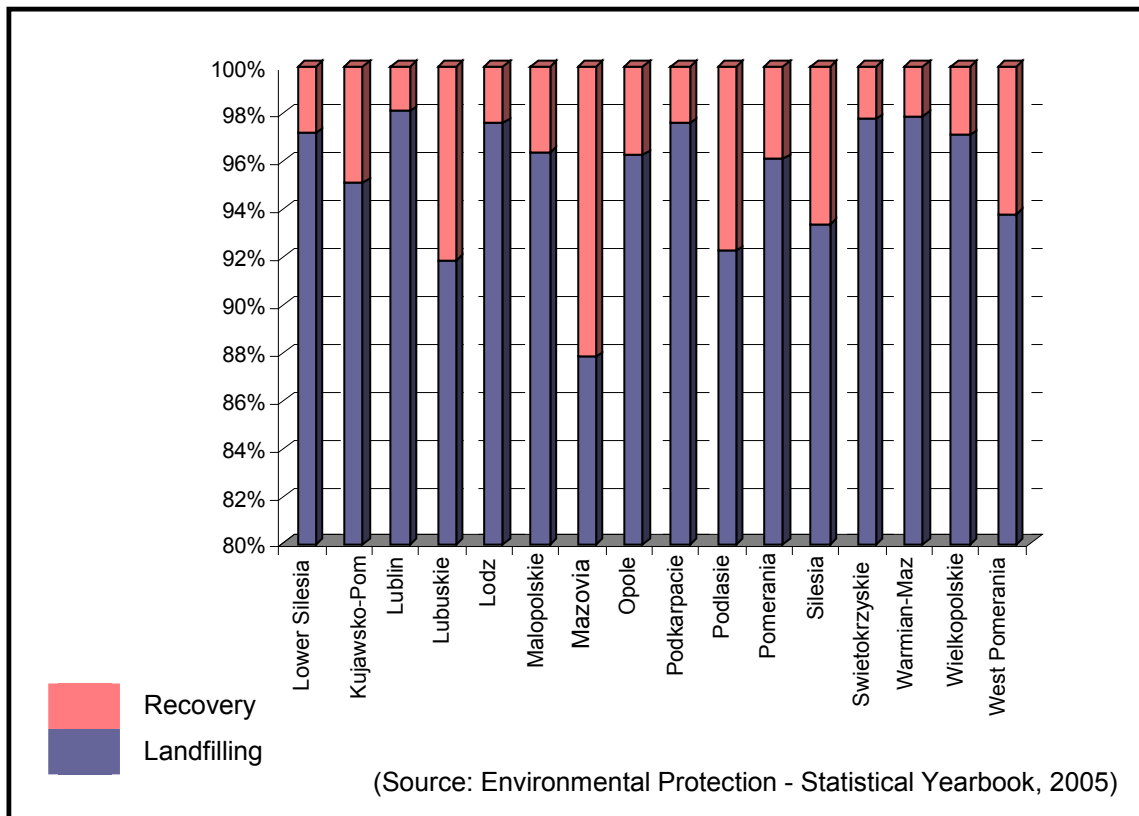


Figure II.2.8. Recovery and disposal of municipal solid waste by county in 2004

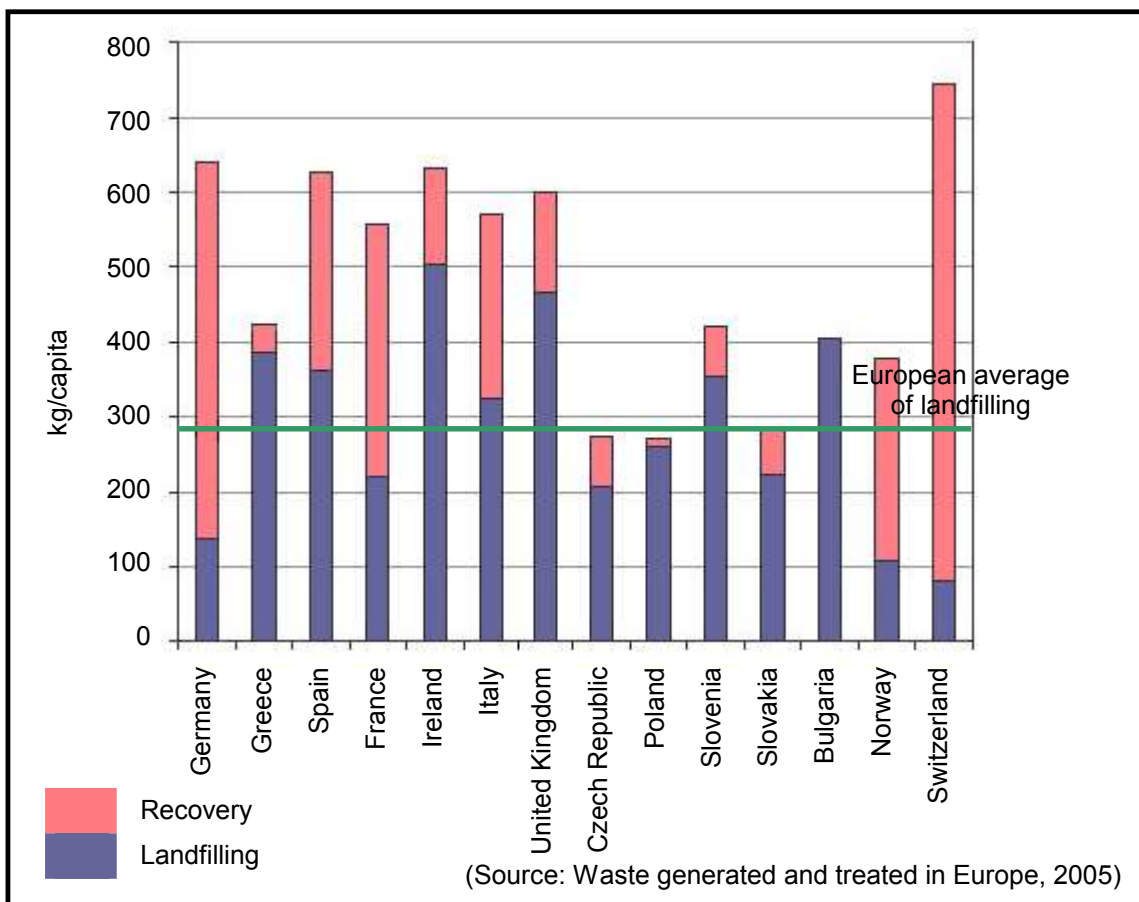


Figure II.2.9. Recovery and disposal of municipal solid waste in chosen European countries in 2002

II.2.4. Organisational structure of the municipal waste sector

The management of municipal solid waste falls within the jurisdiction of local governments. Their detailed obligations are presented in the Maintenance of Cleanliness and Order in the Communes Act of 13th September 1996. According to this Act, local governments are obliged, inter alia, to remove, recover and safely dispose of waste generated by communities. They have the right, however, to decide on their role in fulfilling these responsibilities. Consequently, local governments may act exclusively as a supervisory organ or as an executive and supervisory organ simultaneously. Depending on the choice of individual local governments, management of municipal solid waste can be operated by public or private organisations, or a combination of public and private sectors alternatively (Jakubczyk et al, 1998). If the system relies on the mixture of public and private capital then the common practice is to contract private hauliers to collect MSW. No single organisational structure is universally applied in Poland since each local government needs to consider its own financial and technological capabilities.

Most local governments in Poland have still been managing their municipal solid waste autonomously either via a budgetary organisation or an incorporated company – joint stock or limited liability company (see figure II.2.10). While the budgetary organisation is directly subordinated to local government, an incorporated company has greater independence through having its own legal entity, economic autonomy and administration. A local government, though, still has some control over the operation of an incorporated company since it has its representatives on a supervising board. Incorporated companies can put some of their services out to tender. This leads to the inclusion of the private sector into the management of municipal solid waste which, in the long run, can improve the quality of municipal services. In addition, this may decrease unit operation costs. Irrespective of the choice of ownership structure, most of small and medium-size communes have limited financial resources and, as a result, restrict their activity to collecting and disposing municipal solid waste at landfill sites. Only some, the wealthier communes, supplement the system by materials and energy recovery from the stream of MSW.

As very often individual local governments have insufficient financial, technological and organisational capabilities for the proper integrated management of municipal solid waste, they are encouraged to co-operate with neighbour communes. Two or more local governments can establish 'an intercommunal structure' – a kind of regional organisation for an execution of their responsibilities with regard to the provision of waste collection, recovery and disposal services (see figure II.2.11). It is also possible to restrict the collaboration between communes to only one element, for instance the disposal of MSW at a regional sanitary landfill site. In practice, the collection of MSW is very often left within the duties of individual communes. There are many potential 'intercommunal structures' for local governments that wish to combine their efforts in the proper management of municipal solid waste. Two most commonly chosen alternatives are an association of communes or an incorporated company – a joint stock or a limited liability company. The former in comparison with the latter has a lower sovereignty due to a strong dependence on local governments that make nominal financial contribution and can afterwards decide about the allocation of this input. This may lead to many conflicting situations since the priorities of one community can be dissimilar with the priorities of the association of communes. If only local governments are able to reach an agreement as to the organisational structure they can largely benefit from this. Frequently when the communes share their responsibilities for the management of municipal solid waste, then the unit investment and operation costs become lower, there is wider access to external funding and there is a higher ability to adopt innovative technologies.

Taking the above into consideration, it is planned to reorganise the organisational structure of the Polish municipal waste sector in the near future. All duties related to the recovery and the disposal of MSW will be shifted to regional governments; thus local governments will be solely responsible for the collection of MSW. Until these changes are implemented, it is highly recommended to all small communes with few citizens and a small income to establish 'an intercommunal structure'. Simultaneously, based on the instructions of the Minister of the Environment, local governments need to facilitate the formation of public-private partnerships (Ministry of the Environment, 2005).

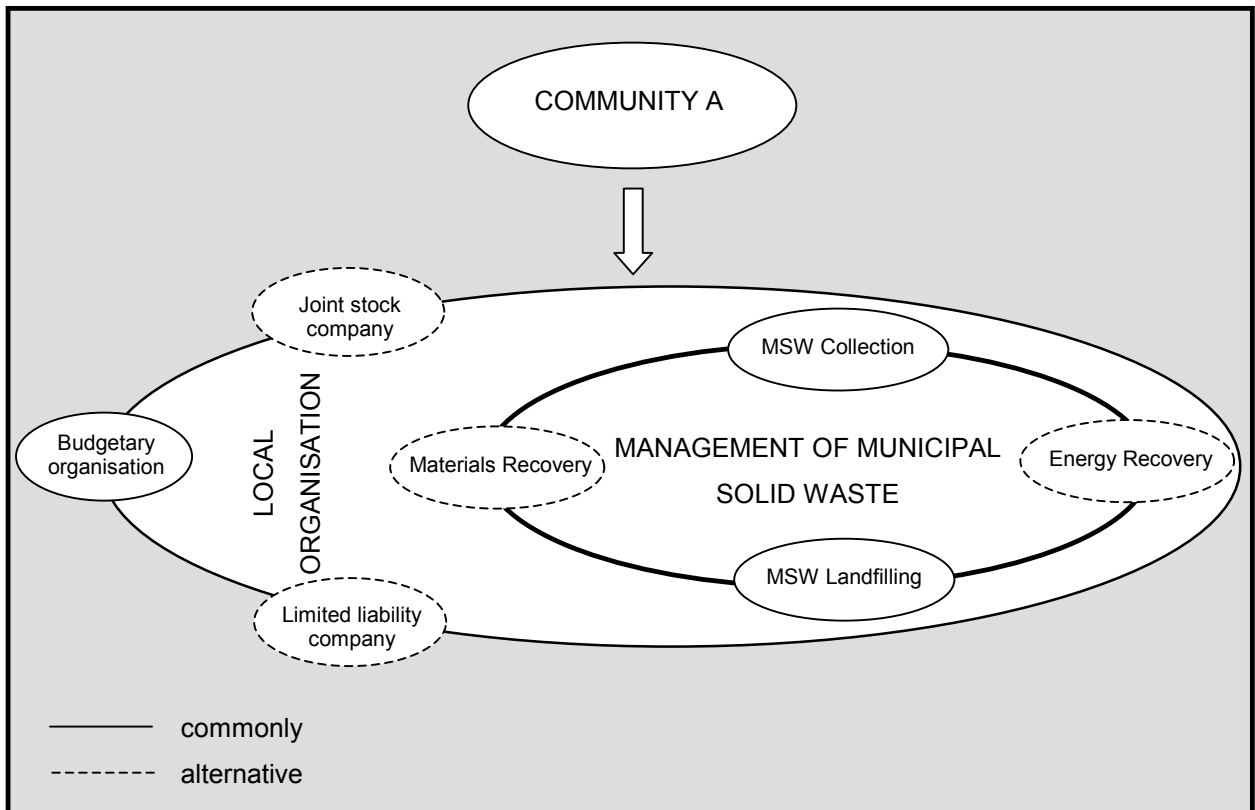


Figure II.2.10. Communal management of municipal solid waste

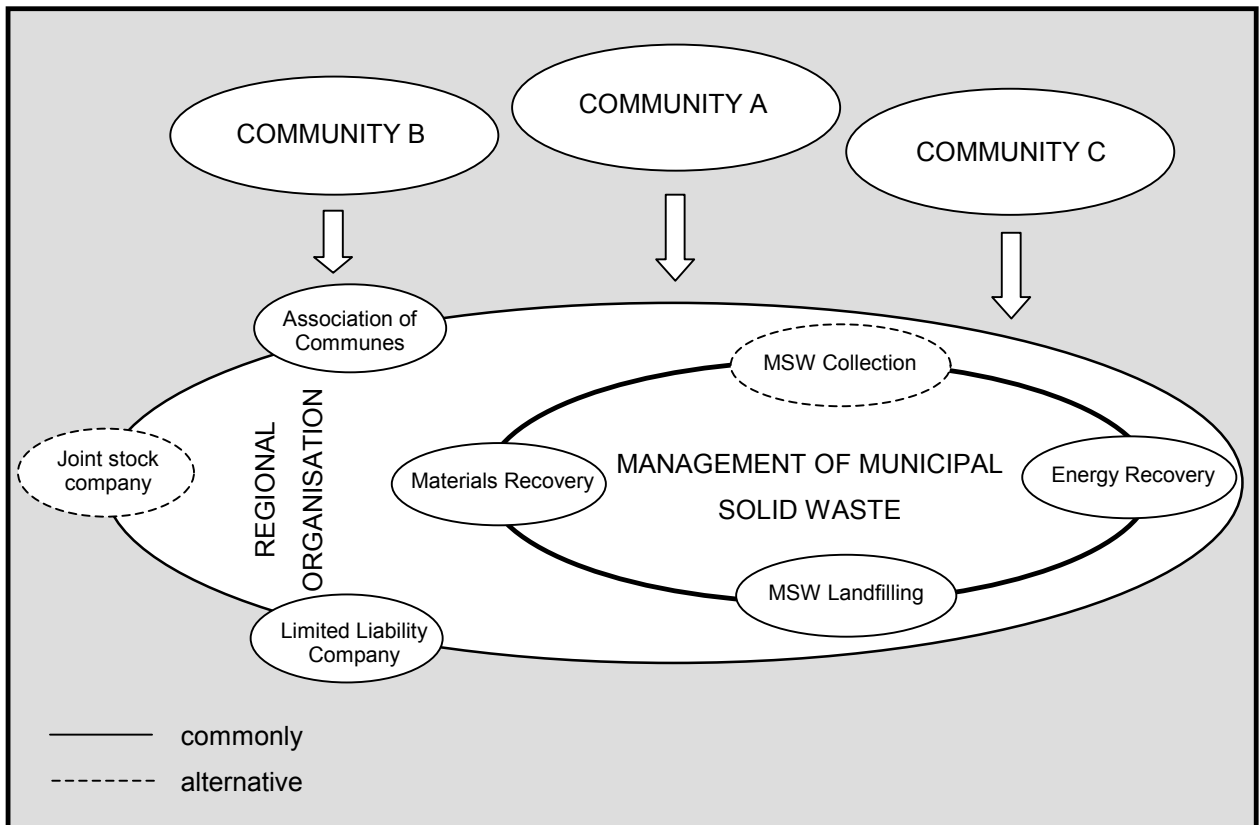


Figure II.2.11. Intercommunal co-operation in the management of municipal solid waste

II.2.5. Priorities and objectives of MSW management

The guidelines for the management of municipal solid waste are presented in the Second National Environmental Policy adopted by the Parliament of Poland in 2000. In order to achieve a gradual improvement in the performance of the municipal waste sector, the fulfilment of obligation towards the European Union was split into three phases. The first phase, implementation of the short-term priorities, was accomplished in the period between 2000-2002. According to the Ministry of the Environment, the municipal waste sector attained a readiness for membership of the European Union at the end of this phase. At that time, though, Poland managed to harmonise its environmental laws with those of the European Union and to develop waste management strategies at national, regional and local levels (Article 84). The second phase, implementation of medium-term priorities, falls between 2003-2010, the initial period of Polish membership of the European Union. The medium-term objectives in terms of the integration process with the European Union include the implementation of required tools and instruments in the field of MSW management. Consequently, the Ministry of the Environment hopes for the intensification of a practical implementation of the developed waste management strategies, an establishment of integrated infrastructure for the selective collection, transportation, segregation, reuse, recovery and safe disposal of MSW, and finally a creation of markets for recovered materials (Article 85). The final phase, implementation of the long-term objectives, is expected to be completed by 2025 and embraces a significant reduction of material-energy intensity and waste generation in production processes. In order to achieve this, the priority will be the full restructuring of the consumption and production model while utilising the best available techniques and a product-life cycle analysis (Article 86).

Although legal, administrative and economic mechanisms governing the waste sector are the main focus of the Second National Environmental Policy, it also determines some quantitative measures to be accomplished. In terms of the management of municipal solid waste, the most significant are maintenance of an average level of municipal waste at 300 kg per capita, reuse and recovery of at least 50% of paper and glass by 2010 and ultimately the systematic execution of a national strategy for the reduction of landfilled biodegradable waste,

in line with the Council Directive 1999/31/EC concerning the landfilling of waste (Articles 84-86). Considering the requirements of the Council Directive 1999/31/EC, the following amounts of biodegradable municipal waste can be deposited:

- by 2010 – 75% of the total amount (by weight) of biodegradable municipal waste generated in 1995,
- by 2013 – 50% of the total amount (by weight) of biodegradable municipal waste generated in 1995,
- by 2020 – 35% of the total amount (by weight) of biodegradable municipal waste generated in 1995.

According to the Waste Management Strategy for Poland 4,380 thousand tonnes of biodegradable municipal waste was produced in Poland in 1995.

The detail priorities and objectives as regards the management of municipal solid waste are stated in the Waste Management Strategy for Poland. It specifies the exact levels of sorting, recovery and recycling to be achieved and the investment needs in the coming years.

In line with article 3.1.1.3, it is planned to:

- reduce the landfilling of biodegradable waste to levels required by the Council Directive 1999/31/EC (discussed above),
- attain the packaging waste recovery level of 50% and the recycling level of 25% by 2007,
- collect source-separately 20%, 50% and 70% of bulky waste by 2006, 2010 and 2014 respectively,
- collect source-separately 15%, 40% and 60% of construction and demolition waste by 2006, 2010 and 2014 respectively,
- collect source-separately 15%, 50% and 80% of hazardous waste (selected from the stream of municipal solid waste) by 2005, 2010 and 2014 respectively and
- secure the capacity of sanitary landfills of 47 937 thousand m³ by 2006, 44 580 thousand m³ by 2010 and 40 715 thousand m³ by 2014.

To fulfil the above specified objectives that concern the management of municipal solid waste, it will be necessary to design a relevant infrastructure. Pursuant to the Waste Management Strategy for Poland, article 3.1.1.3, the following projects are expected to be developed:

- a construction of systems for recovery of biodegradable waste including green waste, sewage waste, waste paper and cardboard, wood and textiles of a total capacity 720 thousand tonnes by 2006,
- creating a system for collection and sorting of packaging waste by 2007,
- building of waste incineration plants that should guarantee the processing of 1 800 thousand tonnes of paper and cardboard waste by 2007,
- a construction of dismantling and sorting lines for bulky waste as well as construction and demolition waste by 2006 and
- a construction of regional sanitary landfill sites – no more than 100 by 2010. This requires closing all landfill sites that do not meet technical criteria.

A separate investment programme has been established for managing hazardous waste (selected from the stream of municipal solid waste).

Despite the general nature, both the Second National Environmental Policy and the Waste Management Strategy for Poland play a stimulating role for the improvement of the management of municipal solid waste. Taking, however, the current state of municipal waste sector into consideration, their implementation may raise a number of difficulties. According to the Report on the Accomplishment of the Waste Management Strategy for Poland (Ministry of the Environment, 2005), what is very alarming is the lack of a relevant infrastructure for separate MSW collection at source. This refers, in particular, to biodegradable and hazardous waste. Unless rapid progress in the integrated management of municipal solid waste happens, the time-limits for fulfilling the objectives may require some future negotiations with the European Union.

II.3. The application of environmental management systems in the municipal waste sector

The experience with the application of environmental management systems in non-industrial businesses, including service organisations is very limited. A lack of relevant studies and no credible EMSs' statistics has made the current research even more difficult. Although some studies have been carried out, typically they have covered all organisations certified to the ISO 14001 standard in Poland. Consequently, they are of limited value to a description of certification status of Polish municipal waste treatment facilities. Despite this, former studies are a good source of information about the general tendencies governing the process of the EMS's implementation in Poland.

According to official data of the Institute of Organisation and Management in Industry, in the beginning of 2004, there were 5 municipal waste treatment facilities in Poland certified to the ISO 14001 system. Some of them have decided to integrate the ISO 14001 environmental management system with the ISO 9001 quality management system to accomplish an overall improvement of management. This was the case of the MWTFs from Zakopane, Zamość and Białystok. At the same time, there were no municipal waste treatment facilities in Poland registered to the EU Eco-management and Audit Scheme. Due to a lack of access to a reliable database of the sectoral distribution of organisations certified to the ISO 14001 system, no comparison with other countries could be done. Despite this, the analysis of the quantity of organisations from the sector of sewage and refuse disposal, sanitation and similar activities that are registered to EMAS in Europe clearly shows how far behind other European countries Poland is in the environmental management (see table III.3.1). Considering, hence, European

Union requirements for improving municipal waste management in Poland, an increase in the adoption of ISO 14001 and EMAS can be envisaged.

Table II.3.1. Participation of MWTFS in environmental management systems

		Total	Service sector	Sewage and refuse disposal
No. of issued ISO 14001 certificates in 2004	World	89,937	No data	No data
	Europe	39,278	No data	No data
	Poland	709	No data	5
No. of EMAS registered organisations in 2005	Europe	3,195	1,605	221
	Poland	1	0	0

(Source: the annual ISO survey of ISO 9001 and ISO 14001 certificates, 2002 – 2004; the European Commission – official statistics, 2005; the Institute of Organisation and Management in Industry – Register of ISO certification, 2004)

There are many reasons why organisations in Poland have decided to introduce the environmental management system. According to Matuszak-Flejszman (2001), for 92% of Polish organisations to be formally ISO 14001 certified was an element of corporate development strategy, whose essential aim is the continual improvement of performance. A desire to address the environmental concerns, thus fulfilling legal requirements, motivated 71% of investigated organisations to adopt the environmental management system. Another significant reason was a wish to integrate the ISO 14001 EMS with the already implemented ISO 9001 QMS (63% of organisations in Poland) to succeed effective total management. All remaining reasons, for instance improving an image among clients, have had a relatively low influence upon the decision to adopt the ISO 14001 system. Considering current environmental practices of Polish municipal waste treatment facilities, there are strong grounds for assuming that managing interactions with the environment in a more effective and systematic manner will be a prime motive for the implementation of an environmental management system.


In the opinion of Gruszka and Niegowska (2004), the process of identification and assessment of environmental aspects in order to determine the significant ones has caused the most difficulties during adoption of the ISO 14001 system by Polish organisations. Sample problems related to this essential requirement of the ISO 14001 standard are a lack of relevant methodology to evaluate environmental aspects, ambiguous criteria against which environmental aspects are assessed and conscious ignoring of inconvenient significant impacts of companies' performance on the environment. Consequently, many inconsistencies have been occurring during the realisation of this stage of the environmental management system. There is no knowledge of barriers concerning the ISO 14001 system's implementation and maintaining in municipal waste treatment facilities.

Each organisation in Poland, which is ISO 14001 certified, has achieved a number of benefits resulting from the adoption of this environmental management system. According to research carried out by Matuszak-Flejszman (2001), 60% of Polish organisations admitted that the main actual benefit of having an environmental management system is an improved environmental performance resulting in reduced impacts upon the environment. Another important benefit resulting from setting up the ISO 14001 system is an enhanced environmental image that helps to attract environmentally conscious customers, improves relationship with regulators and provides an advantage over competitors (45% of organisations in Poland). The experience of municipal waste treatment facilities from the European Union seems to show that an environmental management system offers a certain potential to assist them to focus stronger attention on the control and improvement of their environmental obligations and risks.

Analysis of recent studies conducted among the ISO 14001 certified organisations in Poland has clearly revealed that through EMS's implementation they wanted to actively respond to the challenge of sustainable development. Being fully aware of the market-legal-social conditions they operate in, many Polish organisations are strongly convinced that environmental management systems are in the best position to face growing expectations for a sound environmental performance.

Chapter III

RESEARCH METHODOLOGY



III.1. A brief description and justification of the methodology

To address the research objectives, thereby the research hypotheses a multiplicity of study methods was employed. They fall into two categories – primary (questionnaires and non-structured interviews) and secondary (literature review). Among the primary methods of data collection, the quantitative investigation (postal and telephone questionnaires) constituted an essential source of accessing the study field. Although the questionnaires were largely comprised of closed-ended questions, they also contained open-ended questions where respondents may freely share their professional experience. In conjunction with the quantitative method, the qualitative one (face-to-face non-structured interviews) was applied. This unfolded naturally as a comprehensive view of the investigating area wanted to be achieved. Therefore, the interviews consisted of personal conversations on technological and managerial aspects related to the operation of a municipal waste treatment facility. Further information was sought through the acquisition of written materials namely books, professional journals and documents of environmental management systems, and through informal conversations with academic staff and specialists in the field of municipal waste management as well as environmental management.

As mentioned above, the quantitative research method (questionnaires) forms the main tool of accessing the field of study. The questionnaires were selected as the research instrument due to their ability to address a topic of considerable breadth and to address a relatively large audience. In case of this research, the audience of 101 respondents needed investigating. By giving high attention to the questionnaire design (formulation and ordering of

questions) the reliable information on the studied population could be collected. The postal method of questionnaire distribution allowed for a geographically dispersed population – located all over Poland to be reached relatively easily at a reasonable cost. In addition, the respondents were given the possibility to complete the questionnaires at their convenience and comfort, and send it back either via post, fax or electronically. Where preferable, the questionnaires could be also filled in on the telephone or online. This mode of survey distribution and collection was more desirable to apply under the constraints of time, money and people resources imposed upon the author. To compensate for the poor response rate that is often associated with the chosen study method, the researcher decided to inform all respondents of the purpose of the research on the telephone.

The qualitative research method (non-structured interviews) was applied as an auxiliary tool in the research. There were various reasons for this choice. First and foremost, the aim of running the interviews was to give the studied population a ‘voice’ in the research. The interviews as being a sort of guided conversation gave great flexibility to the respondents who could freely express their opinions on the investigated area (environmental management systems). Thereby, this method proved to have a high potential for exploring an in-depth sense of poor quantitative data. An equally significant reason for running the interviews was their ability to give the researcher a much wider perspective on the study field thanks to visiting the sites (municipal waste treatment facilities) in person. In consequence more complete information, including some supplementary data in form of written documents and respondents’ reactions were collected. Unfortunately, with the sample size used in the research and because of the large distance between researcher and respondents, personal interviews could only be conducted with a few, selected on the basis of the questionnaires’ results.

III.2. Selection of the sample

Sampling decision – the selection of municipal waste treatment facilities was directly influenced by the Waste Management Strategy for Poland published in 2003. Further to this document, a key priority for achieving more sustainable waste management in Poland is the construction of numerous regional municipal waste treatment facilities to serve complex integrated solutions. Simultaneously the modernisation of existing ineffective local municipal waste treatment facilities (not fulfilling the European Union standards) is expected to be intensified. It is therefore essential, to provide such a service that will substantially decrease the number of municipal solid waste going to a landfill site due to a separate municipal solid waste collection, raising levels of recycling and making greater use of organic waste via biological processing. Ipso facto, municipal waste treatment facilities (MWTFS) were defined as regional organisations responsible for municipal solid waste collection, the processing of solid waste and finally environmentally sound deposition. To meet all these objectives, MWTFS offer integrated solutions allowing (see figure III.2.1):

- manual and mechanical separation of source-separated and/or commingled municipal solid waste,
(The main streams of materials recovered from MSW for further reprocessing are paper and cardboard, glass, plastics and metals (including aluminium).
- aerobic processing of the organic fraction of municipal solid waste to produce compost,
- anaerobic processing of the organic fraction of municipal solid waste to produce biogas and
- deposition of municipal solid waste residues at a sanitary landfill site.

In addition, a considerable number of municipal waste treatment facilities allow:

- some sort of mechanical treatment processes, for instance, size reduction,
- dismantling of oversized items,
- processing of demolition waste,
- removal of hazardous waste from the stream of municipal solid waste and its temporal storage and
- incineration of the organic fraction of municipal solid waste with energy recovery (in case of the Municipal Solid Waste Utilisation Plant in Warsaw).

Apart from being responsible for municipal solid waste management, municipal waste treatment facilities in Poland offer a number of other eco-services. Typically, these are maintenance of cleanliness in parishes and planning of green areas. Moreover, MWTFs in Poland provide a number of consultancy services, including environmental sample collection and analysis, the development of strategies and policies, and environmental training. Despite such a broad spectrum of working of MWTFs, the investigation focuses solely on their responsibilities related to integrated solid waste management. This is though their main function and reason for establishment.

Taking the above into consideration, only these municipal waste treatment facilities were selected for the research that perform at least one of the techniques for recovery value from municipal solid waste, including sorting to allow recycling, composting or biogas production. Although it was the minimum condition, a great many of the municipal waste treatment facilities carry out more than one of these sustainable waste processing methods. Additionally, all facilities process collected waste for environmentally sound deposition by using some kind of mechanical treatment practices. Unlike in many European countries, many of the Polish municipal waste treatment facilities are also responsible for solid waste collection.

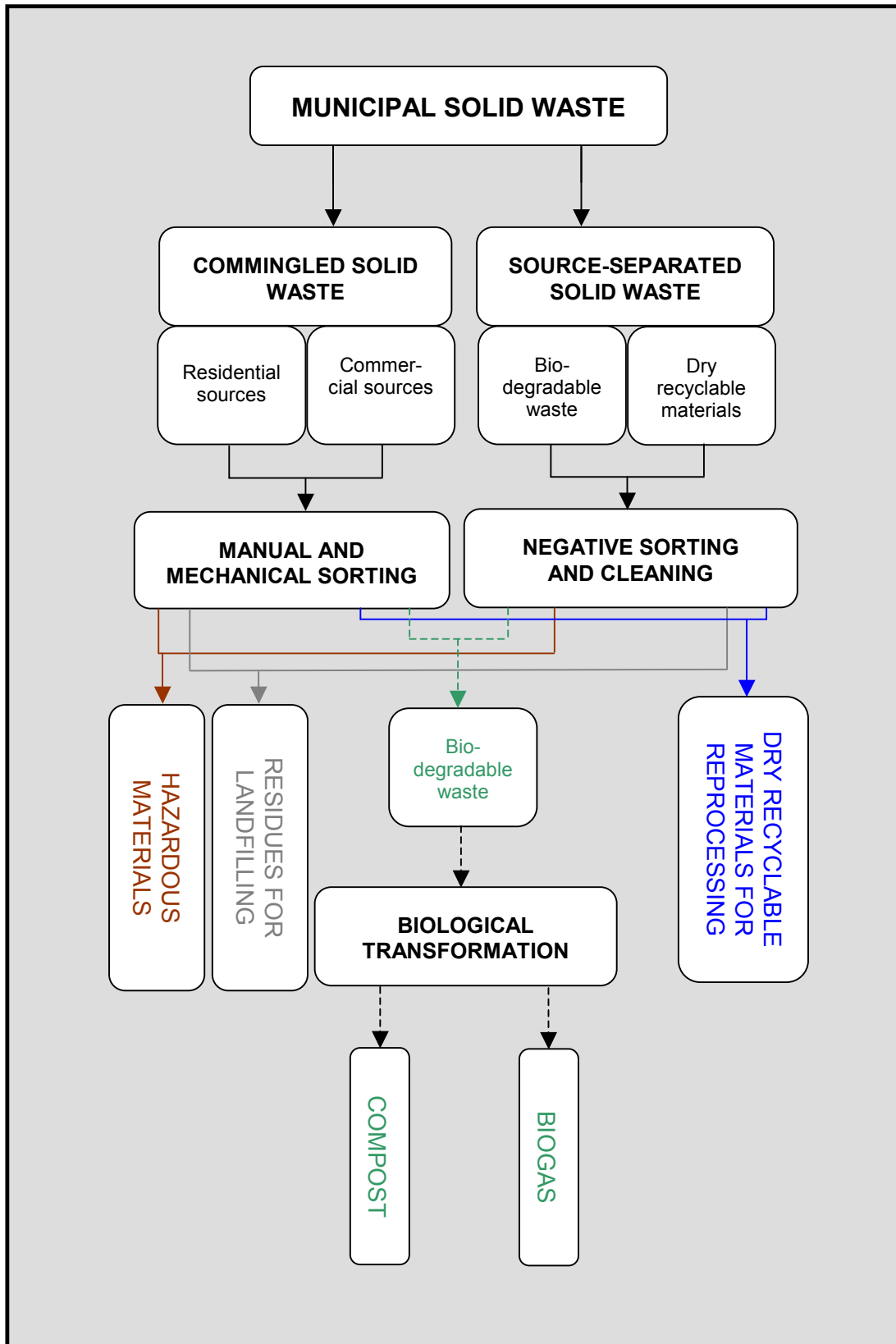


Figure III.2.1. Simplified flow diagram for a MWTF for municipal solid waste processing in Poland

Although it was relatively easy to select the study sample, a number of difficulties was encountered while establishing a database of municipal waste treatment facilities fulfilling the just specified requirements. Due to dynamic changes undergone by the Polish municipal waste sector – some new facilities are in and the others are out, there is no up-to-date national database of municipal waste treatment facilities. The aim of the first stage of the research was hence to construct the current database of MWTFs operating in Poland. Following a sequence of steps, the information necessary for running further investigation such as telephone number, postal address and an ownership structure of facilities was collected (see figure III.2.2).

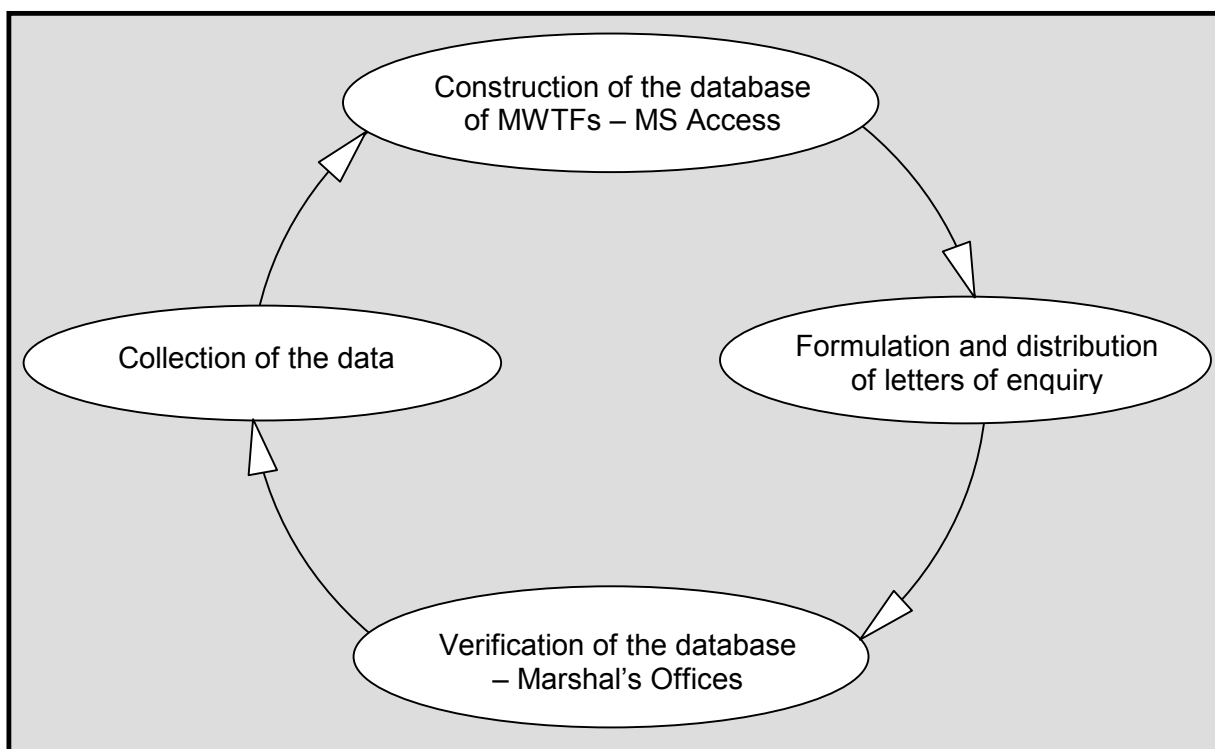


Figure III.2.2. Graphical representation of the database construction

A preliminary database of municipal waste treatment facilities was constructed on the basis of waste management strategies for each county and the list of waste recovery and disposal installations published in the Polish Monitor (M.P. No.11.159 2003). The MS Access programme was used for this purpose. The researcher, however, very soon discovered a number of contradictions in the official data. For incomprehensible reasons, the data were not identical. To get around this difficulty, waste management inspectors from all Polish marshal

offices were asked about the interpretation of the gathered data (Appendix A). They, in accordance with the statutory entitlements, are responsible for running the county level databases on waste production and management. Letters of enquiry with the list of the municipal waste treatment facilities, prepared upon the secondary resources review, were thus posted to each of them. To increase credibility, special consideration was given to the administration of letters of enquiry. They were all printed on BTU headed paper and were endorsed with a supervisor's stamp (Appendix B). The query was met with interest and all waste management inspectors replied in either written or electronic form. Being in possession of the necessary information, amendments were introduced to the database (see figure III.2.3). The database eventually contains 101 MWTFs with which contact during the research was made (Appendix C).

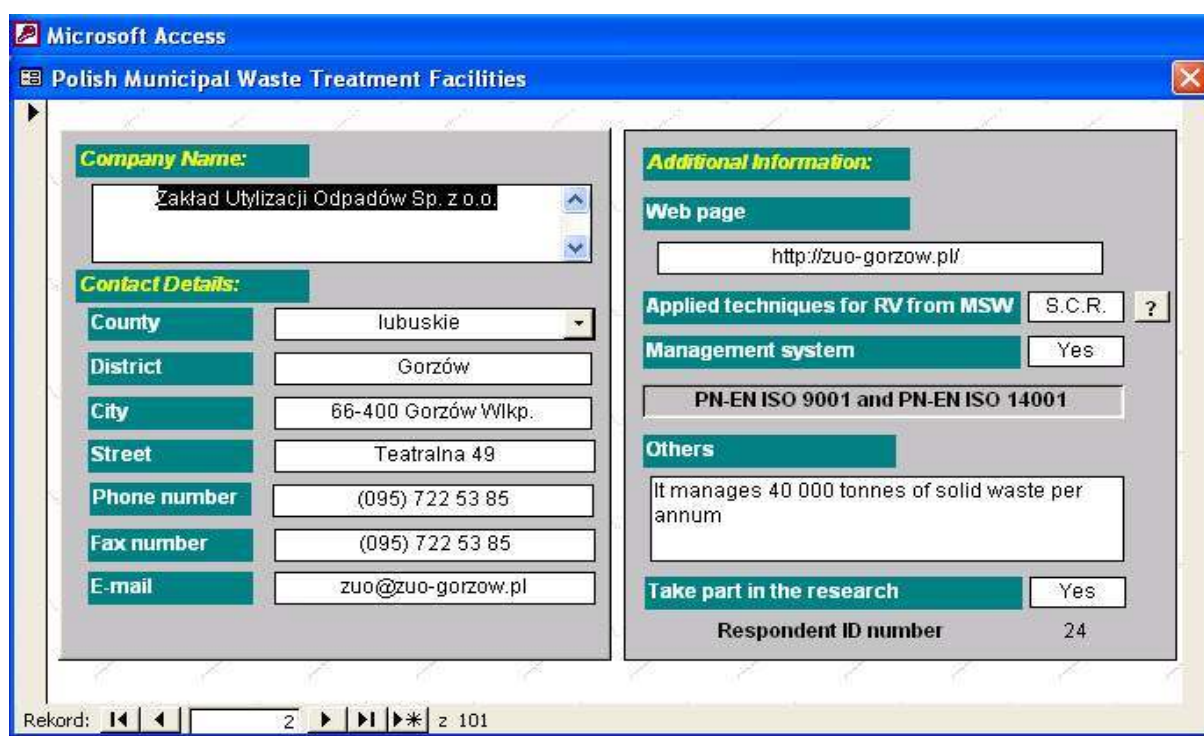


Figure III.2.3. An example of visual display of data on MWTFs in the MS Access programme

The facilities are randomly spread out around Poland (see figure III.2.4). Most of them apply mechanical transformation combined with biological ones. In one case, the facility is also processing waste thermally (see figure III.2.5).

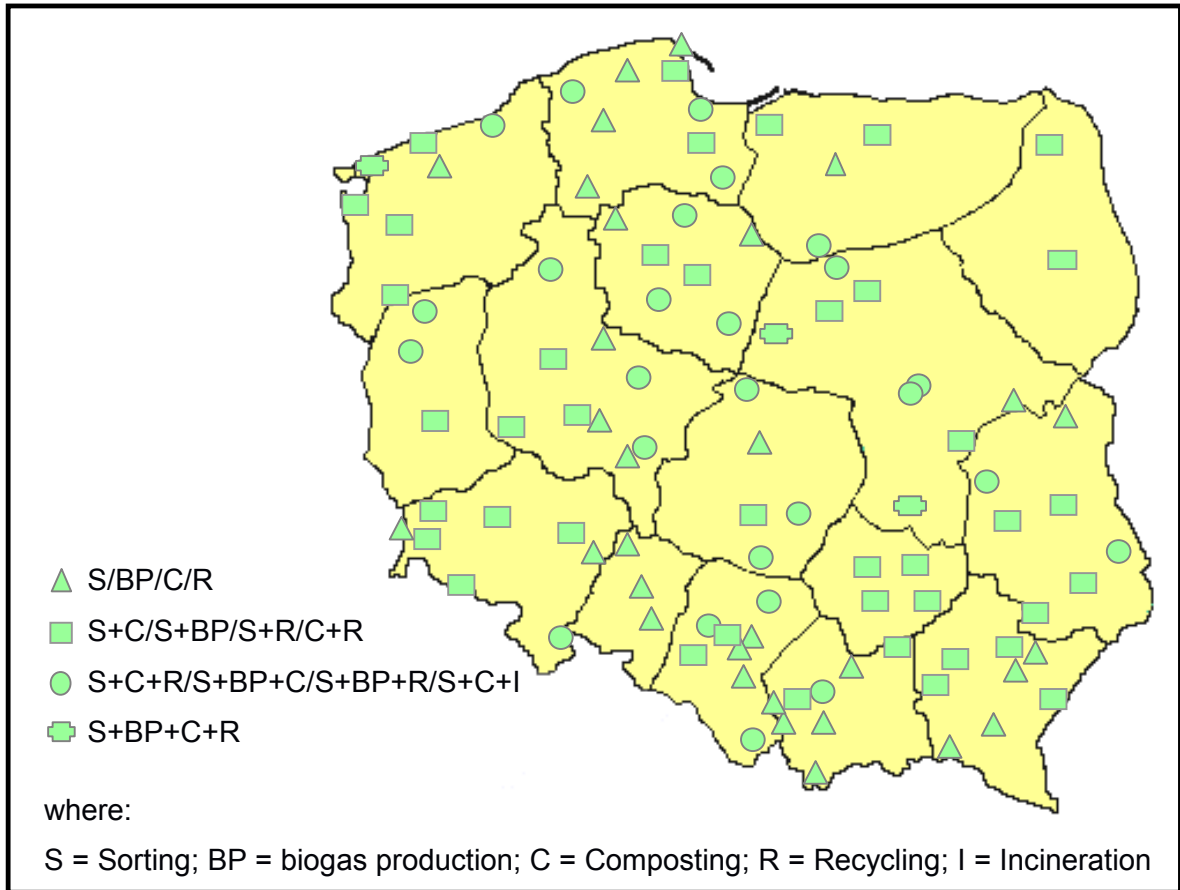


Figure III.2.4. Geographical distribution of MWTs in Poland

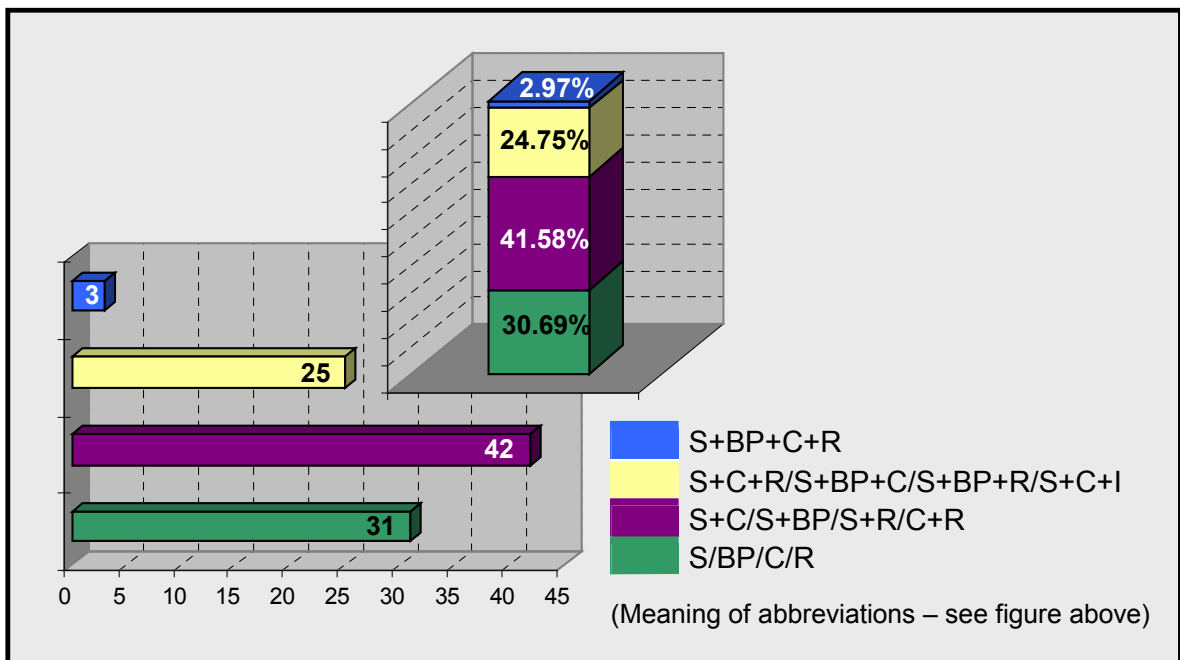


Figure III.2.5. The division of MWTs according to the applied techniques for recovery value from municipal solid waste

III.3. The process of survey design and implementation

The process of survey design and implementation was divided into three major stages due to the research setting and complexity. The first stage aimed at constructing the reliable database of the target population – directors or environmental managers of the Polish municipal waste treatment facilities. The second stage was entirely dedicated to quantitative investigation, namely questionnaire design, distribution and collection and finally analysing of gathered data. The final stage was a logical consequence of the second one since it aspired to improving the collected quantitative information by an additional qualitative one. The qualitative data were collected through personal interviews with professionals working in the Polish municipal waste sector. These three stages were strongly interrelated and intended for testing the research hypotheses. Below the quantitative and qualitative research is only described by virtue of presenting the construction of the database in subsection III.2.

III.3.1. The questionnaire

The quantitative investigation in the form of postal and telephone questionnaires formed a main stage of this research. Its course, as described above, was divided into several steps – design of the questionnaires, their implementation and collection, and finally coding and analysis of achieved results. These steps followed one another to make a loop of actions that terminated in discovering information to serve the study objectives and hypotheses (see figure III.3.1). Some observed regularities on environmental management systems, however, required further clarification. This made a place for the application of additional qualitative research.

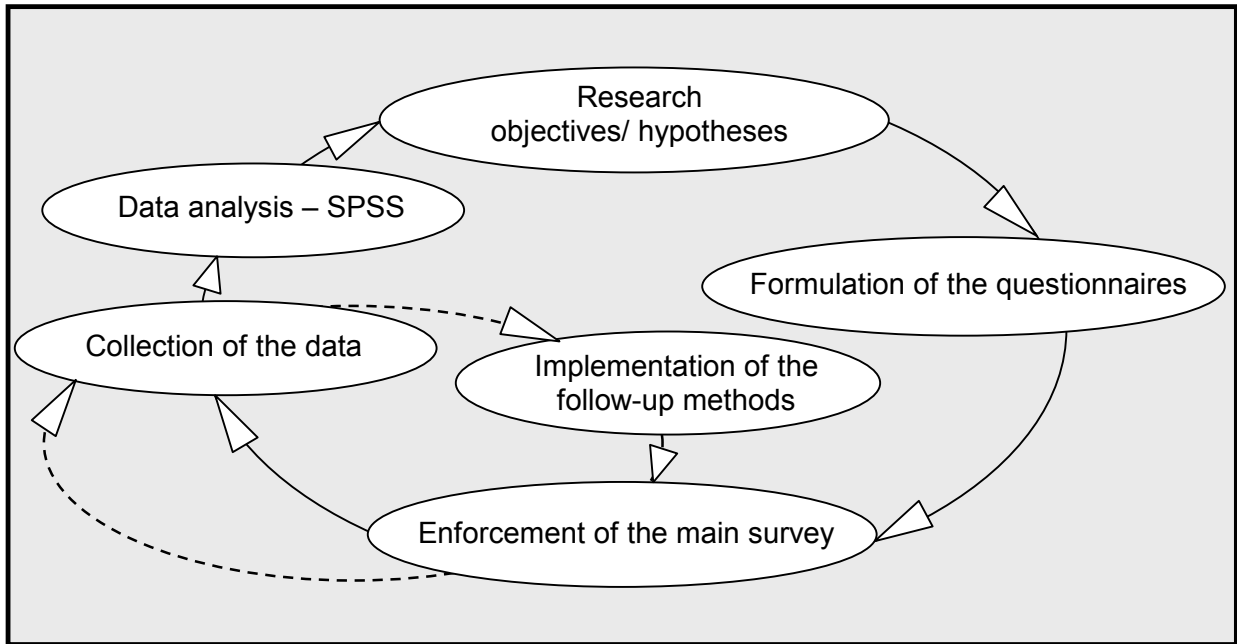


Figure III.3.1. Graphical representation of the quantitative investigation

The process of questionnaires' design was very complex because of the need to transform the research objectives into specific questions. To be equal to this assignment, two types of questionnaires were formulated – the former posted to these municipal waste treatment facilities that do not have EMS in place (Appendix D); the latter posted to these facilities that have already implemented the ISO 14001 system (Appendix E). The list of facilities being eco-certified was based upon an official data of the Institute of Organisation and Management in Industry. Since organisations working in the ISO 14001 environment have no obligation to notify any external bodies of their certification, this data revealed only a partial view on issued certificates in the municipal waste sector in Poland. Despite a considerable difference in the length and character of the surveys posted to certified and non-certified facilities, they follow the same style of question ordering. In both cases, an initial question having very general character creates a setting and prepares participants for more and more detailed answers to be requested. This is particularly noticeable in the questionnaire addressed to the facilities with implemented EMS since it aims to examine effectiveness and potential deficiencies of the ISO 14001 system's functioning. Closed-ended questions with an offered set of answers were primary used in the surveys on account of being easier to answer and thus

more likely to be completed. Only when detailed information on each of the facilities operation was required, did the researcher apply open-ended questions. An effort was also made to keep the total number of questions to a minimum. Both questionnaires were originally written in English. Their Polish translation was done under the supervision of prof. dr. hab. Magdalena Graczyk from the University of Zielona Góra. She also verified the questionnaires in terms of terminological correctness.

The enforcement of the survey, through contacting each respondent via telephone and informing them of the purpose of the survey, initiated a sub-circle of the second research stage (see figure III.3.1). This, on one side, gave a greater assurance to the investigated population that the study is conducted solely for scientific reasons as the researcher was no longer anonymous and could personally answer all enquires. On the other side, this was a very valuable source of additional information for the researcher, collected directly from practitioners working in the municipal waste sector. After establishing contact with either directors or environmental managers of MWTFS, the questionnaires were posted. A covering letter with a university stamp was attached to each of them. If preferable the respondents could also fill the questionnaires in online. After a month and due to the very small percent of completed questionnaires being sent back, a number of follow-up actions was undertaken in order to raise the response rate. Respondents were contacted either via telephone or email again and reminded of the questionnaire. If required, the replacement questionnaire was also provided. Sometimes, it was necessary to apply a combination of follow-up methods. This finally guaranteed the response rate of 68%, which is relatively high. Therefore, presenting the results, the researcher could presuppose that the collected data are representative for the whole population. The main reason given for delaying the response was simply a lack of time. Moreover, some questionnaires were not completed, as fully as required, and thus needed further clarification.

To make possible a successful analysis of assembled data a coding system was developed. An identification number was allocated to each respondent and the collected data-set was grouped into meaningful categories (Appendix F). To avoid a loss of any data, special attention was paid during the coding of open questions. Subsequently, the data were inputted into the SPSS programme where they were the subject of analysis (see figure III.3.2). To investigate the correlation between different variables, for instance whether business structure, size and technological progress have an influence upon the decision to implement the ISO 14001 system, various statistical methods were used. Although the bivariate analysis was the most often applied, a multivariate analysis was also used to understand the relationship between more than two variables.

	ID	Local	Structure	Size	MWTFchar	EMS	ConImp	EnvImp	Image	PubUnCon	MotStaff	FulLeg	DocOrg	RedCosts	IncStan	HumRes	Costs
1	12	2	2	1	1	6	0	0	0	0	0	0	0	0	0	0	0
2	47	7	5	1	1	5	2	2	1	1	2	2	2	2	9	9	1
3	45	7	2	1	2	5	2	2	1	2	2	2	1	2	9	9	2
4	13	2	1	5	2	5	1	2	1	1	1	2	1	2	3	2	1
5	51	2	1	9	2	6	0	0	0	0	0	0	0	0	0	0	0
6	26	5	2	4	1	4	2	1	1	1	2	2	2	2	1	2	3
7	20	3	2	1	2	5	1	2	1	2	1	2	1	2	2	1	3
8	39	7	1	5	3	5	1	2	1	1	2	1	1	2	3	2	1
9	64	11	2	1	1	5	1	1	1	2	1	1	1	2	2	3	1
10	40	7	1	1	2	5	2	1	2	1	2	1	2	2	9	9	1

Figure III.3.2. Example of the display of coded data on MWTFs in the SPSS programme

III.3.2. Interviewing survey

The qualitative investigation in the form of non-structured interviews formed the next main stage of this research. Its course was divided into several steps – preparation for the interviews, running personal conversations with environmental managers or the equivalent in the facility and visiting the sites, and finally analysing the collected data. These steps followed one another to furnish detailed information in the explored field (see figure III.3.3). Some additional information concerning the ISO 14001 documentation, for instance reports on significant environmental aspects, procedures applied and records, was also expected to be collected.

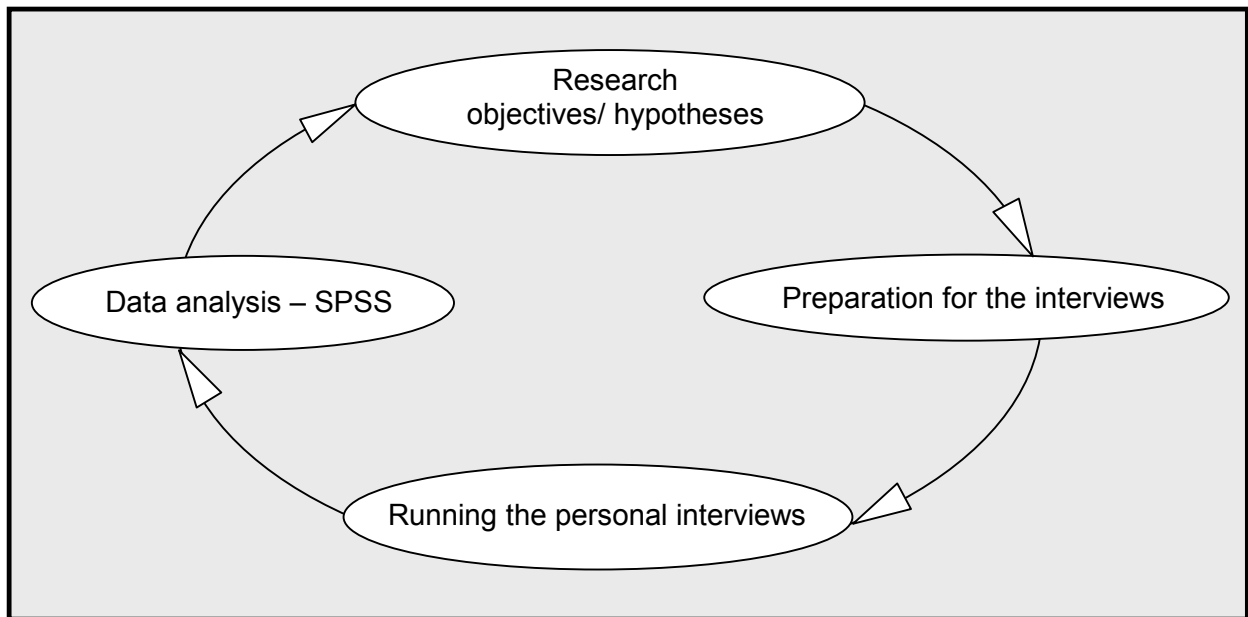


Figure III.3.3. Graphical representation of the qualitative investigation

As part of the preparation for running the interviews all directors of Polish municipal waste treatment facilities with an issued ISO 14001 certificate were approached. Consequently, a letter of enquiry was posted to each of them to fix the date, time and conditions for the interview (Appendix G). Despite the researcher's attempts only a few environmental managers of eco-certified MWTFs in Poland agreed to be interviewed and allowed visiting the facility itself (see figure III.3.4). Moreover, the ones localised in the far east of Poland, for instance the municipal waste treatment facility in Zamość, the author was unable to visit due to distance (more than 700 kilometres). There were also directors of municipal waste treatment facilities that despite not giving permission for site visiting provided some requested documents on managerial and technological aspects related to the operation of the facility. This was, for instance the case of the municipal waste treatment facility in Chełm, which answered most of the researcher's enquires by telephone and email.



MWTF in Poznań – education centre



MWTF in Ponań – the retention pond for leachate



MWTF in Gorzów Wielkopolski – the landfill site



MWTF in Włocławek – manual belt sorting facility

Figure III.3.4. Photo gallery from chosen visits to Polish MWTFs

While approaching the target population, an interview guide was established. It specifies general topics that need further discussion. Consequently, in the interviews, answers were sought to the following 'leading' questions:

1. Technological aspects: How is the operation of the facility organised, for instance:
 - A. how are municipal solid waste collected and transported?
 - B. what methods of separation and processing of municipal solid waste are applied?
 - C. how is the landfill site designed?

2. Managerial aspects: What is an effectiveness of EMSs in addressing the concept of sustainable development, for instance:
 - A. what is the improvement potential of the ISO 14001 system of facility's environmental performance?
 - B. what is the cost of implementing and operating in respect of the ISO 14001 system?
Have any financial savings been possible? Have any financial support from the national or the European Union funds been received?
 - C. does the ISO 14001 system support active internal and external communication with all interested parties?

The investigation of the latter – managerial aspects was strongly interrelated to the quantitative research since its main aim was to get a more in-depth sense of issues revealed in the questionnaires. The interviews were basically conducted between January and June 2006 and never lasted more than 3 hours. They could not be tape-recorded since lack of assent from the side of the interviewees.

Qualitative information is very difficult to convert satisfactorily to parameters that can be analysed statistically. Accordingly, results of this part of the research are presented in the next chapter in a more qualitative way. Only when given consent, can the interview records be ascribed to a particular facility.

III.4. Discussion of the applied methodology limitations

The methodology employed in the research on environmental management systems and their application in the municipal waste sector in Poland, though provided a wide range of relevant information, is not free of limitations. They were largely consequence of the applied methods and thus can not be entirely eliminated but only to some degree mitigated. Therefore, each stage of the research process had its own inherent constraints that might, in effect, have led to some artefacts in the final results. The major difficulties that the author faced are discussed below; the rest, since only having a minor influence upon the study results, are not presented.

The first problem appeared while constructing the database of the municipal waste treatment facilities. The institutional obstacles to getting reliable data on the municipal waste management in Poland seemed initially very difficult to overcome. The gathered data were very often dissimilar and, in addition, varied in their completeness. Consequently, to avoid bias, the author could not only restrict her research to analysing the official documents, which do not very often overlap. She had to also contact directly the directors of the environmental protection and agriculture departments in the marshal offices who are liable for municipal waste management at county level. They were asked to interpret the data. A comparison of the information assembled during the secondary and the primary investigation led to the formulation of the final version of the database and considerably enhanced its quality. Despite all the efforts, there still remains some uncertainty regarding the accuracy of the data on municipal waste treatment facilities operating in Poland.

A selection of the issues covered by the questionnaires along with the formulation and arrangement of questions make the next limitation of the research. Due to the breadth of the subject being investigated, the author is fully aware that some aspects were not given the appropriate place within the questionnaires and, as a result, there are issues insufficiently examined. Furthermore some respondents did not complete the questionnaires comprehensively, leaving some open-ended questions unanswered. Therefore, if the researcher had the possibility, she would investigate the financing options and technological aspects related to the implementation and operation of environmental management systems in more depth. There are signals from the future users of the ISO 14001: 2004 standard and EMAS programme that they could greatly benefit from such information. Unasked questions left a room, however, for qualitative research where part of these aspects could be adequately addressed.

The final limitation of the study process was related to running the non-structured interviews. Despite exploring the study field in person and giving the respondents maximum flexibility, a detailed description of several characteristics of environmental management systems was not fully accomplished. The interviewees provided as much information as they are obligated according to the ISO 14001 standard, that is avoiding sharing significant quantitative data, for instance regarding an environmental performance improvement. This, in consequence, made the analysis of the ISO 14001 system's eco-efficiency very difficult. Moreover, the majority of the interviewees did not agree to be tape recorded. A reluctance to being tape recorded led to weaknesses in the interviews since some important information could be lost while making notes. Despite all these constraints, a considerable amount of relevant information on technological and managerial principles of the operation of municipal waste treatment facilities was collected.

Chapter IV

RESEARCH FINDINGS

IV.1. Environmental management systems: implementation status

Following the results of the quantitative research, 12% of all municipal waste treatment facilities operating in Poland were registered to the ISO 9001 system and/or the ISO 14001 system by mid 2005 (see figure IV.1.1). In the subsequent 9% of MWTFs, the ISO 14001 system was then in the implementation stage and undertaking the certifying audit was only a matter of time. The next 29% of MWTFs declared their interest in environmental management systems and stated they would consider the ISO 14001 implementation in the coming decade. Most municipal waste treatment facilities intend to integrate the enforcement of the ISO 14001 EMS with the ISO 9001 QMS. Approximately one-quarter of surveyed MWTFs admitted to not committing to either quality or environmental management systems.

The recurring research at the beginning of 2006 confirmed a high interest in EMSs among Polish municipal waste treatment facilities. In the course of half a year the number of ISO 9001 and/or ISO 14001 certified facilities increased to 25% so by 13%. This has been the highest growth in the implementation of quality/environmental management systems in Poland since 2000 when the first eco-certificate was awarded to an organisation from the municipal waste sector. Most MWTFs (60%) made a decision to integrate the ISO 14001 system with the ISO 9001 system as to achieve sustainable development (see figure IV.1.2). There are also MWTFs that, in concern for their workers, combine the integrated management system with the standard of PN-N 18001 – Polish equivalent of an occupational health and safety management system (12%). Although 16% of certified MWTFs still only have the ISO 9001 system in place, they are considering a future ISO 14001 system implementation. A full list of Polish facilities working in line with EMS and/or QMS is provided in the appendix H.

In relation to the Eco-management and Audit Scheme, the situation is far worse since there is no formally EMAS registered municipal waste treatment facility in Poland. Optimistically, there are a few MWTFs that go beyond the requirements of the ISO 14001 standard, for instance, through an active involvement of employees in analysing an organisation's environmental performance and which consider the future implementation of EMAS. According to the declarations, they form, however, only 33% of all eco-certified municipal waste treatment facilities in Poland.

Spatial analysis has illustrated a very asymmetrical distribution of municipal waste treatment facilities being ISO 9001 and/or ISO 14001 certified in the territory of Poland (see figure IV.1.3). There are clusters of MWTFs that have gradually introduced EMSs in some regions whereas simultaneously there are no certified MWTFs in other areas. The region of Silesia is an unquestionable leader in the implementation of environmental and integrated management systems since 28% of Polish certified MWTFs are located there. Following the good practice of 'Bytomskie Przedsiębiorstwo Komunalne', which introduced the ISO 14001 system in 2002, 87% of MWTFs of the Silesia Region have decided to work according to the ISO 9001 and/or ISO 14001 standards by the end of 2005. Slightly worse but still very promising is the situation in the region of Lublin where 57% of MWTFs are certified. The region of Wielkopolskie is in third place among counties with the highest ratio of certified MWTFs as 33% of facilities have implemented the environmental management system there.

'Tatrzańskie Przedsiębiorstwo Komunalne Tesko' was the first municipal waste treatment facility in Poland registered to the ISO 14001 standard (see figure IV.1.4). The facility went successfully through a certifying audit and became certified by the Polish Centre for Testing and Certification (PCBC) in 2000. From then on an ongoing increase in the certification has taken place, limited primarily by a lack of environmental awareness and financial resources. The real boom in the implementation of quality and environmental management systems has occurred in recent years. In 2005, for instance, the group of certified MWTFs was enlarged by 11 organisations. Consequently, the number of certificates awarded has been

boosted by 44%. Although there are many reasons for such a high interest in sustainable management tools among Polish municipal waste treatment facilities; in line with the qualitative research, an increasing environmental and social responsibility of directors of facilities seems to be of prime importance.

Considering the organisational structure and the size of the certified municipal waste treatment facilities, there are some apparent regularities among organisations. Nearly all MWTFs that have adopted the ISO 9001 system and/or the ISO 14001 system are publicly own limited liability companies. The only two exceptions are the facilities from Poznań and Ostrów Wielkopolski, where the former is a budgetary organisation and the latter a joint stock company. In case of incorporated companies (a joint stock and limited liability company) top managers can directly influence the way financial resources are allocated and, consequently, more often invest in quality and environmental management systems. Regarding budgetary organisations the decision process is much longer and, in practice, only if the local government itself is certified does it decide to implement a standard in subordinated (controlled) units (MWTF). According to the Decree of 25th February 2004, all certified MWTFs can be classified as medium size organisations since their total number of employees ranges from 50 to 250. Relatively large MWTFs usually opt for having management systems more willingly, on account of the ISO standards' high improvement potential of communication within an organisation.

Regarding the applied techniques for recovery value from municipal solid waste, all certified municipal waste treatment facilities separate recyclable materials from the stream of collected municipal solid waste (see figure IV.1.5). This is accomplished either manually or mechanically. In addition, 76% of eco-certified MWTFs do not restrict their operation solely to separation of municipal solid waste but also apply other sustainable techniques for dealing with waste. The majority produce compost and/or recover landfill gas. A broad spectrum of methods applied for waste processing may suggest that the certified MWTFs either provide already complex integrated solutions or are in the process of offering such services.

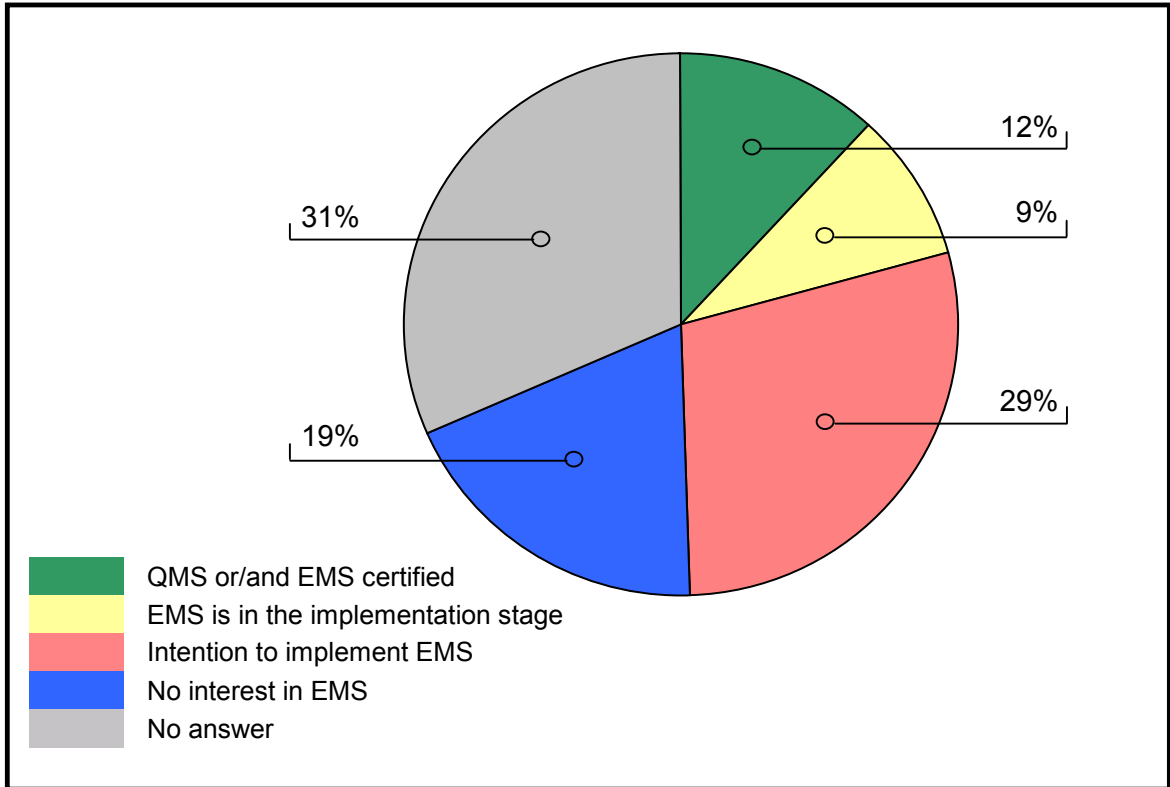


Figure IV.1.1. The implementation status of MWTFs in Poland

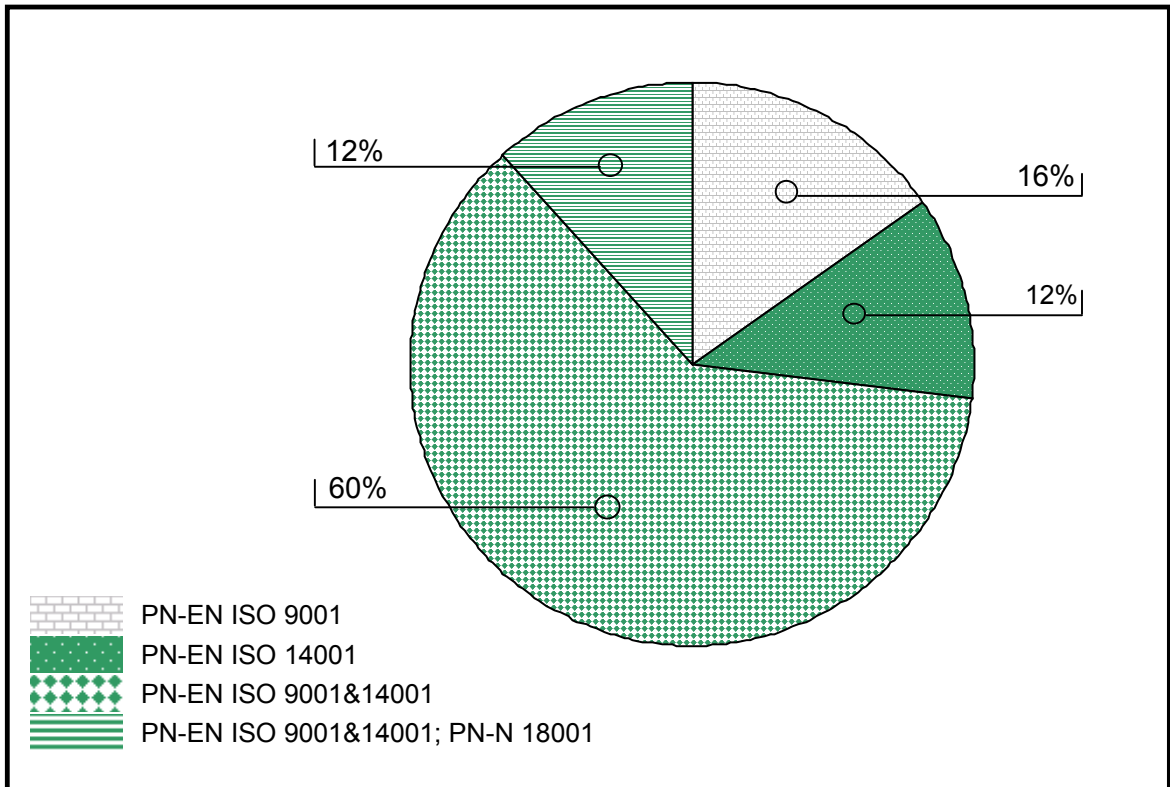


Figure IV.1.2. ISO 9001 and ISO 14001 certification of MWTFs in Poland

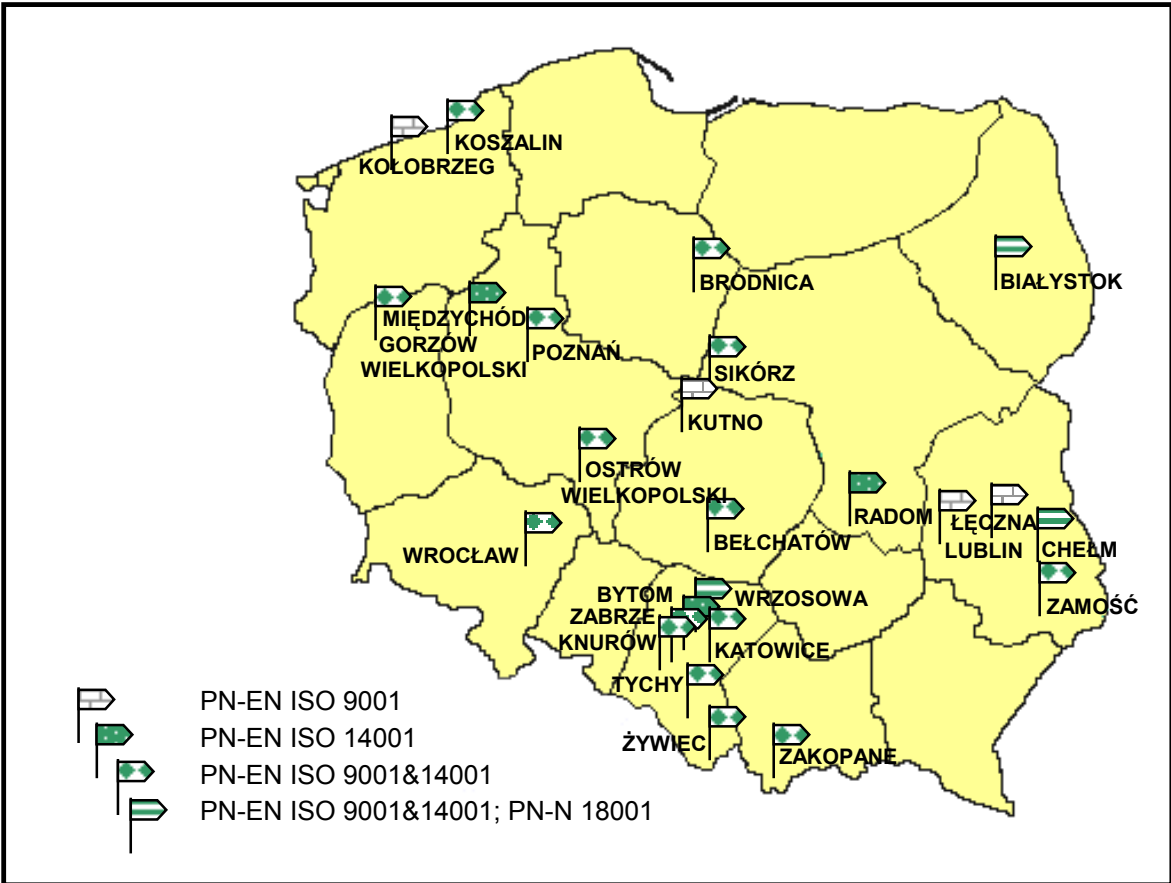


Figure IV.1.3. The localisation of the ISO 14001 certified MWTFs in Poland

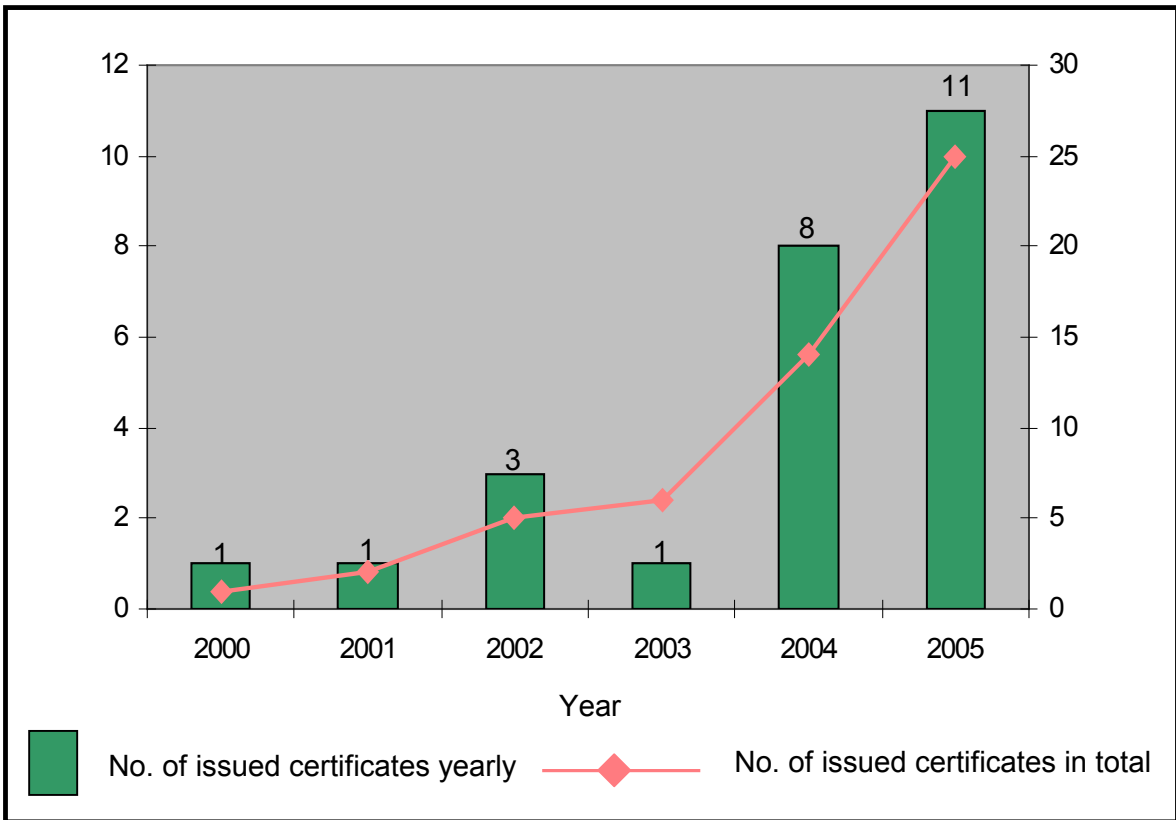


Figure IV.1.4. Growth of ISO 9001 and 14001 certificates in MWTFs from 2000 to 2005

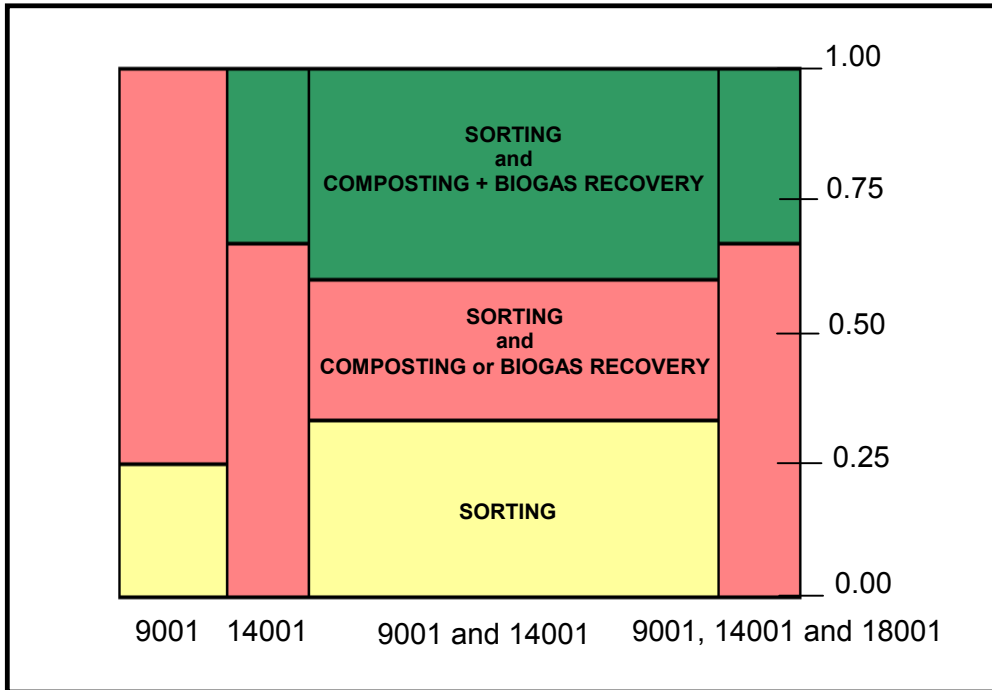


Figure IV.1.5. A correlation between the type of management system and applied techniques for recovery value from municipal solid waste

IV.2. Reasons for implementing the ISO 14001 environmental management system

In the era of the strong transformation of the municipal waste sector in Poland, managers are seeking the most efficient tools in addressing the changing priorities of municipal solid waste management. Investigating the existing opportunities, many have decided that environmental management systems are in the best position to stimulate the sustainable development of municipal waste treatment facilities thereby tackling environmental concerns as well as financial, technological and social constraints. Apart from EMSs' potential for initiating innovative solutions in municipal solid waste management, there are a number of individual reasons for implementing the ISO 14001 system, resulting from the specificity of a given region or organisation.

Municipal waste treatment facilities are primarily motivated to introduce the system of ISO 14001 for its high ability to intensify the process of continual improvement of the environmental performance (see table IV.2.1). Consequently, 64% of MWTFs that are certified or consider future certification expect from the ISO 14001 system assistance in reducing the environmental burden generated during the management of municipal solid waste. The improvement envisaged would be achieved principally through raising the efficiency of the system of technological operation, internal communication and documentation. Another, equally significant reason for adopting the ISO 14001 EMS is its attribute of strengthening the position of certified MWTFs on the waste market. As 68% of surveyed organisations from the group of interested in EMSs admitted, the certificate of ISO 14001 is still very prestigious in Poland and thus might be a very valuable instrument in establishing a strong environmental image of facilities. Having a better reputation can transfigure into a number of tangible benefits, including

a better relationship with public authorities, clients and insurance companies. Finally, Polish facilities struggling with lack of public understanding for the work they perform, hope that by operating according to the ISO 14001 standard they will gain social acceptance and participation in the management of municipal solid waste through separate waste collection. Further to the research, 56% of current and potential users of EMSs are convinced that the ISO 14001 system has a high capability to restore public trust. They claim that the active involvement of people in municipal solid waste reduction and separation will be a natural result of operating according to EMS.

Table IV.2.1. Main reasons for implementing the ISO 14001 system by MWTFs in Poland

We want to:	Percentage
continually improve our environmental performance and operate according to the highest technological standards in the municipal waste sector	64%
reduce environmental impacts that may stem, for instance, from waste landfilling	46%
achieve a better image on the municipal waste market in Poland	68%
improve a public understanding and confidence that their waste is being handled properly	56%
improve staff motivation by carrying out professional training and raising ecological awareness	34%
ensure fulfilment of current environmental legislation	40%
improve documentation and organisation	54%
reduce costs, for instance, by reducing the number of environmental incidents	10%

Results of the research have explicitly shown an evolution of reasons for implementing the ISO 14001 environmental management system among municipal waste treatment facilities in Poland. Observing the efficiency of ISO 14001 operation in the certified MWTFs, the current implementors and those considering future implementation of EMS have a more realistic view of its capabilities (see table IV.2.2 and figure IV.2.1). The highest alteration of expectations has occurred with regard to the ISO 14001 system's potential to accomplish continual environmental performance improvements and a reduction of environmental impacts. As only

a few years ago, 89% of currently certified facilities were anticipating that a direct result of adopting the ISO 14001 system would be a tangible improvement in the environmental performance; in 2005 it was only 58% of MWTFs. Disappointingly, the certified facilities have not achieved as many environmental performance improvements as envisaged. Moreover, MWTFs have sometimes had difficulties with showing quantitative evidence of fulfilling the pre-established environmental objectives. The enhancement of the documentation and organisation is the only reason for the ISO 14001 implementation that has considerably gained in importance. Consequently, improvement of management tactics is for 58% of current and potential users of the ISO 14001 system a significant motivation for setting up the system. Again good management practice observed in the certified MWTFs have had a strong influence upon the opinion of contemporary implementors. The remaining reasons for implementing the ISO 14001 system have stayed at a comparable level.

Table IV.2.2. Evolution of main reasons for implementing the ISO 14001 system by MWTFs in Poland

We want to:	Percentage	
continually improve our environmental performance	¹ 89%	² 58%
reduce environmental impacts	67%	41%
achieve a better image on the municipal waste market in Poland	67%	58%
improve public understanding and confidence	55%	56%
improve staff motivation	44%	32%
ensure fulfilment of the current environmental legislation	33%	41%
improve documentation and organisation	33%	58%
reduce costs	11%	10%

1 – municipal waste treatment facilities with certified ISO 14001 EMS

2 – municipal waste treatment facilities that are currently being implemented or are intended to be implemented ISO 14001 EMS

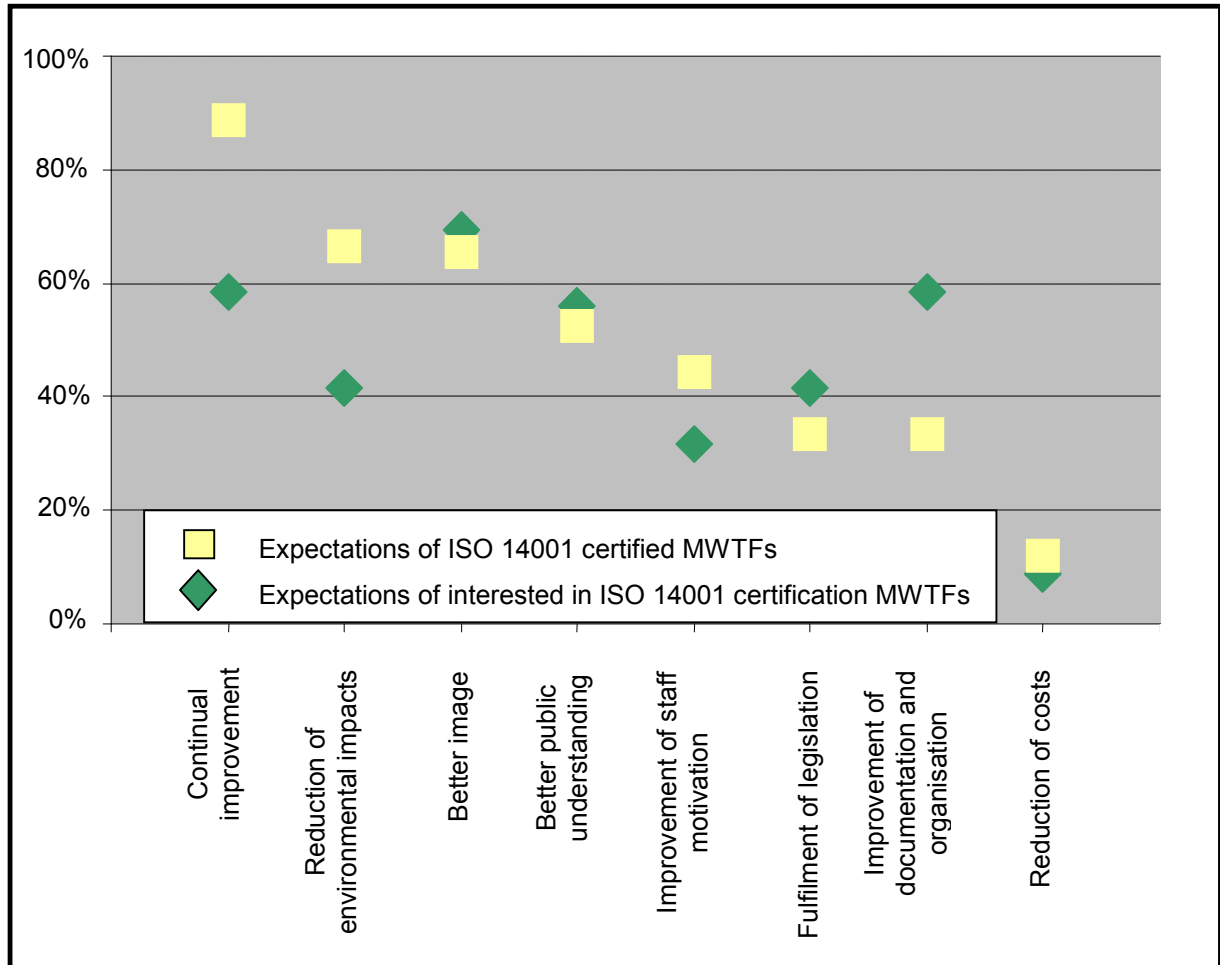


Figure IV.2.1. Evolution of main reasons for implementing the ISO 14001 system by MWTFs in Poland

Apart from transparent and universal motives for the decision to implement the ISO 14001 EMS, there are distinctive reasons of a given region or an individual facility. They, however, are very problematic to identify since they require an in depth analysis of each case individually. From the researcher's point of view, what is worth mentioning is the situation in the Region of Silesia where the highest number of MWTFs with the implemented ISO 14001 system (28% of all eco-certified facilities in Poland) exists. Although it is very difficult for experts to specify the exact reasons for this peculiar situation, there are presumptions that strong competition between facilities was the main driving force for the popularity of the ISO 14001 system. A large accumulation of relatively successfully operating MWTFs in one region has led to an improvement in environmental performance because of the necessity to win tenders for collection and management of municipal solid waste.

IV.3. The implementation process of the ISO 14001 environmental management system

The ISO 14001 environmental management system, for its universal character, can be applied irrespective of the organisation's type, size and complexity throughout the world. Although this universality greatly contributes to the popularity of the ISO 14001 system, it also leads to many confusions during its implementation and operation. Every sector thus needs to tailor EMS to its specificity so as to achieve the desired environmental results. Therefore, before developing effectively operating the ISO 14001 system, site-sector detailed decisions need to be made. Every organisation individually has to establish a unique approach of adjusting its environmental policy, procedures and practices to the general standard requirements in the most advantageous manner.

This subchapter is, first and foremost, designed to provide a practical guidance to all municipal waste treatment facilities wishing to improve their environmental performance through the future implementation of the ISO 14001 environmental management system. The author is certain, though, that the currently certified MWTFs can also benefit out of this manual by getting familiar with pioneering solutions applied in other organisations. The manual describes every stage of the EMS development separately following the experiences of the municipal waste sector in Poland, which were collected entirely during the empirical research. Consequently, it illustrates, among others, sample policies, programmes or approaches to successful establishment and certification of the ISO 14001 system. In addition, the manual embodies examples of environmental aspects, objectives and targets, potential emergency situations as well as monitoring procedures being a very sector specific.

IV.3.1. Environmental policy

Due to the ISO 14001:2004 standard, environmental policy ought to define overall intentions and the direction of an organisation related to its environmental performance as formally expressed by top management (Article 3.11). In other place, the ISO 14001:2004 standard (Article 4.2) states that the organisation's environmental policy has to:

- a) be appropriate to the nature, scale and environmental impacts of its activities, products and services,
- b) include a commitment to continual improvement and prevention of pollution,
- c) include a commitment to comply with applicable legal requirements and with other requirements to which the organisation subscribes which relate to its environmental aspects,
- d) provide the framework for setting and reviewing environmental objectives and targets,
- e) be documented, implemented and maintained,
- f) be communicated to all persons working for or on behalf of the organisation, and
- g) be available to the public.

Taking into consideration the guiding principle of the ISO 14001 standard for preparing sound environmental policies, essential for further operation of the EMS is to include a commitment to continual improvement as well as to the prevention of pollution and a commitment to comply with the regulations. Continual improvement is defined as a recurring process of enhancing the environmental management system in order to achieve improvements in the overall environmental performance (ISO 14001:2004 standard, Article 3.2). The principal element of continual improvement is, hence, the process of enhancing the EMS itself, not the environmental performance. Naturally, improvements in the functioning of the EMS ought to lead to less of a burden on the environment. Similarly, the concept of prevention of pollution requires organisations to use of all possible means to avoid, reduce or control the creation of pollution, in order to reduce adverse environmental impacts

(ISO 14001:2004 standard, Article 3.18). The commitment alone to comply with all environmental legislation sets very specific performance obligations regarding the impact upon the environment. Organisations, though, do not have to fulfil all the relevant regulations at the stage of certification. To become registered, it is sufficient to have a working plan towards achieving total legal compliance.

To demonstrate conformity with the specified above requirements of the ISO 14001 standard, Polish municipal waste treatment facilities have included a number of declarations within their environmental policies. Besides the assurance of continual improvement of the system, the certified facilities have made a strong commitment to improving their environmental performance. To execute this obligation, facilities, among others, intend to:

- operate in line with the best available technologies (MWTF Belchatow),
- modernise the infrastructure for municipal solid waste collection to enable separation of waste at source (MWTF Zakopane),
- introduce new unit operations used for the separation and processing of municipal solid waste (MWTF Radom),
- run a constant monitoring of its environmental impacts and immediately react to all nonconformities (MWTF Chelm) and
- organise landfilling of municipal waste in the least harmful way to the environment (MWTF Ostrow Wielkopolski).

Apart from the enumerated actions dedicated directly to accomplishing the continual improvement of environmental performance, Polish facilities have customised the environmental policies to improve relationships with clients and the local community. Consequently, all facilities, in one way or another, have made a commitment to a gradual enhancement of the quality of offered services and to initiate a multilevel information programme in order to increase the social consciousness of waste problems. Simultaneously, many MWTFs in their environmental policies have declared a systematic raising of their employees' qualifications and environmental awareness by organising appropriate training.

According to the ISO 14001 standard, a commitment to comply with applicable legal requirements that relate to environmental aspects is the third pillar of sound environmental policy, thus the environmental management system. The eco-certified MWTFs in Poland seem to have forgotten about this responsibility, as all of their environmental policies have been limited to one very vague statement on obeying the current environmental legislation. None have decided to go beyond a very general declaration, let alone a commitment to beating the required legal standards or to complying with applicable voluntary regulations.

As regards the remaining features of the environmental policy, specified by the ISO 14001 standard, a requirement of providing framework for setting and reviewing environmental objectives and targets deserves individual exploration. Many environmental policies of Polish municipal waste treatment facilities use very general language, making anticipation of their environmental objectives and targets very difficult or impossible. It is very often also the case that information on the nature of facility's business activity is missing. Not having such information, the reader is unable to make his own judgement on the relevance of formulated declarations to the character of the organisation. Consequently, it is sometimes very problematic to assess if the environmental policies of Polish MWTFs are appropriate to their nature, scale and environmental impacts. Certainly, there are also some good practices (see table IV.3.1).

Research has revealed that many MWTFs in Poland have a problem with communicating effectively their environmental policy among employees. Essentially, facilities seem to constrain their communication procedures to those members of the staff that are involved in activities having significant detrimental impacts upon the environment while others are left unaware. Most frequently, employees are acquainted with a documented version of the environmental policy during staff meetings. Regardless of problems with internal communication, the MWTFs' environmental statements are very well externally communicated. They are available to the public online at facilities' webpages, advertised in brochures published by the eco-certified facilities and announced in local newspapers.

Table IV.3.1. An example of good practice of an environmental policy

Environmental Policy

The Municipal Waste Treatment Facility 'Radkom' Ltd manages waste being generated in an area of the Region of Radom. Top management of 'Radkom' has agreed that its main responsibility is the continual improvement of the facility's operation in harmony with the natural environment. Our environmental policy is designed for the protection of soil, water and air and is implemented within the confines of the PN-EN ISO 14001 EMS.

Main environmental objectives

- dissemination of selective waste collection
- continual striving for shifting waste away from landfilling
- reducing the negative impact on the environment as a result of waste landfilling

Main environmental targets set to accomplish the above stated objectives

- introduction of new unit operations used for the separation and processing of municipal solid waste
- assembly of separation systems for construction and demolition waste as well as bulky waste
- systematic reduction of current and prospective negative impact on the environment being a consequence of the facility's operation
- systematic raising of the employees' qualifications and environmental awareness by organising appropriate training
- propagation of good practices of waste management among the local community and other waste producers

The top management of the Municipal Waste Treatment Facility 'Radkom' Ltd will consistently execute its set targets, concurrently obeying relevant legislation, improve relationships with clients and ensure the necessary funds for a successful implementation and functioning of the system.

(Translated by the author)

IV.3.2. Planning

The planning phase has fundamental significance to the ISO 14001 system's functioning. It requires from an organisation to:

- establish procedures to identify the environmental aspects and to determine these that have a significant impact on the environment,
- establish procedures to identify legal and other requirements related to its environmental aspects, and finally
- establish, implement and maintain documented environmental objectives and targets as well as a programme for achieving these objectives and targets.

Although it is not a demand of the ISO 14001 standard, many municipal waste treatment facilities in Poland carry out an initial environmental review. The prime aim of this review is to assess the current position of a facility with regard to the environment. To be able to do this, MWTFs identify environmental aspects, evaluate previous emergency situations, specify the applicable legal requirements and examine the existing environmental management practices. Consequently, facilities that have performed the initial environmental review comprehensively, have practically completed the first two elements of the planning stage too.

IV.3.2.1. Environmental aspects

According to the ISO 14001:2004 standard (Article 4.3.1), organisations are to establish, implement and maintain procedures to:

- a) identify the environmental aspects of its activities, products and services within the defined scope of the environmental management system that can be controlled and those that can be influenced taking into account planned or new developments, or new and modified activities, products and services, and
- b) determine these aspects that have or can have a significant impact(s) on the environment¹.

¹ The environment is a surrounding in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation. (ISO 14001:2004 standard, Article 3.5)

Considering the ISO 14001 standard requirements, the process of establishing environmental aspects can be divided into four major steps. These are:

- identification of activities, products and services that will be embraced by the EMS,
- identification of environmental aspects related to them,
- identification of impacts of the determined environmental aspects upon the environment,
- evaluation of the environmental aspects in order to determine the significant ones.

The deposition of municipal solid waste at a landfill site was recognised almost unanimously by Polish municipal waste treatment facilities as the activity having the biggest detrimental impact upon the environment. This proves the legitimacy of the waste hierarchy, which defines landfilling as the least desirable option for waste management. Moreover, environmental managers of the certified facilities seem to be fully aware that a landfill site evokes a number of environmental concerns not only during the operation phase but also during the process of designing and postclosure. The review of remaining areas of activities of MWTFs demonstrated that collection and transportation as well as manual separation of MSW are also significant sources of potential public health and environmental impacts. Contrary to waste landfilling, though, these operations can bring adverse and beneficial results, depending on their organisation.

With the help of environmental managers from the ISO 14001 certified municipal waste treatment facilities, a list of sample environmental aspects of processes encompassed by the ISO 14001 system was produced (see table IV.3.2). Emissions to water, soil and atmosphere, which are a result of collection and transportation, processing and finally landfilling of waste are considered as being typical environmental aspects related to municipal solid waste management. This type of activity is also not without an impact upon landscape since the placement of a facility and the construction of a landfill site modify the existing natural systems to a large extent. In essence, the operation of municipal waste treatment facilities give rise to a very broad spectrum of environmental aspects. Inadequately organised, these can have a negative impact upon human health too.

Table IV.3.2. Sample environmental aspects and their impacts

Activity/Product/Service	Environmental aspect	Environmental impact
Collection and transportation of waste	Consumption of petrol	Depletion of natural resources
	Emission of automobile exhaust fumes	Air pollution
	Noise production	Discomfort for local population
	Nesting of vermin, worms and insects	Public health impacts
	Chance of accidental leakage of oil-derivative substances	Soil and water pollution
	Landfill siting	Land use, modification of landscape, visual impacts
	Emission of landfill leachate	Soil and groundwater contamination
	Emission of landfill gas	Air pollution (the greenhouse effect)
Deposition of municipal solid waste at a landfill	Emission of odours	Odour nuisance to human
	Uncontrolled firing of waste	Air pollution
	Nesting of vermin, worms and insects	Employees health impacts
	Noise production	Discomfort for employees
Separation and storage of dry recyclables	Emission of odours	Discomfort for employees
	Dust emission	Air pollution
	Localisation of composting systems	Land use
Production of compost	Odours emission	Odour nuisance to employees
Office work	Production of waste	Waste burden to the environment
	Energy and water consumption	Depletion of natural resources

Municipal waste treatment facilities apply various procedures to evaluate environmental aspects and to identify those having significant impacts upon the environment. Very frequently, though, a tabular format is applied (see table IV.3.3).

Table IV.3.3. Sample procedure for identifying significant environmental aspects

Criterion	Level of significance of environmental aspect								
	low			medium			high		
	0	1	2	4	5	6	8	9	10
Environmental factors: <ul style="list-style-type: none"> ▪ Probability of occurrence¹ ▪ Duration of impact ▪ Intensity of impact² ▪ Range of impact³ 									
Legal requirements: <ul style="list-style-type: none"> ▪ Current deficiencies ▪ Anticipated deficiencies⁴ 									
Expectations of interested parties: <ul style="list-style-type: none"> ▪ Development strategy of a facility ▪ Fulfilment of obligations to an insurance company ▪ Claims of employees ▪ Clients' expectations ▪ Claims of the local community 									
The sum of points in every column									
In total									

¹ Defined by a number of processes in which it occurs

² Defined by a number of environmental impacts (for instance, impacts on air, quality of water or soil)

³ Defined as having a local, regional or global impact

⁴ Being a consequence of new coming into force regulations

The assessment of environmental aspects in this method is based upon three principled criteria. These are:

- environmental factors,
- legal requirements and
- expectations of parties interested in the operation of a given MWTF.

Having the criteria against which environmental aspects are evaluated, it is necessary to adopt a scale for assessing the level of their significance. This scale is usually split into three categories – low (0,1,2), medium (4,5,6) and high (8,9,10) – representing the different intensity of impacts. Now, previously ascertained environmental aspects are individually evaluated. This enables a selection of aspects with the highest score thus with the most adverse impacts. Naturally, they are considered as significant and make the basis for establishing the environmental objectives and targets. According to the information received from the environmental managers of MWTFs, the procedure for evaluating environmental aspects is periodically reviewed, typically once a year.

In accordance with the expectations, a large portion of environmental aspects specified by Polish municipal waste treatment facilities have their source in waste landfilling. Consequently, emission of landfill gas together with the emission of leachate was placed at the top of the list of the most problematic environmental aspects (see figure IV.3.1). 55.6% of the certified facilities admitted that securing waste landfilling to minimise environmental impacts is their main objective. The nesting of vermin, worms and insects being a result of inadequate sanitation conditions during transportation, separation and storage of municipal solid waste was specified by 22.2% of the eco-certified facilities as one of their significant environmental impacts. The same number of environmental managers has indicated the emission of automobile exhaust fumes being a side effect of waste transportation as one of their main worries. Finally, 11.1% of the ISO 14001 certified facilities specified dust and odours emissions arising during unloading and separation of waste as well as waste composting as aspects bringing constant environmental concerns.

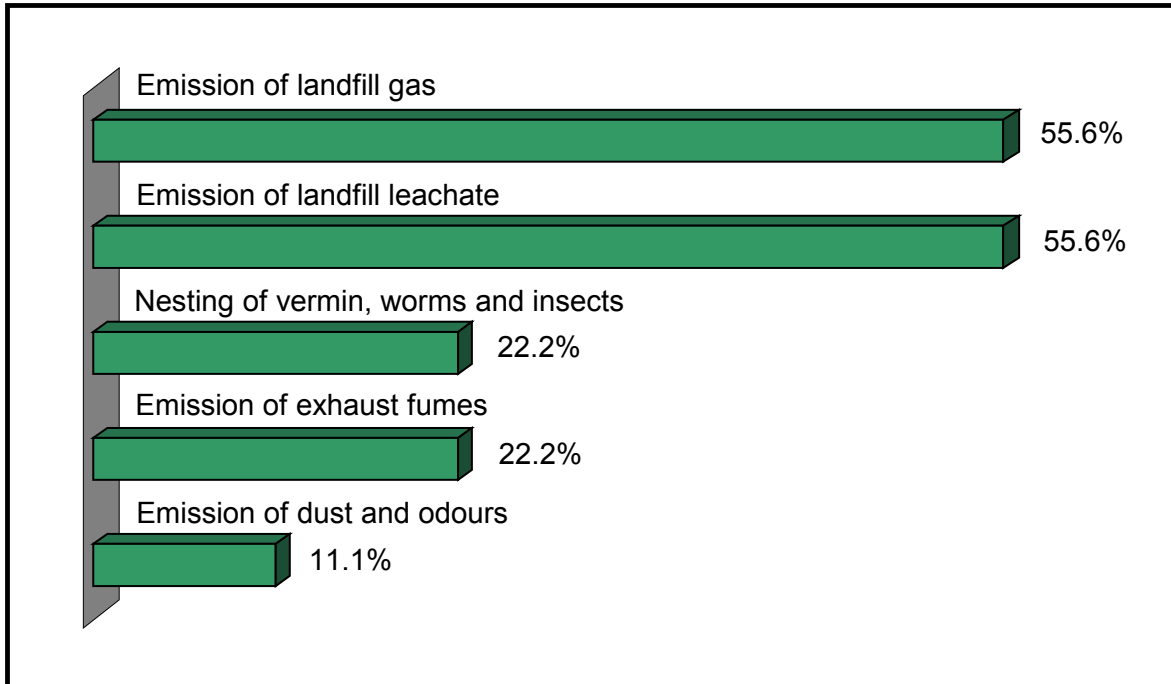


Figure IV.3.1. The most significant environmental aspects of the MWTFs' operation according to the opinion of environmental managers

IV.3.2.2. Legal and other requirements

According to the ISO 14001:2004 standard (Article 4.3.2), organisations are required to establish, implement and maintain procedures to:

- a) identify and have access to the applicable legal requirements² and other requirements³ to which the organisation subscribes related to its environmental aspects, and
- b) determine how these requirements apply to its environmental aspects.

Due to the number and complexity of regulations as well as their frequent amendments, it is advisable to catalogue their up-to-date versions. Organisations then have a reference list against which legal compliance can be tested. Moreover, every person in the organisation has access to the officially authorized register of legal and other requirements on site. Although copies of the regulations do not have to be stored by an organisation, many decide to keep them for review.

² Legal requirements may include international, national or local government legislation.

³ Other requirements can be in the form of agreements with public authorities, customers and the local community, norms or voluntary codes of practice, etc.

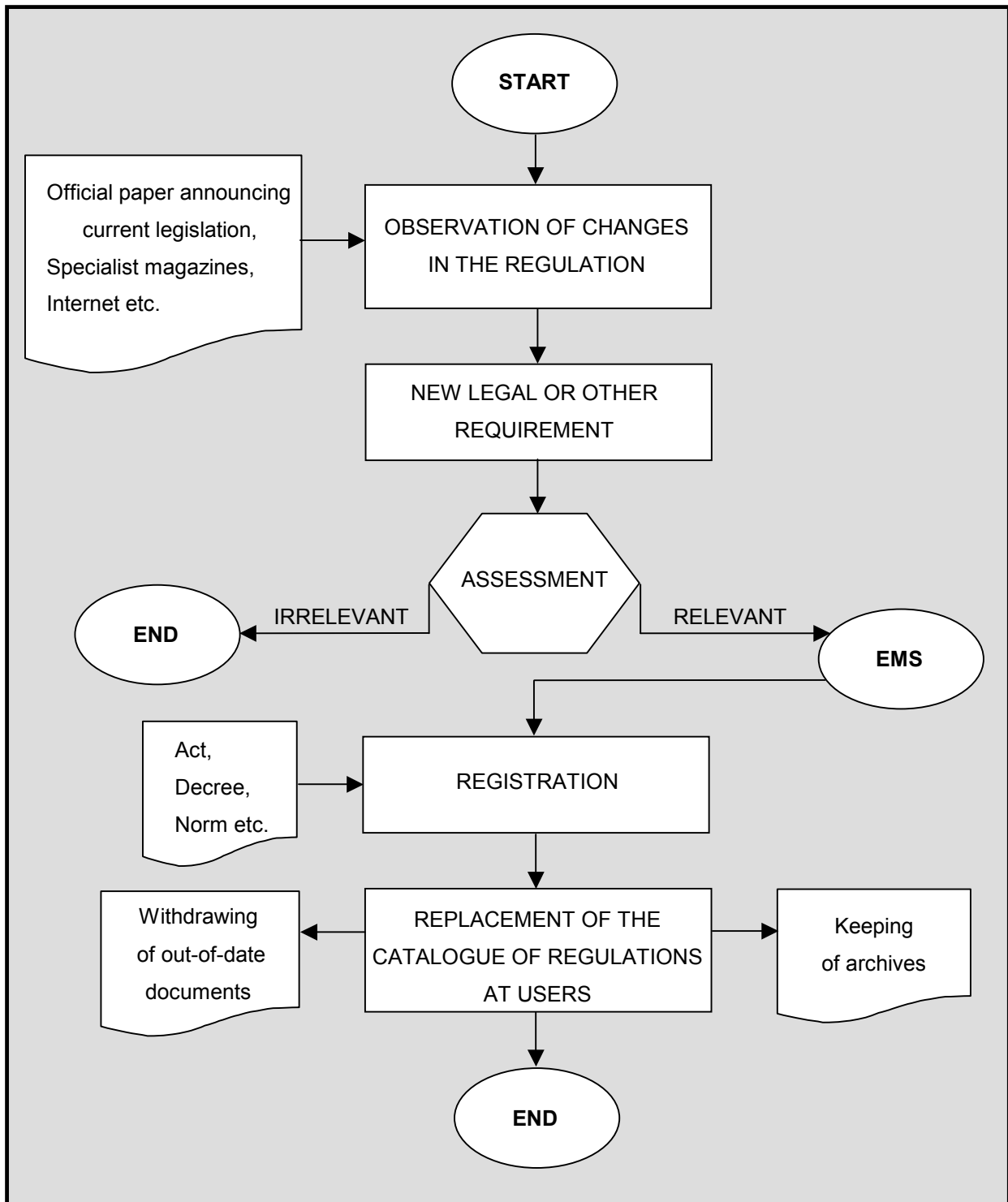


Figure IV.3.2. Sample instructions for identifying and bringing up-to-date legal and other requirements

Municipal waste treatment facilities in Poland have usually separate procedures for identifying and registering the relevant legal and other requirements (see figure IV.3.2). Beside a regular checking of the legislation, this procedure can be activated by any person in

an organisation that comes across new regulations. Having information on new legislation coming into force or amendments in the current one, the environmental manager should be contacted to make an evaluation of the reported legislation in regard to its relevance to the environmental aspects. If applicable, it will be added to the catalogue of current regulations. Normally, this catalogue is subdivided into three parts. The first part contains only national acts and decrees; the second one is solely devoted to local authority legislation whereas the third one provides a list of administrative decisions on the facility's operation. Besides the administrative decisions that employees possess, other legislation is owned by the environmental manager and is available for all employees in the facility.

IV.3.2.3. Objectives, targets and programme(s)

The ISO 14001:2004 standard (Article 3.9) defines an environmental objective as an overall environmental goal, which an organisation sets itself to achieve. An environmental target is described as a detailed performance requirement that arises from the environmental objectives and that needs to be set and met to achieve these objectives (Article 3.12). Both the objectives and targets are to be quantified where practical and consistent with the environmental policy. Furthermore, while establishing and reviewing the environmental objectives and targets, organisations are required to take into account legal and other requirements to which it subscribes and its significant environmental aspects (Article 4.3.3).

Most municipal waste treatment facilities in Poland seem to understand the requirements of the ISO 14001:2004 standard in the scope of setting objectives and targets. The approach they take to determine their environmental goals clearly stems from their commitments expressed in environmental policies (see table IV.3.4). Furthermore, they have a comprehensive action plan to achieve these goals. Unfortunately, as the research shows, besides these positive examples, there are facilities that evidently have a problem with setting measurable targets. Their environmental targets are very vague and, as a consequence, a continual improvement of environmental performance is difficult to verify and prove.

Table IV.3.4. The transfer of environmental policy's commitments into an action plan

Environmental policy	Environmental objective	Environmental target	Action plan
Shifting waste away from landfilling	To initiate separate collection of municipal solid waste at source	To recover 277 tonnes of dry recyclables a year	Organising a necessary infrastructure for separate municipal solid waste collection and transportation
	To decrease the amount of landfilled municipal solid waste	To increase the recovery rate of dry recyclables by 5% of the current level within a year	Modernisation of the system for municipal solid waste separation
	To eliminate bulky waste from landfilling whenever viable	To manage all bulky waste by 2008	Prepare an area for disassembling and sorting bulky waste
Reducing the negative impacts of waste landfilling	To prevent the migration of landfill gas into the atmosphere	To become self-sufficient in energy	Modernising gas control facilities and installing an energy recovery system
	To control the movement of leachate from a landfill site	To achieve legal compliance ¹	Prepare a project of integrated leachate management system
	To reduce the nuisance of landfilling on employees and nearby residents	To control blowing materials and dust	The placing of a wire fence around a landfill in operation
Modernising the system for waste transportation	To reduce the emission of automobile exhaust fumes	To decrease the consumption of diesel oil by 4% of the current level within a year	Purchase of higher efficiency engines
Improvement of office work	To reduce waste production	To reduce the consumption of stationery	Purchase and activation of the system for electronic communication

¹ Decree of 24th March 2003 establishing detailed requirements on siting, designing, operation and closure of all types of landfills

The aim of an environmental management programme is to provide a complete framework for the implementation of appointed objectives and targets. Consequently, according to the ISO 14001:2004 standard (Article 4.3.3), programmes should include:

- a) designation of responsibility,
- b) means and a time frame by which environmental objectives and targets are to be achieved.

Matuszak-Flejszman (2001) recommended writing an environmental management programme in a tabulate form for each environmental objective separately. She has made a suggestion that this facilitates the system of communication and monitoring within an organisation. This might be the reason why municipal waste treatment facilities in Poland follow such a style of writing programmes (see table IV.3.5). Unfortunately, due to limited access to environmental management programmes, it was practically impossible to test their completeness.

Table IV.3.5. An example of an environmental management programme

	Remarks
Objective	To initiate a separate collection of municipal solid waste at source
Target	To recover 277 tonnes of dry recyclables a year (55 tonnes of paper, 68 tonnes of glass, 73 tonnes of plastics and 81 tonnes of metals)
Action plan	1. Organising necessary infrastructure for separate municipal solid waste collection and transportation 2. Installation of the system for municipal solid waste separation
Responsible person	The manager of the Department for Municipal Solid Waste Management
Financial resources	-----
Time frame of implementation	By the end of 2008

IV.3.3. Implementation and operation

The process of implementation and operation of the ISO 14001 system provides solutions for a systematic integration of the environmental management system into an organisation's every day functioning. Having sound environmental policies, set objectives and targets, organisations need to take adequate measures for their effective coming into force.

These measures are:

- the appointment of resources and responsibilities,
- the provision of an appropriate training,
- communication procedures,
- documentation and control of ISO 14001 documents,
- operational control and
- emergency preparedness and response.

In line with the ISO 14001:2004 standard's requirements, these are the essential elements for making necessary operational adjustments for a continual improvement of the environmental performance.

IV.3.3.1. Resources, roles, responsibility and authority

According to the ISO 14001:2004 standard, organisations need to ensure the availability of resources, including human, infrastructure, technology and financial, essential to establish, implement, maintain and improve the environmental management system. Consequently, to facilitate effective implementation and operation of the ISO 14001 system, it is important to define roles, responsibilities and authorities. An environmental manager, who is directly subordinate to top management, has key responsibilities and authorities over the ISO 14001 system's functioning. He also provides regular feedback to top management on the performance of EMS for review. In addition, personnel involved in organisation's crucial actions need to be well informed about its roles and responsibilities with regard to the ISO 14001 system.

Not being given detailed information, it has be assumed that as long as municipal waste treatment facilities in Poland apply for certification and the ISO 14001 certificate is them granted, facilities have necessary resources to implement and operate the environmental management system. In addition, few facilities have positively gone through a recertifying audit where their preparedness for supporting necessary resources was checked.

Municipal waste treatment facilities in Poland have unequivocally recognised that the best person for the position of an environmental management representative is a person who is familiar with its operation. Consequently, the most frequently, a vice-director of a facility becomes the environmental manager. His personal attributes, such as versatility, decisiveness, perceptiveness, and an established reputation among workers undoubtedly makes him very good for this role. Moreover, years of work experience, have allowed him to understand well the facility's organisation and processes. On the technical side the main technologist of municipal waste treatment facility assists him.

IV.3.3.2. Competence, training and awareness

In line with the ISO 14001:2004 standard, any person in an organisation performing tasks that have the potential to cause significant environmental impacts should be competent on the basis of appropriate education, training or experience. In addition, organisations need to provide training or take other action to make employees aware of:

- a) the importance of conformity with the environmental policy and procedure and with the requirements of the environmental management system,
- b) the significant environmental aspects and related actual or potential impacts associated with their work,
- c) their roles and responsibilities in achieving conformity with the requirements of the environmental management system, and
- d) the potential consequences of departure from specified procedures.

Basically municipal waste treatment facilities in Poland apply two types of training: training for general environmental awareness and training for competence to execute a given job. The training for general environmental awareness is provided to all employees in a facility and is carried out by external bodies – usually an organisation running the certifying process. The major goal of this training is to make all personnel aware of the ISO 14001 system's requirements and their roles and responsibilities in fulfilling these requirements. The training for competence to execute a given job is provided to selected groups of employees performing work that, because of its nature, can have actual and potential significant impacts on the environment. A manager of MSW collection and transportation, a technologist of municipal waste management, a manager of MSW separation are, among others, included in the specialist trainings, which are delivered by contracted companies. The training of other employees is designed for internal training. The branch managers, who are externally trained, are responsible for their course.

The telephone interview has shown some deficiencies in employees' general environmental awareness. It is very difficult, however, to determine unequivocally the reasons for such a poor knowledge of the requirements of the environmental management system among middle level managers and blue-collar workers. This might be the result of either an inadequately organised training system or a lack of personnel commitment to the ISO 14001 system, or both. Being provided with the procedures for executing systematic training, it can be only speculated that a lack in employees' dedication is the main reason. Consequently, traditional training, which is for many workers an additional burden, proves to be ineffective in case of Polish municipal waste treatment facilities.

IV.3.3.3. Communication

The ISO 14001:2004 standard (Article 4.4.3) with regard to communication requires establishing, implementing and maintaining procedures for:

- a) internal communication among the various levels and functions of the organisations,

- b) receiving, documenting and responding to relevant communication from external interested parties.

The external communication within an environmental management system is optional, which means that its application is left for an organisation to decide.

MWTFs in Poland employ various means of internal communication, including among others, periodic employees' newsletters, regular staff meetings and the intranet. The opinion based on the empirical research, though, is that the most effective method for vertical – from top management to bottom level workers and inversely as well as horizontal – between departments communication has proven to be staff meetings. The former, due to the possibility for direct contact between personnel, is very useful for presenting the results of the ISO 14001 system's functioning, sharing experiences, and finally solving problems and making sensible decisions on undertaking corrective actions, if necessary.

According to the National Environmental Education Strategy (2001) environmental education has not been primarily under the responsibility of municipal waste treatment facilities. Despite that many of Polish facilities play an active role in developing environmental awareness and stimulating public interest in mutually related economic, social and municipal waste issues. As there are no legally imposed practices of environmental education methodology, each organisation applies the one that suits its current situation, naturally depending of available human-financial resources.

Most Polish municipal waste treatment facilities, which are ISO 14001 certified, have acknowledged that they established and implemented a range of communication methods for interested members of the public (see Appendix I). Apart from replying to all enquires, requests and complaints, they issue articles in local newspapers and publish information leaflets. Since surveys of the state of public awareness have demonstrated that mass media have a significant effect on the level of knowledge about the environment, local television, radio and newspapers

are the most commonly applied means of the external communication. In addition, to stimulate pro-active behaviour of the local community in separate waste collection and to popularise the usage of products manufactured from recyclable materials, many facilities also co-organise with local authorities various education schemes. This is done, among others, in the form of:

- 'Day of the World' where pupils of primary and high schools collect rubbish from forests, parks, and other civic amenity sites,
- 'open door days' for pupils during which they have been given an opportunity to visit a facility,
- 'eco-lessons' for young people taking place in regional environmental education centres, which are moderated by somebody from a facility, or
- environmental festivals, usually organised once a year.

The festivals of recycling attract the wider audience since they are a good entertainment for families as well as provides notable information initiatives on sustainable waste management. They are sometimes accompanied by outdoor information campaigns. Unfortunately festivals' organisation is very expensive and thus only the wealthiest communities can afford them. Consequently, most eco-certified MWTFs restrict its external communication to press releases and information provided on a facility's webpage.

The research shows clearly that public information and education programmes, proposed by Polish municipal waste treatment facilities, vary in style and content as much as development of the municipal waste management systems they promote. Although many similar elements make up a particular programme, the degree to which they are applied is often predicted by the local conditions of given region. Consequently, both information and education programmes require careful consideration of each communication process about waste based on frequency, cost and probably the most significant - audience. Independent of which tool the eco-certified MWTFs choose to educate and inform the public, all agreed that without a change in the consumers' attitude they will be able to adopt only the minimum practices necessary to comply with the municipal waste regulations of today.

IV.3.3.4. Documentation and control of documents

According to the ISO 14001:2004 standard requirements, the minimum documentation of the environmental management system should include:

- environmental policy,
- environmental objectives, targets and programmes,
- roles, responsibilities and authorities,
- procedures to control operations that are associated with the identified significant environmental aspects,
- monitoring and measurement procedures,
- procedures for evaluating compliance with applicable legal requirements, and
- results of taken corrective and preventive actions.

A crucial element of the ISO 14001 system's documentation in Polish municipal waste treatment facilities forms a manual of environmental management. It has a strategic meaning for the functioning of ISO 14001 since it provides an outline for its implementation and operation in a facility. It covers, among others, environmental policy, objectives and targets, and sometimes environmental programmes too. In addition, the MWTFs in Poland work out procedures, instructions and flow charts, having an operational sense. Their aim is to translate the general commitments of the ISO 14001 system, presented in the book of environmental management, into the every day operation of a facility. Finally, to demonstrate conformity with the ISO 14001 standard, the MWTFs keep records. All documentation is prepared and maintained in both paper and electronic format.

The documentation of the environmental management system needs to be controlled. This means that all documents are approved for adequacy prior to issue, reviewed and updated as necessary, dated (date of last revision), remain legible and readily identifiable. In addition, applicable documents should be available at points of use and obsolete ones are to be immediately withdrawn. The certified MWTFs in Poland follow the ISO 14001 standard,

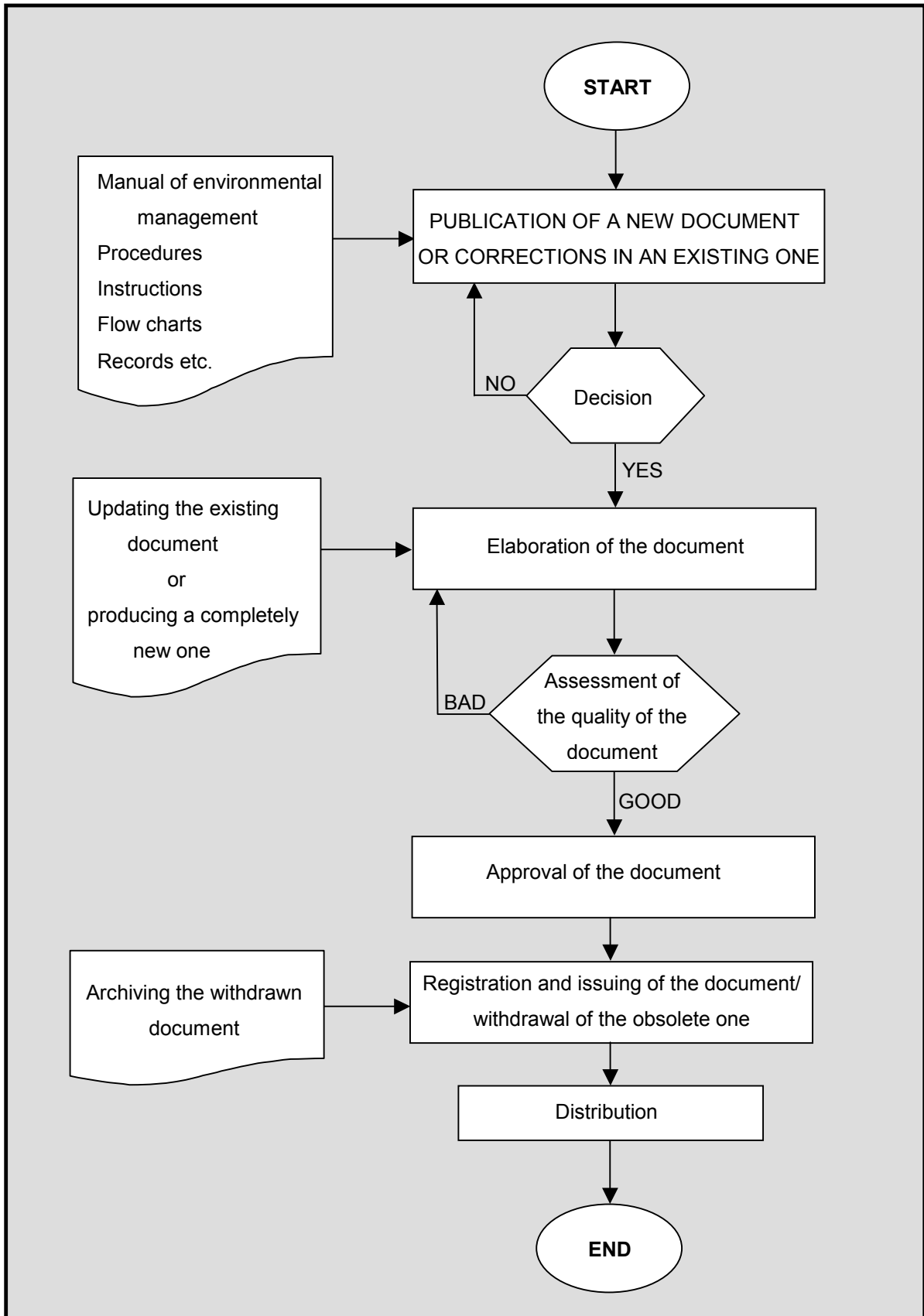


Figure IV.3.3. Sample procedure for reviewing and revising the ISO 14001 documentation

regarding control of documentation. They all have established necessary procedures for keeping the documents updated and available, and for eliminating or archiving obsolete ones. Therefore, it can be assumed that EMS documentation in Polish MWTFs is subject to constant revision (see figure IV.3.3).

IV.3.3.5. Operational control

The ISO 14001:2004 standard requires from organisations to identify and to plan these operations that are associated with the recognized significant environmental aspects, in order to ensure that they are carried out under specified conditions. This means that organisations need to:

- a) establish, implement and maintain documented procedures to control situations where their absence could lead to deviation from the environmental policy, objectives and targets,
- b) stipulate the operating criteria in the procedures and
- c) establish, implement and maintain procedures related to the identified significant environmental aspects of goods and services used by the organisation and communicate applicable procedures and requirements to suppliers, including contractors.

Sample processes associated with the significant environmental aspects of the municipal waste treatment facilities' operation are as follows:

- collection and transportation of waste,
- separation and storage of dry recyclables,
- processing of chosen dry recyclables, for instance aluminum, paper and cardboard and glass,
- dismantling of bulky waste,
- production of compost and
- deposition of waste at a landfill site.

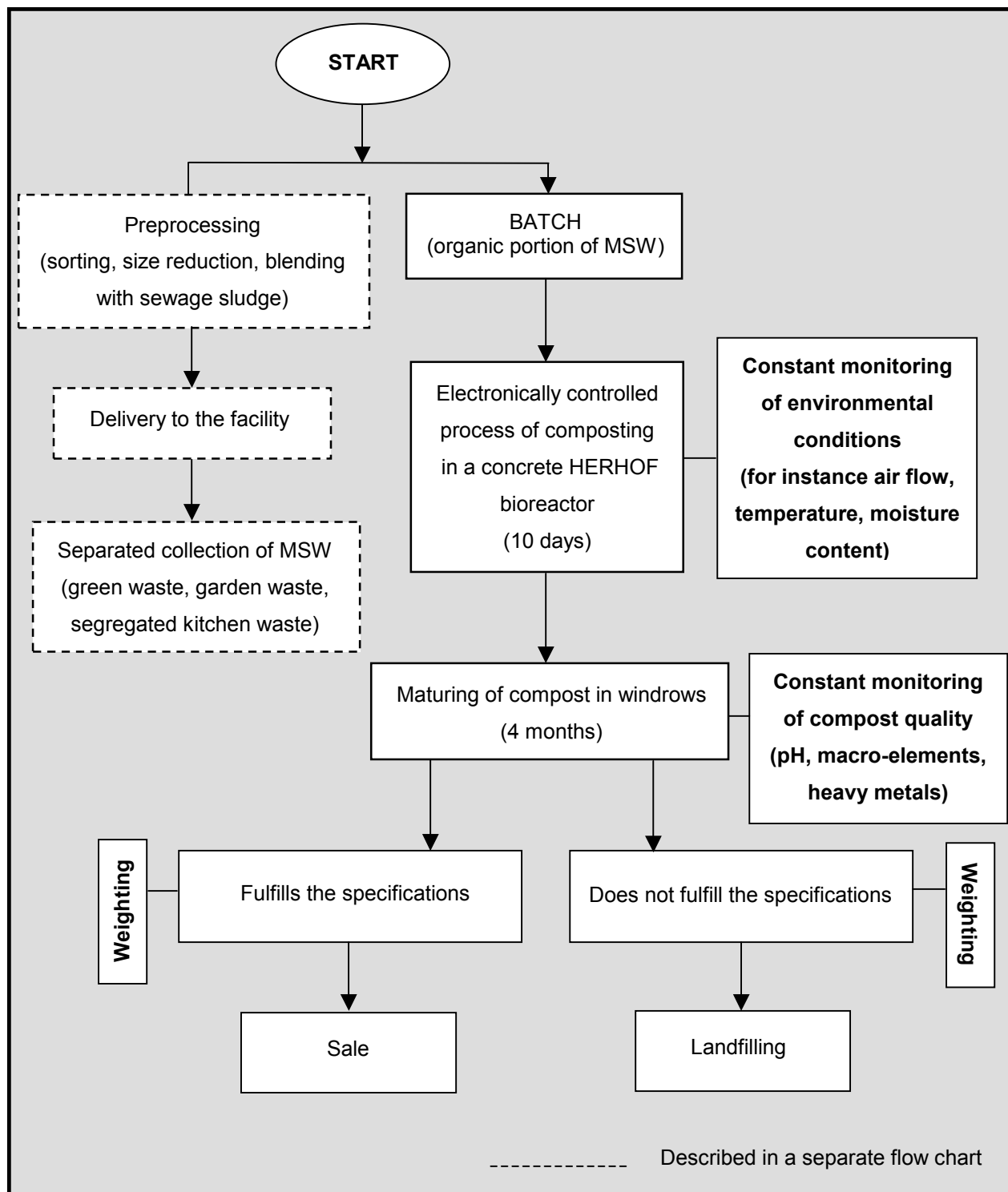


Figure IV.3.4. Sample flow chart for the process of composting

Besides the typical technological processes requiring operational control, there are also legal and organisational practices that might need separate written procedures. This, amidst others, may include:

- individual clients' servicing,

- marketing, for instance, promoting separate waste collection, or
- informing suppliers and contracting parties of certain procedures and requirements related to an environmental management system.

The scope of processes being covered by the operational procedures in the ISO 14001 frame is, though, largely dependent upon the set environmental objectives by each facility individually.

Once MWTFs had identified the processes associated with the significant environmental aspects, they developed flow charts for each of these processes to recognise process measures requiring control (see figure IV.3.4). This usually refers to operating procedures, work instructions and process information that are written, among others, upon extensive consultation with employees, who are responsible for their subsequent implementation. Unfortunately, the detailed documentation on operational control can not be provided since it belongs to the confidential information of facilities. Preparing appropriate control procedures to the scale of the environmental impacts seem to be crucial to the fulfilment of this ISO 14001 standard's requirement. They, on one hand, need to be concise to be easy to follow and, on the other hand, sufficiently comprehensive to cover all environmental issues.

IV.3.3.6. Emergency preparedness and response

In line with the ISO 14001:2004 standard, it is the responsibility of each organisation to establish, implement and maintain procedures to identify potential emergency situations and potential accidents that can have impacts on the environment. Moreover, organisations ought to respond to actual emergency situations and accidents thus preventing or mitigating associated adverse environmental impacts. Finally, organisations are expected to periodically review and revise their emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations.

All Polish municipal waste treatment facilities, which are ISO 14001 certified, have established procedures for potential emergency situations. They are, depending upon a facility,

reviewed and if necessary modified once a year or every two years. The scope of procedures covers a list of potential emergencies related to municipal solid waste management, preventive actions to avoid their occurrence and finally means of conduct in emergency situations. Responsibilities and authorities, for instance an appointment of a fast reaction group, are also clearly defined.

Sample emergencies identified in the procedures on potential emergency situations are as follows:

- self-ignition of waste accumulated at a landfill site,
- overflowing of a lined leachate retention pond and pumping system failure,
- puncturing of the geomembrane protecting the movement of leachate and landfill gases from a landfill site,
- presence of hazardous, radioactive or hospital waste in a stream of municipal solid waste and finally
- uncontrolled leakage of oil-derivative substances.

For each of the described above emergency situations, the preventive and response activities have been specified.

Taking into consideration, for instance the first emergency situation, which is the self-ignition of waste accumulated at a landfill site, the proposed preventive actions are:

- compacting the deposited waste material and covering it with a layer of mineral substances – mainly soil,
- environmental monitoring and
- daily inspections of an active area of a landfill site by workers, for instance an operator of a compactor.

If despite undertaking all these measures, self-ignition of waste accumulated at a landfill site occurs, then the appointed personnel have a clear procedure to follow to minimise adverse environmental impacts (see figure IV.3.5).

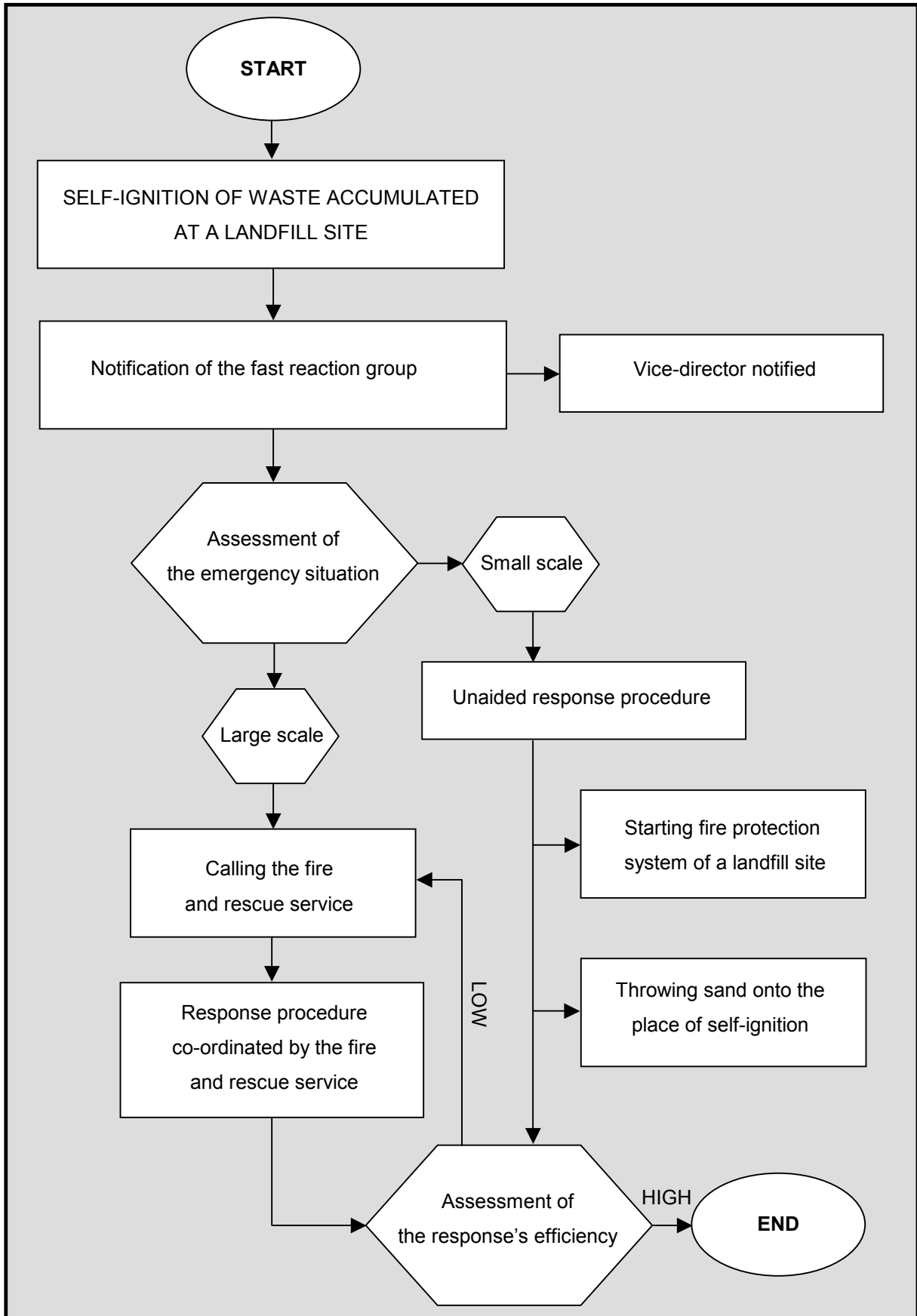


Figure IV.3.5. Sample instructions for the response procedure to self-ignition of waste at a landfill site

IV.3.4. Checking

After the process of planning and implementation of the ISO 14001 system, one should control if it is functioning in line with the philosophy of Deming. To confront the plans with the implemented actions, the following measures need to be taken:

- monitoring and measurement,
- evaluation of compliance with applicable legal and other requirements to which organisation subscribes,
- investigating nonconformities and taking corrective and preventive actions,
- control of records,
- conducting internal audits.

IV.3.4.1. Monitoring and measurement

The ISO 14001:2004 standard (Article 4.5.1) requires from organisations to establish, implement and maintain procedures to monitor and measure, on a regular basis, the key characteristics of operations that can have significant environmental impacts. The procedures shall include the documenting of information to monitor performance, applicable operational control and conformity with the organisation's environmental objectives and targets. Calibrated or verified monitoring and measurement equipment have to be used and associated records maintained.

For the sake of the character of performed activities, municipal waste treatment facilities in Poland carry a very comprehensive monitoring and measurement of its operations. This covers, among others, the following processes:

- collection and transportation of waste,
- separation of dry recyclables,
- production of compost,
- operation of a landfill site (see table IV.3.6) and
- quality and quantity of final products (materials recovered).

Table IV.3.6. Sample monitoring and measurement procedures for a landfill site

Monitoring of the landfill site

Environmental monitoring during the operation phase of a landfill site covers the following parameters:

- precipitation – monitored every day by a local meteorological station;
- leachate – monitored and analysed in line with the Decree of 9th December 2002¹ by an accredited laboratory;
- groundwater and surface water – monitored and analysed in line with the Decree of 9th December 2002² by an accredited laboratory;
- landfill gasses – monitored and analysed in line with the Decree of 9th December 2002³ by an accredited laboratory;
- structure and composition of deposited waste – controlled once a year by the chief technologist;
- extent of settlement – controlled once a year by an external competent body on the basis of established datum points.

The manager of the Department for Municipal Solid Waste Management is responsible for establishing, implementing and maintaining the system of monitoring and measurement. A shift foreman is responsible for controlling the monitoring equipment and also for keeping the necessary records.

¹ The volume of leachate is monitored once a month whereas the composition of leachate is monitored every three months. As a minimum, the monitoring needs to include the following parameters – pH , conductivity, total organic carbon (TOC), content of heavy metals (Cu, Zn, Pb, Cd, Cr, Hg) and polycyclic aromatic hydrocarbons. Most of the ISO 14001 certified facilities, however, go beyond the legal requirements and monitor a wider range of parameters.

² Composition of groundwater and surface water is monitored every three months.

³ Emission and composition of landfill gas is monitored once a month, regarding the following constituents – methane (CH₄), carbon dioxide (CO₂), oxygen (O₂).

Similarly to the operation of a landfill site, each of the above enumerated processes has its own environmental monitoring criteria. They are determined by national (alternatively local) regulations, administrative decisions on a facility's operation or worked out practices. Basically, the monitoring procedures of the crucial environmental parameters, for instance emissions of leachate and landfill gasses or quality of produced compost are specified by national regulations. The control of, for example, incoming waste as well as the structure and composition of deposited waste is conducted in line with the permission for the facility's operation issued by a local authority. Finally, parameters such as the quality of materials recovered etc., are monitored upon an individual contract between a facility and a dry recyclables purchaser.

IV.3.4.2. Evaluation of compliance

In line with the ISO 14001:2004 standard, organisations have to establish, implement and maintain procedures for periodically evaluating the compliance with applicable legal requirements (Article 4.5.2.1) and with other requirements to which it subscribes (Article 4.5.2.2). Although it is not required to be in full compliance with environmental legislation, it is expected to be able to show evidence of continual efforts to meet the commitment to compliance. Finally, records of the results of periodic evaluations should be kept.

Since the last modification of the ISO 14001 standard in 2004, the periodic evaluation of compliance has earned a new importance by placing it in a separate section. The rationale for this change was to ensure that organisations meet their commitments to comply with legal and other requirements. As it is a recent provision, experience as for the fulfilment is limited. Consequently, even though municipal waste treatment facilities in Poland have already established necessary procedures, they are usually vague and require further clarification. Evaluation of the legal compliance is very often confused with tracking legal and other requirements. Facilities it seems, need to be given more time to improve their approach. The researcher was informed by the environmental controlling institutions that serious violation of law by MWTFS has hopefully not been notified in practice.

IV.3.4.3. Nonconformity, corrective action and preventive action

The ISO 14001:2004 standard (Article 4.5.3) requires from organisations to establish, implement and maintain procedures for dealing with actual and potential nonconformities and for taking corrective and preventive actions. These procedures should define requirements for:

- a) identifying and correcting nonconformities and taking actions to mitigate their environmental impacts,
- b) investigating nonconformities, determining their causes and taking actions to avoid their recurrence,
- c) evaluating the need for actions to prevent nonconformities and implementing appropriate actions designed to avoid their occurrence,
- d) recording the results of corrective actions and preventive actions taken and
- e) reviewing the effectiveness of corrective and preventive actions taken.

Actions taken ought to be appropriate to the magnitude of the problems and the environmental impacts encountered.

Polish municipal waste treatment facilities have a well developed programme for tracking nonconformities since it uses a wide range of information sources. This detailed information, among others, is guaranteed by an in-depth analysis of:

- all oral and written complaints,
- employees' notifications,
- evaluation of compliance with legal requirements,
- results of internal audits,
- periodical management reviews.

Once the nonconformity is identified, the necessary corrective and preventive actions are undertaken in accordance with the relevant procedure (see figure IV.3.6). Employees of a department are responsible for the removal of arising nonconformities in which they were identified. The manager of this department also supervises the magnitude of actions taken. The efficiency of the implemented actions is assessed by the environmental manager.

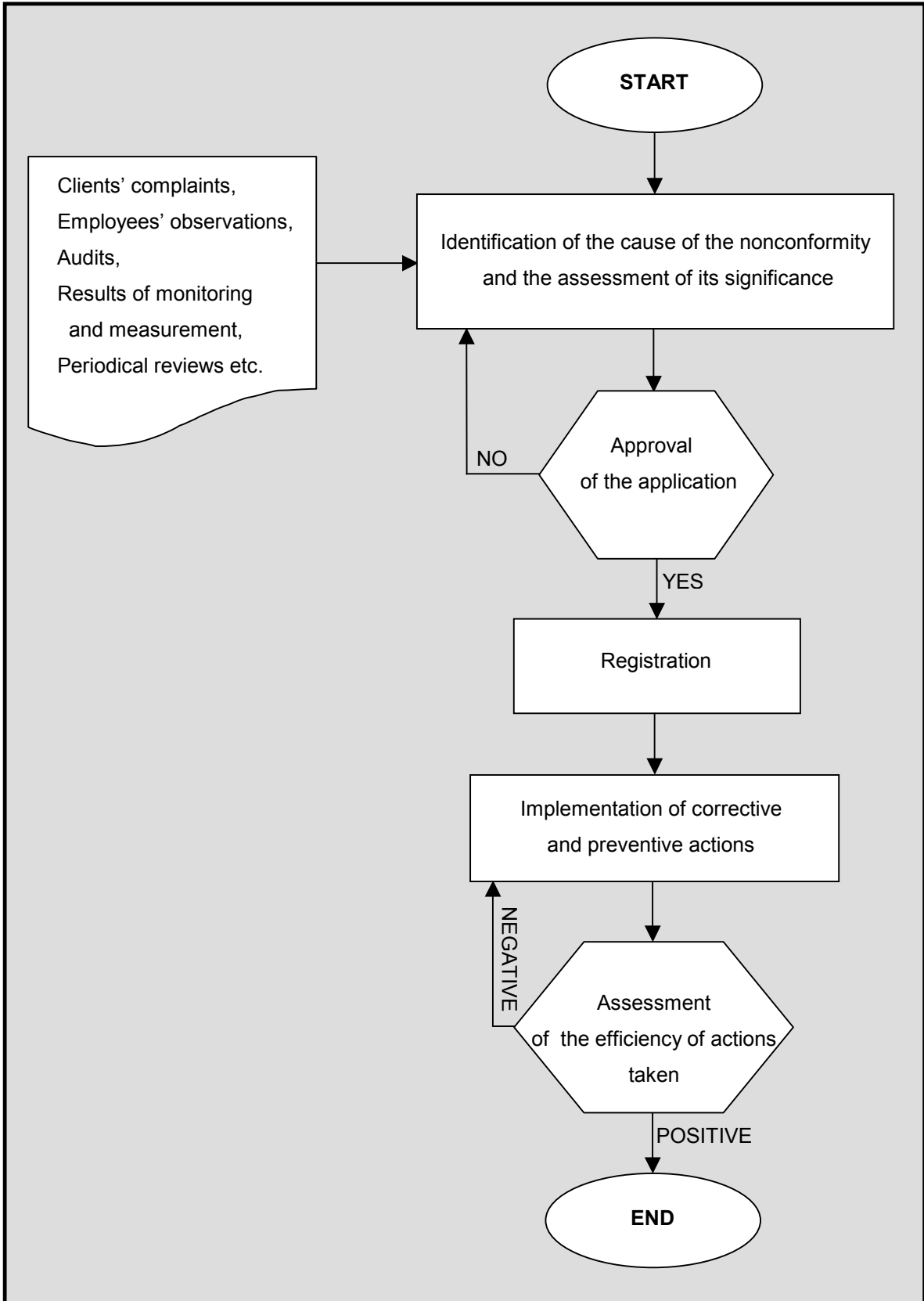


Figure IV.3.6. Sample procedure for the identification of nonconformities and taking of corrective and preventive actions

IV.3.4.4. Control of records

According to the ISO 14001:2004 standard (Article 4.5.4), organisations have to establish and maintain records to demonstrate conformity to the requirements of their environmental management system and results achieved. In other words, records make up a chronicle of the ISO 14001 implementation and operation in an organisation. Consequently, a procedure for the records' identification, storage, protection, retrieval, retention and disposal need to be developed. Records must be legible, identifiable and traceable, when necessary.

Records maintained by municipal waste treatment facilities in Poland cover a wide range of issues related to the functioning of the ISO 14001 system. This includes, among others,:

- records of significant environmental aspects,
- records of applicable legal requirements – acts, decrees, administrative decisions etc.,
- training records – a training schemes, course of training, register of attendance etc.,
- monitoring records – analysis of the percentage of separated MSW, weight-volume analysis of collected waste, parameters of pile etc.,
- records of inspection and maintenance of machines and equipment,
- complaint records – internal and external,
- audit records – audit schedules, programme of audit, audit results.

The above itemised records only exemplify the extensiveness of recording procedure being applied by the ISO 14001 certified MWTFs. Thanks to good organisation, the establishment and maintenance of records seem not to be too burdensome for the facilities. The responsibility for the records' preparation is assigned individually and drawn up in the procedure entitled "Control of records". In addition, managers of individual departments are in charge of the appropriate maintenance of records. Finally, the right to inspect records is only given to employees whose concern it is, namely, chief technologists, the board of directors and an environmental manager.

IV.3.4.5. Internal audit

The ISO 14001:2004 (Article 4.5.5) requires from organisations to ensure a conducting of internal audits of the environmental management system at planned intervals to:

- a) determine whether the system conforms to planned arrangements for environmental management including standard requirements and has been properly implemented and is maintained and
- b) provide information on the results of audits to management.

The programme of internal auditing should be planned, taking into consideration the environmental importance of the operations concerned and the results of previous audits. The chosen audit procedures have to address the responsibilities and requirements for planning and conducting of audits, reporting results and retaining associated records as well as the determination of audit criteria, scope, frequency and methods. The process of auditing needs to be organised in a way that ensures objectivity and impartiality.

All eco-certified municipal waste treatment facilities in Poland have declared that they conduct regular internal audits of their environmental management system. On the whole, a comprehensive audit, covering all aspects related to the ISO 14001 system's functioning is done once a year whereas a selective audit, covering chosen individual components of the ISO 14001 system is done from a few to several times a year. Prepared procedures, performed processes or fulfilment of objectives and targets are, for instance, the focus of selective audits. The frequency and the scope of internal audits is, however, a very individual issue that needs to be tailored to the maturity of an environmental management system. Consequently, a programme of auditing is established based on a steady observation of the ISO 14001 system's operation, an analysis of records and an evaluation of compliance to the standard. In most cases, the internal audits are conducted by an environmental manager. A person, sometimes a team of workers, is assigned from a facility that has adequate qualifications and work experience, to run the audits on his behalf. All MWTFs that have also implemented the ISO 9001 system conduct integrated internal audits.

There are two types of internal audits performed by municipal waste treatment facilities in Poland. These are:

- an audit of conformance – verifying the conformity to the requirements of the ISO 14001:2004 standard and
- an efficiency audit – testing the results of undertaken actions in the framework of the ISO 14001 environmental management system.

The common feature of these two types of audits is looking for opportunities for achieving maximum improvement of EMS in order to enhance the facility's environmental performance. The prime method of self-assessment in both cases is a checklist constituting a guide for evaluation. The audit of conformance usually covers selected aspects of the ISO 14001 practices and procedures being implemented (see table IV.3.7). Whereas the efficiency audit covers selected quantitative characteristics of the facilities' operation (see table IV.3.8). Provided checklists are not complete, but can prove to be useful as a good starting point for designing of MWTFs' own audits.

To ensure a continual effective implementation and operation of the ISO 14001 system, many municipal waste treatment facilities in Poland, while conducting internal audits, apply other fragmentary standards of the ISO 14000 family. First and foremost, facilities make use of the ISO 19011 standard that has replaced the ISO 14010, ISO 14011 and ISO 14012 standards and provides a guideline for auditing of quality and/or environmental management systems. Some facilities also employ the ISO 14015 standard giving guidance to the environmental assessment of sites and organisations. This standard describes the relationship between the environmental aspects (impacts) and their ensuing financial consequences and is occasionally required by insurance or credit granting companies. Finally, some municipal waste treatment facilities, while making a periodical evaluation of their environmental performance, apply certain components of the ISO 14031 standard providing a structured approach for organisations wishing to confront their achievements with set environmental objectives and targets.

Table IV.3.7. Audit of conformance – ISO 14001: 2004 overall documentation requirements

AUDIT OF CONFORMANCE – CHECKLIST			
No	ISO 14001:2004 documentation requirements	Status quo¹	Comments
1.	Documented information on environmental aspects and evaluation of impacts	Yes/No	
2.	Records of identified applicable environmental legal and other requirements	Yes/No	
3.	Documented policy, objectives, and targets and programmes	Yes/No	
4.	Documented roles, responsibilities and authorities	Yes/No	
5.	Records on competence and performed training of permanent employees and of contracted workers	Yes/No	
6.	Documented communication procedures from and with interested parties	Yes/No	
7.	Documented procedures for operation and activities that may cause significant environmental aspects	Yes/No	
8.	Documenting information on monitoring performance, applicable operational controls and conformity with objectives and targets (including records to track calibration and maintenance of monitoring and measuring equipment)	Yes/No	
9.	Documenting the evaluation of compliance with environmental legal and other requirements	Yes/No	
10.	Documented changes as a result of corrective and preventive actions (including reports on emergency situations and accidents)	Yes/No	
11.	Documented internal audit programme (including records from audits)	Yes/No	
12.	Records from management review	Yes/No	

¹ Underline the correct answer

Table IV.3.8. Efficiency audit – sample parameters¹

EFFICIENCY AUDIT – CHECKLIST				
Name of parameter	Unit	Year 2005	Year 2006	Comments
Waste production				
Used up disinfecting agents	kg			
Air pollution				
Average consumption of petrol per collection vehicle	litre			
Soil contamination				
Used up oil-derivative substances	Mg			
Water consumption				
Annual water consumption at a car wash	m ³			
Nuisances (local aspects)				
Odour	low/medium/high			
Noise	dB			
Landfill area	ha			
Others (not classified)				
Quantity of separated municipal solid waste	Mg			
Pro-ecological investments	zloty			
Financial penalties for exceeding legal norms	zloty			
No. of arising emergency situations and accidents	no/year			
Response time to emergency situations and accidents	hour			

¹ This list does not intentionally comprise parameters, which are regularly monitored on account of legal requirements.

IV.3.5. Management review

Management review is the final piece of the ISO 14001 continual improvement cycle. It ought to be performed on a set frequency to ensure that the environmental management system is functioning adequately and effectively. Consequently, the aim of the review is to assess opportunities for progress and need for alterations, including the environmental policy, environmental objectives and targets and finally all other elements of the system, consistent with the commitment to the continual improvement in the overall environmental performance of an organisation.

According to the ISO 14001 specification (Article 4.6), minimum input to management review ought to include:

- a) results of internal audits and evaluations of compliance with legal and other requirements to which the organisations subscribe,
- b) communications from external interested parties,
- c) the environmental performance of the organisation,
- d) the extent to which objectives and targets have been met,
- e) status of corrective and preventive actions,
- f) follow-up actions from previous management reviews,
- g) changing circumstances, including developments in legal and other requirements related to its environmental aspects and
- h) recommendations for improvement.

On the other hand, outputs from management reviews should be concrete decisions and actions, reflecting the review findings. Management reviews are to be documented.

Management reviews in Polish municipal waste treatment facilities are regularly performed as they usually take place once a year. They have a very strategic character and hence are solely carried out by people involved in a facility's strategic development. This gives the board of directors that has made a decision on the ISO 14001 system's implementation an

opportunity to objectively review expectations against achievements of the system's functioning. At this stage, the role of an environmental manager is restricted to providing sufficient information to allow for a through judgement of the current environmental situation of the facility. The scope of provided information is consistent with the provision of the ISO 14001 standard.

In line with the collected information, management reviews of the environmental management system's functioning in the eco-certified facilities result in:

- modification of the general directions of the system (only if some considerable changes in applied methods for waste transformation have been introduced),
- rewriting of the environmental policy,
- correction of the environmental objectives and targets,
- establishing a new system of documentation or
- improving techniques for external communication.

These are only selected results of the management reviews of MWTFs, kept general intentionally to enable each facility to address its unique characteristics individually. Essentially recent experience shows that the already implemented ISO 14001 systems in the municipal waste sector have evolved from a solely technological focus to more organisational – looking for improvements in documentation, communication and quality of services offered.

IV.4. Difficulties concerning the process of ISO 14001 EMS's implementation and maintaining

The process of implementation and maintaining of the ISO 14001 environmental management system involves a number of difficulties. They can be categorised into external and internal factors, depending on the causes of difficulties. A lack of necessary funding, complicated wording of the ISO 14001 standard requirements and no clear market value of the certificate are only some of the typical external barriers to the ISO 14001 system's implementation and certification that the municipal waste treatment facilities faced. Alongside these external obstacles, there are facility – internal difficulties emerging while adopting individual elements of the ISO 14001 system. The identified internal obstacles have, however, different sources, scope and intensity since they are largely conditional upon divergences between the standard provisions and the current environmental management practices of a facility. Naturally, the implementation process of the ISO 14001 system runs smoother in facilities that have already had some components of environmental management.

The conducted research has managed to reveal some common areas of the ISO 14001 system where municipal waste treatment facilities in Poland have encountered most difficulties. In line with the opinion of environmental managers of the certified facilities, apart from organising training procedures, all remaining elements of the ISO 14001 standard pose some problems (see table IV.4.1). Sometimes these are minor but nevertheless they demonstrate some difficulties. The reason for not listing the training procedures is a relatively extensive access to well organised environmental education in Poland. Many facilities, hence, respond to this standard requirement with the assistance of external bodies; making them responsible for

the provision of requisite environmental awareness training for employees. As a result, however, many facilities have limited control of the environmental competence of their staff.

Table IV.4.1. Main difficulties of MWTFs in Poland related to the ISO 14001 system's implementation and maintaining

Elements of the ISO 14001 EMS	Percentage
Identification and assessment of significant environmental aspects	56%
Establishment of environmental objectives and targets	11%
Environmental management programmes	11%
Training	0%
Communication	33%
Documentation	11%
Preparedness for emergency situations and response	11%
Monitoring and measurement	11%
Nonconformance, corrective and preventive action	44%
Auditing	22%
Management review	11%

Being given the possibility of stating more than one alternative, the certified MWTFs in Poland have judged that the identification and the assessment of significant environmental aspects raises the most problems during adoption of the ISO 14001 system. Therefore, this what ought to be the nucleus of the EMS and guiding light in continuous improvement – environmental knowledge and prioritisations (Zackrisson et al, 2000) seems to be a great challenge for 56% of all Polish facilities. Municipal waste management is strictly legally controlled and, for this reason, the facilities need to address the environmental aspects of their operation. The real problem starts, however, when the quantification of the identified environmental aspects is performed. The clash of various factors, for instance environmental concerns, business affairs and regulatory liabilities, that have to be taken into account, additionally make the process of the evaluation of environmental aspects very complicated.

Thereby, the development of an appropriate methodology capable of weighing all these factors simultaneously is very difficult for the certified MWTFs in Poland. Finally, facilities sometimes seem to ignore the fact that they have limited practical control over certain environmental aspects resulting from the activities they execute. This is the case of, for instance, waste landfilling, which environmental impacts can be reduced but not entirely eliminated.

Dealing with nonconformities and the implementation of corrective and preventive actions is another major difficulty associated with the ISO 14001 system's maintaining by municipal waste treatment facilities in Poland. Consequently, 44% of the research facilities have admitted that they have problems with fulfilling this provision. Very often, it is not the processing of nonconformities itself that causes confusion, but the tracking of their occurrence. Establishing a multi-threading mechanism for identifying the processes failing to conform seems, hence, to be very problematic. Many facilities, though, rely almost solely upon the findings of internal audits and strongly underestimate the role of employees in determining the sources of deficiencies. Thereby, they lose the opportunity of making a comprehensive examination of nonconformities and taking adequate corrective and preventive actions. Optimistically, there are also MWTFs in Poland that effectively integrate personnel into the flow of information on imperfections of the ISO 14001 system functioning in their organisations. An example of a well developed procedure for dealing with nonconformities is provided in section IV.3.4.3.

Problems with communication are the final significant obstacle to the efficient working of the ISO 14001 system in the municipal waste treatment facilities in Poland. Although all facilities have some communication procedures in place, 33% of them have declared that they have encountered a number of difficulties with circulating information related to environmental management. The study has proved that most facilities make either little or no use of alternative forms of communication, which offer modern technologies. Despite having intranets, the majority of MWTFs still exchange information on paper. In addition, only a few systematically update their webpages. Finally, only some have acquired a correspondence tracking system to

handle enquires from external parties. All the above have considerably prolonged the flow of information and, as a result, have impeded communication. The researcher is certain yet that MWTFs, given more time, would be able to establish adequate approaches and lines of passing on information.

Owing to a relatively short experience with the concepts of environmental management in the municipal waste sector in Poland and the complexity of the environmental standard, the process of the ISO 14001 system's implementation and maintaining is not a simple one. Polish municipal waste treatment facilities have become convinced of this truth in their day-to-day activities. Indeed, to accomplish the continual improvement of the environmental performance, profound changes need to be introduced in the routine management practices of facilities. This, as discussed above, has led to many facility-internal difficulties, which when followed by external impediments can considerably restrain future development of the ISO 14001 system in the municipal waste sector. Therefore, some environmental managers have claimed that environmental management systems can be successfully implemented as a corporate agenda in Polish facilities only if professionally supported.

IV.5. Environmental management systems: a cost – benefit analysis

Facilities before they take a decision whether to implement the ISO 14001 environmental management system, often wish to be acquainted with the potential costs and benefits resulting from initiating the process. One way of determining if the anticipated advantages cover expenditures is by performing a cost – benefit analysis. This technique assumes the quantitative appraisal of the total expected costs against the total expected benefits. In the case of EMS, though, it is very problematic since numerous benefits, for instance an improved image, are practically unfeasible to measure. Consequently, the traditional approach to the cost-benefit analysis has limited value as it results in evaluating the net profit or loss ensued from the implementation of the ISO 14001 system. Despite that, this analytical technique is commonly applied to making a systematic recognition of the structure of costs and benefits.

Municipal waste treatment facilities in Poland split the total costs of pursuing the environmental management system into two groups. The first group constitutes costs directly connected with the process of implementation whereas the second group represents costs resulting from having the ISO 14001 system in place, the so-called indirect costs. Expenditures for pro-ecological investments, for instance the installation of an energy recovery system, are inter alia numbered among the second group. As the indirect costs involve a strong dependence on current environmental practices of each MWTF in Poland individually, they were excluded from the research. The close similarities between the facilities in the organisation of spending for the ISO 14001 system enables a closer study of group's direct costs. These costs are subdivided into the expenditures requisite for the EMS design,

certification and finally maintenance. Nonetheless, there are apparent differences in the allocation of resources, some segments of costs show regularities and they could be therefore investigated (see table IV.5.1). On average, an environmental manager of MWTF requires 150 working days to prepare the ISO 14001 system for the first certification. At the same time, all facilities make use of external consulting agencies assisting them to develop EMS. This generates the standard cost of 30,000 Polish zlotys (7,690 euros) but largely varies between facilities. To certify the ISO 14001 system at least 15,000 Polish zlotys (3,850 euros) is necessary. Most leading certification bodies, however, take 25,000 Polish zlotys (6,410 euros) per three days certifying audit. Once the system is developed, the personnel need to be trained to operate it effectively. Typically, this creates the costs of 6,500 Polish zlotys (1,660 euros), when one considers solely the expenditures for external training. Adding up the total costs associated with the first ISO 14001 certification of MWTFs – consultation, auditing and training, but excluding an environmental manager’s fee, all equal 55,000 Polish zlotys (14,000 euros), on average.

Table IV.5.1. The magnitude of the overall costs of pursuing the ISO 14001 system by MWTFs in Poland

Magnitude of			
design costs (i.e. consultation costs)	certification costs	maintenance costs (i.e. personnel training costs)	
10,000 – 50,000	15,000 – 25,000	5,000 – 8,000	in Polish zloty
2,560 – 12,820	3,850 – 6,410	1,280 – 2,050	in euro ¹

¹ Based on the average euro exchange rate of the National Bank of Poland in 2006

Each municipal waste treatment facility in Poland, which is ISO 14001 certified, has achieved a number of benefits resulting from the possession of the environmental management system. They can be split into two groups. The internal benefits, being very directly connected with the performance of a facility and the external benefits, encompassing enhanced

relationships with external bodies. Despite the fact that these two categories of profits have a different nature, they are equally important for facilities. As far as the opinion of environmental managers from Polish MWTFs is considered, the main actual benefit from implementing the ISO 14001 standard is the continual improvement of the environmental performance and related to this the reduction of negative impacts on the environment that stem from the facility operation (see table IV.5.2). Consequently, according to 67% of the respondents, the ISO 14001 EMS, very often integrated with the ISO 9001 QMS, is one of the essential factors that stimulate a dynamic sustainable progress in their organisations. They maintain that by doing a systematic and documented appraisals of the system and immediate reactions to all non-conformances, a gradual improvement in the management of municipal solid waste has been achieved. This transfigures into broadening the scope of offered services and, as a result, shifting waste away from landfilling. Another, equally significant external benefit resulting from setting up the ISO 14001 system is the considerable enhancement of the facility's reputation in the municipal waste sector. 67% of certified MWTFs have admitted that their relations with regulatory authorities monitoring the operation of a facility as well as customers purchasing from them recyclable materials has largely improved. This is fully justified by the fact that the ISO 14001 certified facilities draw high attention to monitoring procedures.

Table IV.5.2. Main actual benefits from implementing the ISO 14001 system by MWTFs in Poland

We:	Percentage
have continually improved our environmental performance	67%
have reduced environmental impacts	67%
have achieved a better image on the municipal waste market	67%
have improved a public understanding and confidence that their waste is being handled properly	33%
have achieved better staff motivation	44%
better fulfil current environmental legislation	11%
have improved documentation and organisation	22%
have reduced costs	11%

Based on the opinion of the environmental managers from the ISO 14001 certified MWTFs in Poland, there is no significant discrepancy between the benefits and the costs associated with the implementation and maintaining of the environmental management system. 50% of them claim that the actual profits compensate for incurred expenses (see figure IV.5.1). Although the ISO 14001 system brings unquestionable benefits, they speculate that similar environmental improvements could be achieved without having EMS in place. Naturally, it would be a longer process and possibly even more expensive. The next 37.5% of MWTFs with the pursued ISO 14001 system is strongly convinced that the environment-improvement potential of EMS is higher than economic-human costs related to its introduction and functioning. They have recognised, though, that the pace of return for investment in the ISO 14001 system depends upon many factors. The ones of prime importance are a level of sophistication of the existing environmental management practices, a top management commitment and the current status of compliance with legal requirements. Finally, the more convergent environmental objectives with the overall facility goals are, the more effectively the ISO 14001 system operates. The foregoing results let us believe that municipal solid waste with the support of an environmental management system could be collected, treated and disposed of in a healthy and economical manner with a minimum detrimental effect on the environment.

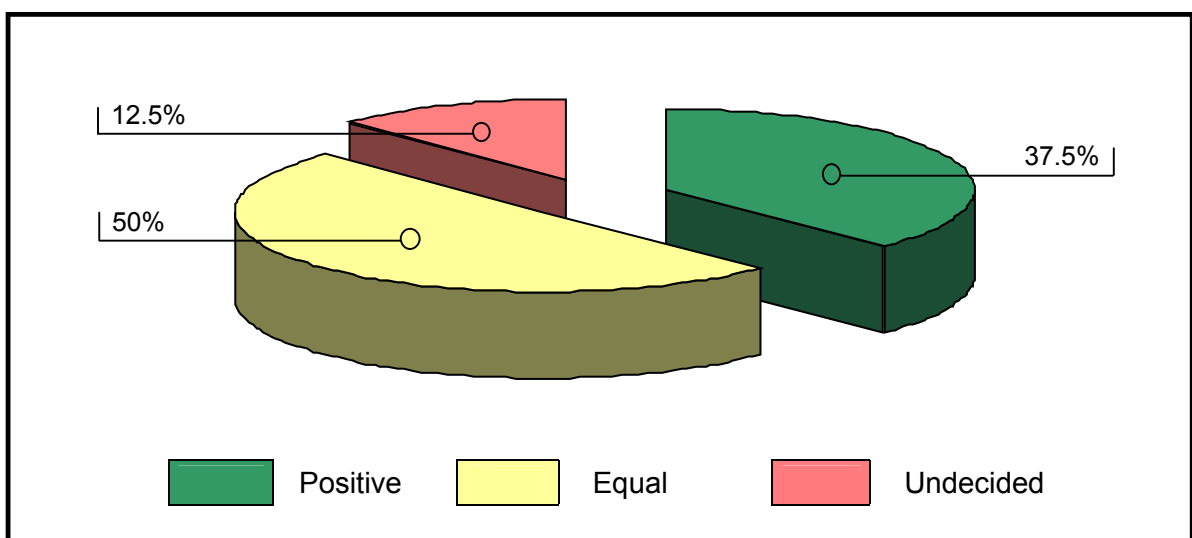


Figure IV.5.1. The relationship between benefits and costs of the ISO 14001 system's implementation by MWTFs in Poland

IV.6. Environmental management systems and sustainable development: a SWOT analysis

Environmental management systems have been developed to assist organisations to face the challenge of sustainable development¹. Consequently, in a growing number of sectors, compliance with environmental management standards has become a symbol of positive response to the principles of sustainability. A number of questions, however, need to be raised. Are EMSs, in fact, a step towards translating the global postulations of sustainability to the local socio-economic development with respect for the environment. If yes, then how do EMSs create sustainability and finally, what is the role of EMSs in providing sustainable solutions to the everyday concerns of municipal waste treatment facilities? To address the above enumerated issues, a SWOT analysis will be carried out. This is a strategic tool that helps to evaluate key strengths, weaknesses, opportunities and threats involved in a given venture. Although a SWOT analysis is undoubtedly a very powerful tool, it is not free of limitation, which is subjectivity.

The results of the SWOT analysis confirmed that environmental management systems offer a certain potential to organisations wishing to follow a sustainable path of development. The wording of the ISO 14001:2004 standard leads sometimes, however, to misconceptions during implementation and operation as well as misunderstandings of their purpose among the general public. Thereby, despite unquestionable strengths and opportunities, environmental management systems have a number of process' weaknesses that, in the long run, can pose

¹ Sustainable development – a process that allows for a gradual balancing of economic growth, social cohesion and environmental protection (Sustainable Development Strategy for Poland up to 2025, 2000).

some threats to sustainability. A decisive factor for the future success of EMSs as a response to the challenge of sustainable development will be their ability to keep a balance in the approach to human beings, the environment and economic growth.

On the basis of research among Polish municipal waste treatment facilities (see table IV.6.1), a clear integration of environmental concerns into the facilities' total management practices (no longer considering environmental protection in isolation) is recognised as the biggest strength of environmental management systems. All further actions, such as, for instance identification of environmental aspects or determination of objectives to be fulfilled, are only a consequence of this acceptance of responsibility for the current environmental practices. The former contribute to technological and managerial innovations in MWTFs that, in the long term, will bring a higher quality of life through elimination of unsustainable management of municipal solid waste. In addition, this gradual change is stimulated by the external funding for pro-ecological investments, which is more often granted to facilities with a formalised commitment to environmental protection. Although time is necessary to allow a full maturity of the ISO 14001 system in Polish facilities by observing current practices, it can be concluded that EMSs help to accomplish the expectations of sound MSW management of present generation without compromising the ability of future generations to implement their concepts of dealing with waste.

One of the greatest weaknesses of the ISO 14001 system in respect to promoting the principles of sustainability is the lack of guidance on assessing the significance of environmental aspects. Consequently, some Polish MWTFs focus their actions on less important environmental problems, for instance a reduction of the stationery's consumption, leaving the more important issues unsolved. Relatively high introduction and running costs of environmental management systems are also not without importance since money invested in the ISO 14001 system could be otherwise allocated, for instance, in some pro-ecological investments. No obligation to communicate externally about the environmental performance

Table IV.6.1. The effectiveness of the ISO 14001 system in addressing the concept of sustainable development of Polish MWTFs – SWOT analysis

Strengths

- Makes a clear integration of environmental concerns into facilities' management practices (environmental protection is no longer considered in isolation)
- Improves the awareness of environmental aspects and impacts of facilities' operation
- Motivates facilities' actions towards a reduction and, if viable, the elimination of environmental impacts

Weaknesses

- Gives no guidance on assessing the significance of environmental aspects
- Requires high introduction and operation costs
- Lack of obligation to communicate to the public (no environmental reporting)

Opportunities

- Strive for a higher quality of life through elimination of unsustainable management of waste
- Contributes to innovation thus stimulates the continual search for the best available solutions for municipal solid waste management (can result in costs reduction and an increase in revenue in the long term)
- Helps to access external funding streams for pro-ecological investments
- Helps to fulfill the expectations of sound MSW management of present generation without compromising the ability of future generations to implement their concepts

Threats


- Ambiguity - no differentiation between a facility of good or bad environmental performance
 - Motivates only such environmental improvements that pay off economically or are legally required
 - May lose public credibility due to the lack of obligation to report externally key indicators of environmental performance
-

forms another constrain of the ISO 14001 system. Thereby, the opportunity to stimulate an active dialogue with a local community about local environmental problems of municipal solid waste management has been lost unless MWTFs decide to beat the ISO 14001:2004 standard's requirements. Furthermore, all interested citizens have no possibility to view the results of the environmental performance of the certified facilities and to make an independent assessment of the achieved progress. If to add the fact of no differentiation between the good and the bad environmental performer, and usually low interest in environmental investments if they do not pay off economically or are legally required; this brings a considerable concern about the credibility of the ISO 14001 system as an effective instrument to accomplish sustainability.

Summarising the research findings, environmental management systems seem to give a foundation for MWTFs' accountability to environmental protection, economic growth and social expectations but not to the same degree. The majority of municipal waste treatment facilities give, though, a priority to the environmental concerns because of strong conviction that environmental sustainability preconditions economic prosperity and the local society's satisfaction in the long run. As long as the strong commitment to the environment will motivate the implementation of EMSs by Polish municipal waste treatment facilities, their role in contributing to the goals of sustainable development will be high.

Chapter V

DISCUSSION



V.1. Implementation of environmental management systems in MWTFs: a critical evaluation

“We have modified our environment so radically that we must now modify ourselves to exist in this new environment.”

Norbert Wiener

Corresponding to the National Waste Strategy for Poland, the system for municipal solid waste management will chiefly rely on regional organisations, established by one or several co-operating communes. These organisations, professionally defined as municipal waste treatment facilities ought to be able to provide highly integrated solutions for materials and energy recovery from the stream of municipal solid waste, and finally environmentally sound deposition. The accomplishment of these responsibilities will certainly not be possible without a change of attitude towards the management process of facilities. The traditional approach to management that places the focus solely on economic aspects has no longer a *raison d'être* in Poland because of the consistent influx of pressure from governmental agencies to improve environmental performance over the last decade. Currently, the coordination of a facility needs to also address environmental and social implications of its operation. The experience shows, however, how difficult a task it is to balance all these concerns. Consequently, to minimise the risk of potential failure, municipal waste treatment facilities in Poland are searching for already proven methods of management; environmental and quality management systems are considered as one of them. To evaluate critically the research findings, the author will address the research hypotheses put forward for verification.

In Poland, there is small but dynamically growing number of municipal waste treatment facilities that are formally registered to the quality and/or environmental management system. In the beginning of 2004, when this research was commenced, solely 6% of MWTFs was formally certified to the ISO 9001 and/or 14001 system in Poland. In two years time, however, the situation has changed drastically. Finishing the empirical investigation in the beginning of 2006, the researcher stated that 25% of Polish MWTFs already implemented one or both of the above enumerated systems. With regard to the Eco-management and Audit Scheme, the situation is far worse since so far no facilities have been formally EMAS registered. Optimistically, there are MWTFs that go beyond the requirements of the ISO 14001 system and consider the future implementation of the European environmental management system. The majority of MWTFs that operate in ISO 9001 and/or ISO 14001 environment are publicly own limited liability companies of medium size (maximum number of employees 250). They all either have already provided complex integrated solutions for municipal solid waste management or are about to offer them.

One of the essential reasons for the decision to implement the ISO 14001 EMS is its potential to stimulate the process of continual improvement of the environmental performance. Thereby, 64% of Polish MWTFs that are eco-certified or are going to apply for future certification expect from the ISO 14001 system an assistance in meeting the growing level of environmental protection. The facilities are hoping that thanks to introducing modifications to work organisation, technological operations and communication will achieve a reduction in the environmental burden. Taking into consideration the high level of commitment to the environment, MWTFs, which have properly implemented the ISO 14001 system, have a great chance to succeed it. A considerable majority of facilities (90% of current and prospective users of EMS) do not consider the ISO 14001 system as an instrument for costs reductions, at least not in the initial stage. Despite these low expectations, 37.5% of Polish MWTFs with the pursued ISO 14001 system admitted that the environmental-improvement potential of the environmental management system is higher than the economic-human costs of its introduction and operation.

One of the major challenges that MWTFs face during the ISO 14001 system's implementation and maintaining is the identification and the assessment of significant environmental aspects. Consequently, 56% of the eco-certified facilities in Poland admitted to having encountered difficulties during the process of establishing and prioritising environmental consequences of their operation. The ISO 14001:2004 standard does not provide any methodological framework for the evaluation of environmental aspects. The choice is left for organisations that do not necessarily target the most significant aspects but rather the ones to which supervision they are legally bound. Fortunately, despite these concerns, a large portion of MWTFs in Poland has well developed procedures to identify and assess environmental aspects. The ones, the researcher had a chance to review, were based upon a multi-criterion rating against environmental, legal and human (interested parties) factors. Therefore, the affirmation that municipal waste treatment facilities prioritise their environmental aspects more on the strength of legal requirements than environmental or social responsibilities does not correspond with reality. Even if such a problem occurs then on a very small scale and thus can be ignored.

Paradoxically, the experience shows that the greatest menace to a broader application of EMSs by municipal waste treatment facilities in Poland does not pose high expenditures for the process of implementation and maintenance, though it can form a certain constraint, but the incompetence of certification bodies. It happens that certification bodies in order to encourage organisations to get formally registered, grant the ISO 14001 certificate without an in-depth examination of the system. An evaluation of an environmental management system for conformance is very often limited to an inspection of documentation if it covers the required procedures. The problems, however, do not only appear during the certification audit but also during the recertification appraisal. The research has revealed that MWTFs unable to prove quantitatively the fulfilment of declared targets, thereby the achievement of any environmental improvements, have also received recertification. Most probably, some certification bodies apply the above enumerated practices to promote environmental management systems and to

attract potential clients. The effect is, however, quite the opposite. This leads, though, to the depreciation of the ISO 14001 system and a scepticism as to the value of these already implemented. As a result, prospective users of EMSs become discouraged in their implementation. Only, a more rigorous monitoring of certification bodies by the Polish Centre of Accreditation can restore and then guarantee the high status of ISO 14001 certificates in the municipal waste sector in Poland. Otherwise, environmental management systems may lose credibility, which would be very damaging to the systems themselves, facilities already formally eco-certified and ones seeking registration, and finally certification bodies.

Originally, the general aim of the ISO 14001 standard was to provide a uniform system to support environmental protection in balance with socio-economic needs in organisations all over the world, irrespective of their economic activity, size and structure. Therefore, non-industrial organisations, including municipal waste treatment facilities, should be able to get as many benefits as industrial companies. The review of Polish facilities has shown, however, that environmental management systems do not evenly contribute to all components of sustainable development. They certainly assist in building a synergy between environmental protection and economic growth but do not necessarily support the creation of a culture of MSW prevention and their active separate collection. Additionally, environmental managers from Polish municipal waste treatment facilities have held the opinion that the environment is superior to the remaining two components (economy and society) of sustainable development. Consequently, in the long run, the integration of environmental concerns into daily activities enables a successful economic prosperity and social participation. Such reasoning is, however, not groundless, if one takes into considerations the high recovery rates that have been achieved by western European facilities that have adopted environmental management systems a few years ahead of Polish facilities.

Environmental management systems seem to offer precisely this what municipal waste treatment facilities that provide integrated waste management solutions do on a day-to-day

basis. Therefore, the relevant parties that expect some fundamental managerial, organisational or technological changes within MWTFs will be deeply disappointed since the only difference in most cases is in the effectiveness of facilities' operation. Those facilities where the ISO 14001 system has been adequately implemented are therefore more professionally managed, become committed advocates of materials and energy recovery from the stream of municipal solid waste to expand a landfill site operation phase and sometimes also promote active public involvement in the separate collection of the waste they generate. Thereby, municipal waste treatment facilities that are certified to the ISO 14001 system, especially if integrated with the ISO 9001 system, are regarded as organisations, which represent the highest standards of performance in the sector. Furthermore, they are continually striving for an improvement in the environmental performance, legal compliance and the provision of good quality services. Although the near future will show, what the actual role of environmental management systems will be in addressing the environmental and socio-economic obligations of Polish municipal waste treatment facilities, current practices appear to prove a high efficiency of the ISO 14001 system in putting the vision statement (the environmental policy) of these facilities into action.

V.2. Suggestions for continual improvement of environmental management systems in MWTFs

In accordance with the results of the conducted research, the researcher has given below some suggestions for Polish municipal waste treatment facilities if they wish to succeed in the further continual improvement of environmental management systems. As facilities face dissimilar problems, each of them ought to only follow those recommendations that can assist them in accommodating to increasingly stringent requirements of environmental protection in a systematic manner. On the whole, MWTFs need to be fully aware of the fact that an approach to the process of an environmental management system's implementation will determine the benefits they receive; following the rule of thumb – what you get out of something depends on what you put into it!

- Consider future EMAS registration

It is highly recommendable to MWTFs that have already been certified to the ISO 14001:2004 standard to consider future EMAS registration. Since the last ISO 14001 revision these two environmental management systems are parallel. The EMAS scheme, however, supports internal and external communication more actively through supplementary requirements of an active involvement of employees and publication of an environmental statement, which very often fails in Polish facilities. Thereby, EMAS is perceived as a more transparent and credible system.

- Consider an integration of management systems

A recommendation for all MWTFs is to integrate the ISO 14001 EMS with the ISO 9001 QMS

and the PN-N 18001 OHSAS. Only the synergy between the improvement of environmental performance and quality of provided services, which accompanies a continual concern for employees enables to succeed the enhancement of a total facility's performance. Furthermore, the recent revisions of standards have reduced confusions and have given administrative benefits related to the process of implementation and maintenance. Apart from the internal advantages, the integration of management systems brings a number of external benefits and ultimately contributes to sustainable development.

➤ Select a competent certification body

When choosing a certification body, MWTFs should not focus exclusively on the price it offers. In the interest of facilities seeking registration, it is advisable to find such a certification body that employs experienced environmentalists who will help to succeed continual improvement. Remember that, in the long run, only an adequately implemented environmental management system will bring an enhancement of environmental performance as well as financial, legal and social benefits. To be able to achieve this, it is highly recommended to select a certification body that has the knowledge of the municipal waste sector, is available for subsequent audits and can provide assistance during possible the EU Eco-Management and Audit Scheme registration.

➤ Apply for subsidies

As the process of EMS's implementation and operation requires huge financial investment, MWTFs are encouraged to apply for subsidies. Since Poland's enters into the European Union, Polish organisations have become eligible for financial support for the adoption of quality and environmental management systems. Past experience has shown that external funding can cover up to 50% of the costs related to implementation and certification. By the end of 2006, one of the most commonly applied source of funding was the PHARE programme. To receive a subsidy a number of fund's specific criteria have to be fulfilled. For detailed information about current funding opportunities, please contact the Polish Agency for Enterprise Development

that is responsible for the management of funds assigned from the State Budget and the European Union (<http://www.parp.gov.pl/en/>).

- Report carefully about environmental performance

All MWTFs ought to be able to provide measurable evidence of continual improvement of the environmental performance. This is especially important for these MWTFs, which intend to implement the Eco-Management and Audit Scheme. EMAS requires, though, a production of validated statement that describes the environmental performance of an organisation against its environmental objectives and targets with respect to its significant environmental impacts. Furthermore, this information should be presented in such a way so as to allow an assessment of accomplished progress.

- Ensure an appropriate training for the personnel

All MWTFs are advised to pay higher attention to a middle level managers' knowledge of an environmental management system. The research has clearly proved that lack of information about an improvement potential of the ISO 14001 system is an essential cause for a lack of commitment among workers to EMSs. Therefore, to implement and operate the environmental management system effectively, it is necessary to make all personnel aware of reasons for pursuing the system and anticipated benefits for a facility. In addition, employees should be acquainted with the main environmental goals, presented in the environmental policy. Only then, can an environmental management system become a corporate personnel priority.

- Promote environmental culture change

Many MWTFs concentrate so much on designing the environmental management system that they seem to forget about the role of social acceptance and participation in successful municipal solid waste management. The perception that on-site actions can solve all environmental problems is entirely wrong unless society's involvement in generating high rates of municipal solid waste recovery. Consequently, once facilities reach a certain level of an

environmental performance improvement, they are advised together with local authorities to promote more aggressively an environmental culture change in the community to gradually break public scepticism as to the benefits of separate MSW collection.

- Share experience with other ISO 14001 certified MWTFs

The research has revealed that exchange of information between MWTFs about their experience with an environmental management system could help to avoid many confusions during its implementation and operation. Therefore, because of steadily growing number of municipal waste treatment facilities that are formally registered to the ISO 14001 system, it is highly recommendable to design a national information platform to facilitate the development of environmental management systems in the municipal waste sector in Poland through provision of good practice examples. In addition, a list of certification bodies with the knowledge of MWTFs' specificity or the current news about possible financial support for facilities could be there provided. This forum for information exchange might be a part of existing waste portal (<http://odpady.net.pl>) that provides professional advice to all practitioners of waste management.

V.3. Proposals for prospective research

The research has provided a breadth of valuable information supporting the successful adoption of environmental management systems by municipal waste treatment facilities. Besides this important contribution, this research project has revealed areas where deeper investigation could be made. The practice has shown, though, that environmental management systems are a vast area of study. Therefore, prospective researchers, who will have an opportunity to continue this work are advised to explore the following environmental management concepts. It must be emphasized, however, that these are only some sample directions into which the current investigation can evolve.

Environmental management systems, as it was already discussed in this work, are relatively new instruments and experience with their implementation and operation in the municipal waste sector is limited. Consequently, the environmental efficiency of EMSs adopted by municipal waste treatment facilities in Poland has not been able to be fully tested. In most cases, though, tangible evidence of the realisation of stated objectives and targets could not be provided since these targets are due for completion in the coming years. The number of collected environmental results was too small to serve as a representative sample for the assessment of the ISO 14001 system's environmental efficiency. Follow up research is, hence, highly recommended to prove beyond all doubt that EMSs stimulate improvement of the environmental performance provided they are well designed and maintained. If so, the study should be able to give evidence of this enhancement, for instance in the form of a measurable reduction of environmental burden resulting from the landfilling of municipal solid waste. Only

by having these results, can the adoption of environmental management systems be viewed as the best way to propagate the idea of environmental sustainability.

The prerequisite of future investment in environmental management systems by municipal waste treatment facilities in Poland is that they pay off economically. The financial profits can be a result of possible cost savings, for instance the payment of lower environmental fees thanks to shifting waste away from landfilling, and an increase in revenue, for instance from selling dry recyclable materials separated from the stream of municipal solid waste. The researcher has made a thorough analysis of costs related to the ISO 14001 implementation but has been unable to give detailed information on economic benefits resulting from the ISO 14001 operation. This was largely impossible because of top management reluctance to provide any information on the financial situation of facilities and treating them as confidential. Furthermore, the majority of environmental management systems implemented by MWTFs in Poland have not reached the maturity stage yet from which organisations can expect a return on any investment. If the prospective researcher is able to access information, results of an investigation of long-term economic benefits can serve another significant argument for a broader application of EMSs by municipal waste treatment facilities.

Some researchers of environmental management have claimed that EMSs play a significant role in propagating the culture of sustainability by raising employee's morale and improving public trust. In return for demonstrating a continual concern for the environment, organisations expect community support for the work they do. Although the conducted research has managed to view that the ISO 14001 certified municipal waste treatment facilities take a responsibility for the public environmental education, it has not been tested what the community response is. The question whether EMSs form an incentive to proactive behaviour towards saving the environment through, for instance, separate municipal waste collection could thus not be fully answered. Hopefully, future studies will have a chance to verify the above stated issues more comprehensively.



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Quality management systems – EN ISO 9001:2000, DIN EN ISO 9001:2000

Rozporządzenie Komisji (WE) 364/2004 z dnia 25 lutego 2004r. zmieniające rozporządzenie (WE) nr 70/2001 i rozszerzające jego zakres w celu włączenia pomocy dla badań i rozwoju (Załącznik 1 - Definicja małych i średnich przedsiębiorstw), Dz. U. L 124 z 20.5.2003

Rozporządzenie Ministra Środowiska z dnia 24 marca 2003r. w sprawie szczegółowych wymagań dotyczących lokalizacji, budowy, eksploatacji i zamknięcia, jakim powinny odpowiadać poszczególne typy składowisk odpadów, Dz. U. RP 61.549

Rozporządzenie Ministra Środowiska z dnia 9 grudnia 2002r. w sprawie zakresu, czasu, sposobu oraz warunków prowadzenia monitoringu składowisk odpadów (Decree on the monitoring procedures for landfill sites), Dz. U. RP 220.1858

Rozporządzenie Ministra Środowiska z dnia 27 września 2001r. w sprawie katalogu odpadów, Dz. U. RP 112.1206

Rozporządzenie Ministra Gospodarki z dnia 30 października 2002 r. w sprawie rodzajów odpadów, które mogą być składowane w sposób nieselektywny, Dz. U. RP 191.1595

Rozporządzenie Rady Ministrów z dnia 9 października 2001r. w sprawie opłat za korzystanie ze środowiska (Decree on the environmental fees), Dz. U. RP 130.1453

Rozporządzenie Rady Ministrów z dnia 30 czerwca 2001r. w sprawie rocznych poziomów odzysku i recyklingu odpadów opakowaniowych i użytkowych, Dz. U. RP 69.719

Second National Environmental Policy prepared by the Ministry of the Environment and adopted by the Council of Ministers on 13 June 2000, GEA: Warsaw

Uchwała nr 219 Rady Ministrów z dnia 29 października 2002r. w sprawie krajowego planu gospodarki odpadami (Waste Management Strategy for Poland), M.P. No.11.159 2003r.

Ustawa z dnia 12 marca 2004r. o krajowym systemie ekozarządzania i audytu EMAS (Act of 12th March 2004 on EMAS), Dz. U. RP 70.631

Ustawa z dnia 11 maja 2001r. o obowiązkach przedsiębiorców w zakresie gospodarowania niektórymi odpadami oraz o opłacie produktowej i opłacie depozytowej, Dz. U. RP 63.639

Ustawa z dnia 27 kwietnia 2001r. Prawo ochrony środowiska (Environmental Protection Act), Dz. U. RP 62.627

Ustawa z dnia 27 kwietnia 2001r. o odpadach (Waste Act), Dz. U. RP 62.628

Ustawa z dnia 20 grudnia 1996r. o gospodarce komunalnej, Dz. U. RP 9.43 1997r.

Ustawa z dnia 13 września 1996r. o utrzymaniu czystości i porządku w gminach (Maintenance of Cleanliness and Order in the Communes Act), Dz. U. RP 132.622



AUTHOR'S CONTRIBUTION

Below is provided a list of chosen author's publications and conference presentations being partially a result of this research project.

- I. Rybaczewska-Błażejowska, M (2005) *Environmental management systems and their application in the Polish municipal waste sector*, VI-th International Waste Management Forum – Efficiency of waste management, Licheń
- II. Graczyk, M and Rybaczewska-Błażejowska, M (2005) *Environmental management systems – tools to improve the environmental performance of the municipal waste sector*, Management Vol.9 No.1, Faculty of Management Press: Zielona Góra
- III. Rybaczewska-Błażejowska, M (2005) *ISO 14001 – pomoc czy utrudnienie?*, Recykling 10(58), Wydawnictwo Komunalne – Abrys: Poznań (in Polish)
- IV. Rybaczewska-Błażejowska, M (2006) *Waste or Resource – A Polish Perspective*, Research Conference – End of life? – looking at responses to 'the waste culture', Cheltenham
- V. Rybaczewska-Błażejowska, M (2006) *Environmental management systems and sustainable development*, 12-th Annual Sustainable Development Research Conference, Hong Kong
- VI. Graczyk, M and Rybaczewska-Błażejowska, M (2006) *Environmental management systems – opportunities, barriers, perspectives*, Management Vol.10 No.1, Faculty of Management Press: Zielona Góra



APPENDICES

Appendix A

LIST OF THE ENVIRONMENTAL PROTECTION AND AGRICULTURE DEPARTMENTS IN MARSHAL OFFICES

NO.	NAME OF THE OFFICE	NAME OF THE DEPARTMENT	DIRECTOR	ADDRESS	TELEPHONE FAX	WWW	EMAIL
1.	Marshal's Office of Lower Silesia	Wydział Ochrony Środowiska	Józef Miklaszewski	12-14 Wybrzeże J. Słowackiego Street 50-411 Wrocław	(071) 374-94-22	www.umwd.pl	agnieszka.walczak@umwd.pl
2.	Marshal's Office of Kujawsko-Pomorski Region	Departament Środowiska	Edward Reszkowski	2 Teatralny Street 87-100 Torun	(056) 621-84-00 (056) 621-84-04	www.kujawsko-pomorskie.pl	e.reszkowski@kuj-pomorskie.pl
3.	Marshal's Office of Lublin Region	Departament Rozwoju Wsi i Ochrony Środowiska	Zygmunt Babkiewicz	4 Spokojna Street 20-074 Lublin	(081) 532-69-71 (081) 532-12-28	www.lubelskie.pl	rozwoju.wsi@lubelskie.pl
4.	Marshal's Office of Lubuski Region	Departament Rolnictwa i Rozwoju Wsi	Marek Żeromski	7 Podgorna Street 65-057 Zielona Gora	(068) 456-54-48 (068) 456-54-18	www.lubuskie.pl	-----
5.	Marshal's Office of Lodz Region	Departament Rolnictwa i Ochrony Środowiska	Stanisław Fontański	3 Sienkiewicza Street 90-113 Lodz	(042) 630-90-62 (042) 630-90-62	www.lodzkie.pl	os@lodzkie.pl
6.	Marshal's Office of Malopolski Region	Departament Środowiska i Rozwoju Wsi	Andrzej Masny	56 Raclawicka Street Krakow	(012) 630-31-40 (012) 630-31-41	www.malopolskie.pl	-----
7.	Marshal's Office of Mazovia Region	Departament Ochrony Środowiska	Małgorzata Krzyżanowska	3 Brechta Street 03-472 Warszawa	(022) 597-91-34 (022) 597-92-60	www.mazovia.pl	m.krzyzanowska@mazovia.pl

NO.	NAME OF THE OFFICE	NAME OF THE DEPARTMENT	DIRECTOR	ADDRESS	TELEPHONE FAX	WWW	EMAIL
8.	Marshal's Office of Opole Region	Departament Ochrony Srodowiska	Manfred Grabelus	14 Piastowska Street 45-082 Opole	(077) 453-74-55	www.umwo.opole.pl	-----
9.	Marshal's Office of Podkarpacie Region	Departament Rolnictwa i Srodowiska	Dariusz Surma	3a Towarnicka Street 35-959 Rzeszow	(017) 860-67-10 (017) 860-67-11	www.podkarpackie.pl	rolnictwo@podkarpackie.pl
10.	Marshal's Office of Podlasie Region	Departament Rolnictwa i Ochrony Srodowiska	Halina Dondziło	28 Legionowa Street 15-281 Białystok	(085) 749-75-08 (074) 748-51-89	www.wrotapodlasia.pl	dgrim.sekretariat@umwp-podlasie.pl
11.	Marshal's Office of Pomerania Region	Departament Rozwoju Obszarów Wiejskich i Ochrony Srodowiska	Kazimierz Sumiński	21/27 Okopowa Street 80-810 Gdansk	(058) 326-16-59 (058) 326-16-63	www.woj-pomorskie.pl	drowos@woj-pomorskie.pl
12.	Marshal's Office of Silesia Region	Wydział Ochrony Srodowiska	Piotr Sznajder	28 Powstancow Street 40-037 Katowice	(032) 207-86-80 (032) 207-86-81	www.silesia-region.pl	srodowisko@silesia-region.pl
13.	Marshal's Office of Swietokrzyski Region	Departament Ochrony Srodowiska	Jan Lis	3 IX Wiekow Kielc Street 25-516 Kielce	(041) 342-18-61 (041) 344-36-10	www.sejmik.kielce.pl	-----
14.	Marshal's Office of Warmian-Masurian Region	Departament Ochrony Srodowiska	Bogdan Meina	1 Emilii Plater Street 10-562 Olsztyn	(089) 521-35-62 (089) 521-35-63	www.warmia.mazury.pl	-----
15.	Marshal's Office of Wielkopolski Region	Departament Ekologii i Infrastruktury	Jerzy Gładysiak	18 Niepodleglosci Street 61-713 Poznan	(061) 655-83-61 (061) 655-83-60	www.wielkopolska.mw.gov.pl	-----
16.	Marshal's Office of West Pomerania	Departament Rolnictwa, Rozwoju Wsi i Srodowiska	Józef Kaliszewski	4 Waly Chrobrego Street 70-502 Szczecin	(091) 430-35-93 (091) 434-38-05	www.um-zachodnio-pomorskie.pl	srodowisko@wzp.pl

Appendix B

EXAMPLE OF AN ENQUIRE LETTER SENT TO MARSHAL OFFICES IN POLAND



Humanökologisches Zentrum (HöZ)
BTU Cottbus
Lehrgebäude 10
Erich-Weinert Str. 1
03046 Cottbus

Jozef Miklaszewski
Marshal's Office of Lower Silesia
12-14 Wybrzeze J. Slowackiego Street
50-411 Wroclaw
Poland

Dear Mr Miklaszewski,

I am writing to enquire about the latest data concerning the municipal waste treatment facilities operating in Lower Silesia Region. Based on the current Polish environmental legislation, namely the Waste Act of 27th April 2001 and the National Waste Management Strategy of 2003, municipal waste treatment facilities were defined as regional utilities where, among others:

- source-separated or commingled municipal solid wastes are either mechanically or manually separated,
- contaminants from the municipal solid wastes are removed to prepare them for subsequent uses,
- organic municipal wastes are decomposed to produce compost or biogas,
- bulky waste is dismantled, and lastly
- remaining municipal waste is put into a landfill.

Analysing the Waste Management Strategy for the Region of Lower Silesia the following municipal waste treatment facilities that fulfil the above specified standards were identified (Appendix 1). The attached list certainly does not cover all municipal waste treatment facilities operating in the Region of Lower Silesia and may also contain utilities that do not fulfil the specified standards. Therefore, I would like to ask you to correct the list by crossing out the

facilities that are placed there by mistake, adding new ones and completing corresponding data.

I can ensure you that received data will be exclusively applied to the research devoted to “Environmental management systems and their application in putting the environmental policies of Polish municipal waste treatment facilities into practice”. The study is being conducted under the supervision of prof. dr Wolf Schluchter from the Brandenburg Technical University in Cottbus and in close co-operation with prof. dr hab. Magdalena Graczyk from the University of Zielona Gora. If you have any further enquires, please contact me directly by email: magdalena.rybaczewska@tu-cottbus.de. Following your request, once the data concerning the municipal waste treatment facilities from Poland will be collected, the database can be posted electronically to you.

I would be very grateful for your assistance.

Yours sincerely,

Magdalena Rybaczewska-Błażejowska

Appendix 1. List of Municipal Waste Treatment Facilities in Lower Silesia Region

Company Name (pl)	City/Town	Street	Telephone/Fax	E-mail	Short description ¹	Others (en)
Zakład Utylizacji Odpadów w Trzebieńcu (Bolesławiec)					S.	
Wałbrzyskie Przedsiębiorstwo Oczyszczania Sp. z o.o.	58-304 Wałbrzych	Piasta 16	(074) 843 42 20 (074) 847 84 75			The company owns landfill site on Stacyjna and Bethovena Street
Legnickie Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o. - Zakład Oczyszczania Miasta	59-220 Legnica	Nowodworska 48	(076) 856 63 40 (076) 856 63 41	zom@pgk.legnica.pl	S.C.	The company owns landfill site of the Legnica city
Przedsiębiorstwo Gospodarki Miejskiej Sp. z o.o.	59-100 Polkowice	Dąbrowskiego	(076) 846 29 44 (076) 846 29 60	zom@pgm-polkowice.com.pl		The company is divided into three institutes, including 'Zakład Oczyszczania Miasta i Usług Komunalnych' responsible for municipal waste management
Miejski Zakład Gospodarki Komunalnej	59-900 Zgorzelec	Łużycka 3	(075) 775 84 84		S.BP.	The company's Municipal Waste Treatment Facility is situated in Jędrzychowice; The MWTF produces 1100-1200 m ³ biogas per day that is primarily used for the facility's own needs
Wrocławskie Przedsiębiorstwo Oczyszczania S.A	50-418 Wrocław	Traugutta 72/78	(071) 342 74 74 (071) 342 10 47	poczta@wpoalba.pl		The company's Municipal Waste Treatment Facility is in the construction phase
Zarząd Budynków Komunalnych	57-550 Łądek Zdrój	Fabryczna 7a	(074) 814 63 45 (074) 814 84 65	zbkladek@op.pl	S.C.	The company manages approximately 6 thousands tonnes of commingled and source-separated municipal waste per year
Zakład Gospodarki i Usług Komunalnych Sp. z o.o.	59-800 Lubań	Lwówecka 8	(075) 722 22 29 (075) 722 46 33		S.C.	The company manages commingled municipal waste, which biodegradable fraction is composted
Miejskie Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o.	58-500 Jelenia Góra	Wolności 161/163	(075) 642 01 00 (075) 642 01 05	mpgk@telvlnet.pl		
Związek Gmin Karkonoskich	58-533 Mysłakowice	Robotnicza 5	(075) 718 24 15 (075) 713 10 89		S.	The company's Municipal Waste Treatment Facility in Ściegny-Kostrzyca is equipped with two separate sorting lines - for commingled and source-separated municipal waste

¹ (BP – biogas production, C – composting, S – sorting)

Dyrektor Józef Miklaszewski
Urząd Marszałkowski Województwa Dolnośląskiego
Wydział Ochrony Środowiska
ul. Wybrzeża J. Słowackiego 12-14
50-411 Wrocław
Polen

Zwracam się z uprzejmą prośbą o dostarczenie mi najnowszych danych odnośnie Zakładów Zagospodarowania Odpadów (ZZO) zlokalizowanych w województwie dolnośląskim. Na potrzeby badania, z wykorzystaniem obowiązującej ustawy o odpadach z dnia 27 kwietnia 2001r. oraz Krajowego Planu Gospodarki Odpadami z dnia 29 października 2002r., Zakłady Zagospodarowania Odpadów zostały zdefiniowane jako ponadlokalne obiekty umożliwiające:

- segregacje zmieszanych odpadów komunalnych,
- doczyszczanie uprzednio posegregowanych odpadów komunalnych,
- unieszkodliwianie odpadów organicznych,
- czasowe gromadzenie odpadów niebezpiecznych oraz
- składowanie pozostałych odpadów komunalnych.

W oparciu o Strategię Gospodarki Odpadami Komunalnymi Dolnego Śląska udało mi się zidentyfikować następujące przedsiębiorstwa działające w województwie dolnośląskim, które naszym zdaniem spełniają wymogi Zakładów Zagospodarowania Odpadów (Załącznik 1). Lista ta na pewno nie przedstawia wszystkich Zakładów Zagospodarowania Odpadów działających w województwie dolnośląskim, jak również może zawierać obiekty nie spełniające wyżej przedstawionych kryteriów. W związku z tym zwracam się do Pana z prośbą o skorygowanie opracowanej przeze mnie listy – wykreślenie obiektów, które znalazły się tam pomyłkowo, dodanie nowych oraz uzupełnienie danych teleadresowych.

Jednocześnie pragnę zapewnić, że uzyskane informacje zostaną wykorzystane wyłącznie w badaniach poświęconych „Environmental management systems and their application in putting the environmental policies of Polish municipal waste treatment facilities

into practice". Powyższe badania prowadzone są na Brandenburgische Technische Universität w Cottbus we współpracy z Uniwersytetem w Zielonej Górze, zaś ich kierownikiem naukowym jest prof. dr Wolfgang Schluchter i prof. dr hab. Magdalena Graczyk. W razie jakichkolwiek wątpliwości proszę kontaktować się ze mną pod adresem emaliowym: magdalena.rybaczewska@tu-cottbus.de. Po skompletowaniu informacji na temat Zakładów Zagospodarowania Odpadów z terenu całej Polski, baza danych w formie elektronicznej może zostać Państwu udostępniona.

Z góry dziękuję za pomoc w naszych badaniach,

Z wyrazami szacunku,

Magdalena Rybaczewska-Błażejowska

Załącznik 1 – Wykaz Zakładów Zagospodarowania Odpadów Komunalnych w Województwie Dolnośląskim

Nazwa firmy	Miasto	Ulica	Telefon/fax	E-mail	Opis	Pozostałe informacje
Miejskie Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o.	58-500 Jelenia Góra	Wolności 161/163	(075) 642 01 00 (075) 642 01 05	mpgk@telvlnet.pl		
Wałbrzyskie Przedsiębiorstwo Oczyszczania Sp. z o.o.	58-304 Wałbrzych	Piasta 16	(074) 843 42 20 (074) 847 84 75			Przedsiębiorstwo eksploatuje wysypisko przy ul. Stacyjnej i Bethovena
Legnickie Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o. - Zakład Oczyszczania Miasta	59-220 Legnica	Nowodworska 48	(076) 856 63 40 (076) 856 63 41	zom@pgk.legnica.pl	S.C.	Składowisko Odpadów Komunalnych dla miasta Legnicy wyposażone w linie do segregacji odpadów komunalnych (szkło, plastik i makulatura) oraz kompostownik
Przedsiębiorstwo Gospodarki Miejskiej Sp. z o.o.	59-100 Polkowice	Dąbrowskiego	(076) 846 29 44 (076) 846 29 60	zom@pgm-polkowice.com.pl		Przedsiębiorstwo podzielone jest na trzy zakłady - "Zakład Oczyszczania Miasta i Usług Komunalnych" odpowiada za gospodarkę odpadami komunalnymi
Miejski Zakład Gospodarki Komunalnej	59-900 Zgorzelec	Łużycka 3	(075) 775 84 84		S.BP.	"Zakład Unieszkodliwiania Odpadów w Jędrzychowicach" - zakład wytwarza 1100 do 1200 m3 biogazu na dobę; Biogaz jest zużywany w postaci energii elektrycznej głównie na potrzeby własne zakładu
Wrocławskie Przedsiębiorstwo Oczyszczania S.A. - WPO ALBA S.A.	50-418 Wrocław	Traugutta 72/78	(071) 342 74 74 (071) 342 10 47	poczta@wpoalba.pl		Nowoczesny Zakład Zagospodarowania Odpadów Komunalnych dla miasta Wrocławia jest obecnie w fazie projektowej
Zarząd Budynków Komunalnych	57-550 Łądek Zdrój	Fabryczna 7a	(074) 814 63 45 (074) 814 84 65	zbiadek@op.pl	S.C.	Przedsiębiorstwo zagospodarowuje około 6000 ton odpadów komunalnych rocznie
Zakład Utylizacji Odpadów w Trzebieiniu (Bolesławiec)					S.	
Związek Gmin Karkonoskich	58-533 Mysłakowice	Robotnicza 5	(075) 718 24 15 (075) 713 10 89		S.	"Zakład Utylizacji Odpadów w Ścięgnach-Kostrzycy" posiada dwie niezależne linie sortownicze do sortowania odpadów komunalnych
Zakład Gospodarki i Usług Komunalnych Sp. z o.o.	59-800 Lubań	Lwówecka 8	(075) 722 22 29 (075) 722 46 33		S.C.	"Centrum Utylizacji Odpadów Komunalnych Gmin Łużyckich" wyposażone jest w sortownię zmieszanych odpadów komunalnych

(S – sortownia, C – kompostownia, BP – odzysk biogazu)

Appendix C

DATABASE OF POLISH MUNICIPAL WASTE TREATMENT FACILITIES IN THE MS ACCESS PROGRAMME

The database is available on the CD attached to the paper version.

Appendix D

EXAMPLE OF A COVERING LETTER AND QUESTIONNAIRE SENT TO MUNICIPAL WASTE TREATMENT FACILITIES IN POLAND



Humanökologisches Zentrum (HöZ)
BTU Cottbus
Lehrgebäude 10
Erich-Weinert Str. 1
03046 Cottbus

Board of Directors

Municipal Waste Treatment Facility Ltd.
7 Tupadzka Street
09-210 Drobin
Poland

Dear Sir or Madam,

Brandenburg Technical University in Cottbus in close co-operation with the University of Zielona Gora is conducting research on the application of the environmental management systems in the Polish municipal waste sector. Accordingly I would like to ask you to fill in the attached questionnaire and post it back to the address provided above. For your convenience the questionnaire is also available online at <http://www.sozum.tu-cottbus.de/Hoez/iso14001poll.html>. If there are any questions please contact Magdalena Rybaczewska-Błażejowska at the following phone number: 0048 697-124-288 or by email: magdalena.rybaczewska@tu-cottbus.de. The results of the survey will be held in strict confidence and will be presented without the possibility of ascribing them to a specific municipal waste treatment facility.

I look forward to hearing from you.

Yours faithfully,

Magdalena Rybaczewska-Błażejowska

Questionnaire

Please answer these questions as completely and as accurately as possible

1. Is your company registered to the quality management system ISO 9001 or/and the environmental management system ISO 14001?

- Yes, registered to ISO 9001
- Yes, registered to ISO 14001
- Yes, registered to ISO 9001 and ISO 14001
- No, not yet, ISO 14001 is in the implementation stage
- No, but our company has set a goal to implement ISO 14001
- No, our company does not intend to register

(If you have chosen the last answer, please ignore the next two questions and only fill in the details of your company)

2. Why has your company decided to seek eco-certification?
(Please choose as many answers that apply, but not more than five)

We want to:

- continually improve our environmental performance and operate according to the highest technological standards in the municipal waste sector
- reduce environmental impacts that may stem, for instance, from waste landfilling
- achieve a better image on the municipal waste market in Poland
- improve public understanding and confidence that their waste is being handled properly
- improve motivation of the staff by carrying out professional training and raising ecological awareness
- ensure fulfilment of the current environmental legislation
- improve documentation and organisation
- reduce costs, for instance, by reducing the number of environmental incidents

3. While pursuing certification of the ISO 14001 standard, what do you foresee as your company's major obstacles?
(Please, order your answers from the most to the least significant)

Major obstacle 1 2 3 Minor obstacle

Incorporating the standard with the current management system operating in the company

Insufficient human resources to develop the environmental management system

Costs of certification and maintaining the environmental management system

Company/Organisation details

Name: _____

Ownership structure: _____

Total no. of employees: _____

Size: Current processing capacity - _____ tonnes of solid municipal waste per annum

Short description: Our company does: biogas production composting recycling sorting

Thank you for your participation

Zarząd
Zakład G K i M Sp. z o.o.
ul. Tupadzka 7
09-210 Drobin
Polen

Szanowni Państwo!

Brandenburgische Technische Universität Cottbus we współpracy z Uniwersytetem Zielonogórskim prowadzi badania nad wykorzystaniem systemu zarządzania środowiskowego ISO 14001 w sektorze gospodarki odpadami komunalnymi w Polsce. W związku z tym zwracamy się z gorącą prośbą do Państwa o wypełnienie załączonej ankiety i przesłanie jej na wyżej podany adres. Dla Państwa wygody ankietę umieściliśmy również w internecie na stronie <http://www.sozum.tu-cottbus.de/Hoez/iso14001poll.html>. Ewentualne pytania proszę kierować pod numer telefonu 0048 697-124-288 lub adres emailowy magdalena.rybaczewska@tu-cottbus.de. Jednocześnie pragniemy zapewnić, iż ankieta jest anonimowa, a jej wyniki służą wyłącznie celom badawczym.

Magdalena Rybaczewska-Błażejowska

Ankieta

1. Czy Państwa przedsiębiorstwo wdrożyło system zarządzania jakością lub system zarządzania środowiskowego i uzyskało certyfikat?

- Tak, wdrożyliśmy system zarządzania jakością i posiadamy certyfikat ISO 9001
- Tak, wdrożyliśmy system zarządzania środowiskowego i posiadamy certyfikat ISO 14001
- Tak, wdrożyliśmy zintegrowany system zarządzania jakością i środowiskiem i posiadamy certyfikat
- Nie, ale jesteśmy na etapie wdrażania systemu zarządzania środowiskowego oraz planujemy ubiegać się o certyfikat
- Nie, ale rozważamy podjęcie działań zmierzających do wdrożenia systemu zarządzania środowiskowego i uzyskania certyfikatu w przyszłości
- Nie, wdrażanie systemu zarządzania środowiskowego i ubieganie się o certyfikat nie jest planowane

(Jeżeli na pierwsze pytanie wybrali Państwo ostatnią odpowiedź to proszę pominąć kolejne dwa pytania i uzupełnić tylko dane o respondencie)

2. Czym kierowało się Państwa przedsiębiorstwo decydując się na rozpoczęcie procesu wdrażania systemu zarządzania środowiskowego? *(Proszę o wybranie najbardziej adekwatnych odpowiedzi, jednak nie więcej niż 5-ciu)*

Chcieliśmy:

- w systematyczny i przejrzysty sposób zarządzać środowiskiem zapewniając ciągłe doskonalenie i poszukiwanie najlepszych rozwiązań technologicznych
- ograniczyć negatywny wpływ na środowisko wynikający np. ze składowania odpadów
- poprawić wizerunek przedsiębiorstwa na rynku gospodarki odpadami komunalnymi
- uzyskać akceptację społeczności lokalnej dając jej pewność, że odpady przez nich wytwarzane, zagospodarowane są z najwyższą starannością
- poprawić motywację personelu, dzięki przeprowadzaniu systematycznych szkoleń i podnoszeniu świadomości ekologicznej
- zapewnić przestrzeganie obowiązującego prawa ochrony środowiska
- uzyskać poprawę systemu organizacji i dokumentacji
- poprawić sytuację finansową przedsiębiorstwa np. dzięki zmniejszeniu ilości sytuacji awaryjnych

3. Jakie są Państwa największe obawy związane z wdrażaniem systemu zarządzania środowiskowego i ubieganiem się o uzyskanie certyfikatu? *(Proszę o przedstawienie odpowiedzi w skali od 1 do 3)*

Największa trudność	1	2	3	Najmniejsza trudność
Integracja obecnie obowiązującego systemu zarządzania z wymaganiami normy				<input type="text"/>
Niewystarczające zasoby ludzkie potrzebne do wdrożenia systemu zarządzania środowiskowego				<input type="text"/>
Wysokie nakłady finansowe związane z uzyskaniem certyfikatu i późniejszym utrzymaniem systemu zarządzania środowiskowego				<input type="text"/>

Dane o respondencie *(Proszę o przystawienie pieczętki)*

Nazwa przedsiębiorstwa: _____

Forma własności: _____

Całkowita liczba pracowników: _____

Wielkość: Przepustowość - _____ ton odpadów komunalnych rocznie

Zarządzamy wysypiskiem w _____

Krótki opis: Nasze przedsiębiorstwo posiada: sortownie kompostownie produkcje biogazu recykling

Serdecznie dziękuję za udział w badaniach

Appendix E

EXAMPLE OF A COVERING LETTER AND QUESTIONNAIRE SENT TO THE ISO 14001 CERTIFIED MUNICIPAL WASTE TREATMENT FACILITIES IN POLAND



Humanökologisches Zentrum (HöZ)
BTU Cottbus
Lehrgebäude 10
Erich-Weinert Str. 1
03046 Cottbus

Board of Directors

Municipal Waste Treatment Facility Ltd.
49 Teatralna Street
66-400 Gorzow Wlkp.
Poland

Dear Sir or Madam,

When working on building up an environmental management system, municipal waste treatment facilities cannot escape from difficulties. A great many mistakes could have been avoided, however, if a sector-guide supporting the process of the systematic implementation of ISO 14001 had been provided.

Brandenburg Technical University in Cottbus in close co-operation with the University of Zielona Gora is conducting research on the application of environmental management systems in the Polish municipal waste sector. Accordingly, I would like to ask you to fill in the attached questionnaire and return it by post to the address provided above. For your convenience the questionnaire is also available online at <http://www.sozum.tu-cottbus.de/Hoez/iso14001poll.html> web page. With your assistance, we hope to make working in the environment of the ISO 14001 system more efficient.

We should be very grateful for your participation in the survey. Simultaneously, we assure you that the results of the survey will be held in strict confidence and will be presented without the possibility of ascribing them to a specific municipal waste treatment facility. If you have any further inquiries, please contact Magdalena Rybaczewska-Błażejowska at the following phone number: 0048 697-124-288 or at the email address: magdalena.rybaczewska@tu-cottbus.de. Compiled results of the research will be made available to all those who contributed.

I look forward to hearing from you.

Yours faithfully,

Magdalena Rybaczewska-Błażejowska

Questionnaire

Please answer these questions as completely and as accurately as possible

1. Why has your company decided to implement the environmental management system ISO 14001?
(Please, tick as many boxes that apply, but not more than five)

We wanted to:

- continually improve our environmental performance and operate according to the highest technological standards in the municipal waste sector
- reduce environmental impacts that may stem, for instance, from waste landfilling
- achieve a better image on the municipal waste market
- improve public understanding and confidence that their waste is being handled properly
- improve motivation of the staff by carrying out professional training and raising ecological awareness
- ensure fulfilment of the current environmental legislation
- improve documentation and organisation
- reduce costs

If yes: Would your company like to achieve cost efficiency thanks to:

- fewer environmental incidents
- lower insurance premiums
- better conditions of business loans
- wider access to the European Union funds
- others _____

- Others _____

2. What are the most significant environmental aspects and potential environmental impacts resulting from your company activities – municipal solid waste management? (Please, specify three of the most important)

Activity/ Product/ Service	Environmental aspect	Environmental impact
Example: Municipal waste incineration	Air emissions (SO ₂ , NO _x , CO _x , metals, dioxins)	Air quality degradation

What methods does your company use to identify the significant environmental aspects and their impact upon the environment?

3. As the ISO 14001 system has continual improvement as its basis, could you provide chosen environmental objectives and targets related to municipal solid waste management performed by your company. What needed to be changed in the company operation to execute these targets? *(Please, provide some examples)*

4. Could you finish the following sentences, regarding the process of the ISO 14001 implementation and operation. *(Please, state only one alternative)*

4.1. The best person for the position of an environmental management representative is:

- someone familiar with the company's operation someone outside the company
ex. _____

4.2. The most effective procedures for internal communication in our company seem to be:

- employee newsletters webpage and email staff meetings others

4.3. Our company kept the documentation in:

- written format electronic format both written and electronic format

5. Does your company externally communicate a commitment to the environment to interested parties, for instance customers and the public?

Yes

If yes: What communication procedures does your company apply?

- Annual reports Environmental reports
 Company webpage Press releases
 Others _____

No, we do not communicate externally

6. Does your company identify potential emergency situations and establish a plan of corrective and preventive actions? *(Please, provide some examples)*

7. Which element of the ISO 14001 implementation was the most expensive in your company?

8. Which elements of the environmental management system ISO 14001 does your company experience as being the most difficult? (Please, tick as many boxes that apply, but not more than three)

- Assessment of significant environmental aspects
- Establishment of environmental targets
- Environmental management programme
- Training
- Communication
- Documentation
- Preparedness for emergency situations
- Monitoring and measurement
- Nonconformance, corrective and preventive actions
- Auditing
- Management review

(Could you briefly justify your answer)

9. What was the approximate cost of the ISO 14001 implementation in your company?
(If you do not wish to answer this question, please feel free to go to the next question)

Environmental management representative: _____ man-days

Consultancy cost: _____ zl

Certification cost: _____ zl

10. What has your company achieved by implementing the environmental management system ISO 14001?
(Please, tick as many boxes that apply, but not more than five)

We:

- have continually improved our environmental performance
- have reduced environmental impacts
- have achieved a better image on the municipal waste market
- have improved public understanding and confidence that their waste is being handled properly
- have got better staff motivation
- better fulfil the current environmental legislation
- have improved documentation and organisation
- have reduced costs

If yes: State the three greatest cost savings which environmental management work has resulted in.

Others _____

11. While pursuing certification of the ISO 14001 standard, what were the major obstacles that your company encountered? What was done by the company to overcome these difficulties? *(Please, order your answers from the most to the least significant)*

Major obstacle 1 2 3 Minor obstacle

Incorporating the standard with the management system operating in the company

Insufficient human resources to develop the environmental management system

Costs of certification and maintaining the environmental management system

(Could you briefly justify your answer)

12. What, in your opinion, could most help in the implementation and operation of the environmental management system ISO 14001 in your company? *(Please, tick the most appropriate box)*

- Branch specific guideline
- Ready to use software
- Experience exchange with other companies from the municipal waste sector
- Others _____

13. How would you describe the relationship between benefits and total costs of implementing the ISO 14001 standard? *(Please, tick the most appropriate box)*

- Positive
- Equal
- Negative
- We do not yet know

14. Why, in your opinion, are there still only a few municipal waste treatment facilities being eco-certified in Poland?

Company/Organisation details

Name: _____

Ownership structure: _____

Total no. of employees: _____

Short description: Our company does:

- biogas production
- composting
- recycling
- sorting

Size: Current processing capacity - _____ tonnes of solid municipal waste per annum

Declaration: Our company is registered to: ISO 14001 ISO 9001

ISO 14001 certificate year: _____

Does your company intend to implement EMAS II? Yes No

Please find attached: Environmental Policy Environmental Management Programme

Thank you for your participation

Magdalena Rybaczewska-Błażejowska
BTU Cottbus / Humanökologisches Zentrum (HöZ)
Lehrgebäude 10
Erich-Weinert Str. 1
03046 Cottbus



Zarząd
Zakład Utylizacji Odpadów Sp. z o.o.
ul. Teatralna 49
66-400 Gorzów Wlkp.
Polen

Szanowni Państwo!

Które z przedsiębiorstw pracujące nad wdrożeniem systemu zarządzania środowiskowego, nie chciałoby ustrzec się od pojawiających się błędów? Te przedsiębiorstwa, jednak, które podjęły już trud wdrożenia systemu zarządzania środowiskowego wiedzą, że znacznej ilości błędów można byłoby uniknąć, gdyby tylko został opracowany kompleksowy przewodnik charakteryzujący poszczególne etapy procesu wdrażania i funkcjonowania systemu ISO 14001 w sektorze gospodarki odpadami komunalnymi.

Brandenburgische Technische Universität Cottbus we współpracy z Uniwersytetem Zielonogórskim prowadzi badania nad wykorzystaniem systemów zarządzania środowiskowego w sektorze gospodarki odpadami komunalnymi w Polsce. Podstawowy instrument badań stanowi załączona ankieta, która dostępna jest również na stronie <http://www.sozum.tu-cottbus.de/Hoez/iso14001poll.html>. Jesteśmy przekonani, że dzięki Państwa zaangażowaniu, uda nam się zarówno zoptymalizować pracę przedsiębiorstw, które posiadają system zarządzania środowiskowego, jak i pomóc tym przedsiębiorstwom, które taki system dopiero zamierzają wdrożyć.

Z góry bardzo serdecznie dziękujemy za wypełnienie załączonej ankiety i zwracamy się z gorącą prośbą o przesłanie jej na podany powyżej adres. Ankieta udostępniona jest również w wersji elektronicznej. Jednocześnie chcemy zapewnić, że uzyskane dane są traktowane jako poufne i będą prezentowane na zewnątrz wyłącznie w formie zagregowanej, a więc bez możliwości przypisania ich do konkretnego zakładu zagospodarowania odpadów. Ewentualne pytania proszę kierować pod numer telefonu 0048 697-124-288 lub adres emailowy magdalena.rybaczewska@tu-cottbus.de. Po skompletowaniu informacji na temat funkcjonowania systemu zarządzania środowiskowego w sektorze gospodarki odpadami komunalnymi w Polsce, wyniki badań mogą zostać Państwu udostępnione.

Z wyrazami szacunku,

mgr inż. Magdalena Rybaczewska-Błażejowska

The 1st questionnaire

Column number	Variable (Label + Name)	Codes – categories (values)
C1	Respondent ID Number (ID)	001- 105

Please answer these questions as completely and as accurately as possible

1. Is your company registered to the quality management system ISO 9001 or/and the environmental management system ISO 14001?

- Yes, registered to ISO 9001
 Yes, registered to ISO 14001
 Yes, registered to ISO 9001 and ISO 14001
 No, not yet, ISO 14001 is in the implementation stage
 No, but our company has set a goal to implement ISO 14001
 No, our company does not intend to register

(If you have chosen the last answer, please ignore the next two questions and only fill in the details of your company)

Column number	Variable (Label + Name)	Codes – categories (values)
C6	Environmental Management System (EMS)	1 – Yes, registered to ISO 9001 2 – Yes, registered to ISO 14001 3 – Yes, registered to ISO 9001 and ISO 14001 4 – No, not yet, ISO 14001 is in the implementation stage 5 – No, but our company has set a goal to implement ISO 14001 6 – No, our company does not intend to register 9 – No answer (NA)

2. Why has your company decided to seek eco-certification?
(Please choose as many answers that apply, but not more than five)

We want to:

- continually improve our environmental performance and operate according to the highest technological standards in the municipal waste sector
 reduce environmental impacts that may stem, for instance, from waste landfilling
 achieve a better image on the municipal waste market in Poland
 improve public understanding and confidence that their waste is being handled properly
 improve motivation of the staff by carrying out professional training and raising ecological awareness
 ensure fulfilment of the current environmental legislation
 improve documentation and organisation
 reduce costs, for instance, by reducing the number of environmental incidents

Column number	Variable (Label + Name)	Codes – categories (values)
C7	Continual Improvement (ConImp) = Continually improve our environmental performance and operate according to the highest technological standards in the municipal waste sector	0 – Not applicable (NAP) 1 – Yes 2 – No 9 – No answer (NA)
C8	Reduce Environmental Impacts (EnvImp) = Reduce environmental impacts that may stem, for instance, from waste landfilling	
C9	Better Image (Image) = Achieve a better image on the municipal waste market in Poland	
C10	Public Understanding and Confidence (PubUnCon) = Improve public understanding and confidence that their waste is being handled properly	
C11	Improvement of Motivation of the Staff (MotStaff) = Improve motivation of the staff by carrying out professional training and raising ecological awareness	
C12	Fulfillment of the Current Environmental Legislation (FullLeg) = Ensure fulfilment of the current environmental legislation	
C13	Improvement of Documentation and Organisation (DocOrg) = Improve documentation and organisation	
C14	Reduction of Costs (RedCosts) = Reduce costs, for instance, by reducing the number of environmental incidents	

3. While pursuing certification of the ISO 14001 standard, what do you foresee as your company's major obstacles?
(Please, order your answers from the most to the least significant)

Major obstacle 1 2 3 Minor obstacle

Incorporating the standard with the current management system operating in the organisation

Insufficient human resources to develop the environmental management system

Costs of certification and maintaining the environmental management system

Column number	Variable (Label + Name)	Codes – categories (values)
C15	Incorporating the Standard with the Current Management System (IncStan) = Incorporating the standard with the current management system operating in the company	0 – Not applicable (NAP) 1 – Major obstacle 2 – Mean obstacle 3 – Minor obstacle 9 – No answer (NA)
C16	Insufficient Human Resources (HumRes) = Insufficient human resources to develop the environmental management system	
C17	Costs of Certification and Maintaining EMS (Costs) = Costs of certification and maintaining the environmental management system	

Company/Organisation details

Name: _____

Ownership structure: _____

Total no. of employees: _____

Size: Current processing capacity - _____ tonnes of solid municipal waste per annum

Short description: Our company does: biogas production composting recycling sorting

Column number	Variable (Label + Name)	Codes – categories (values)
C2	Localisation (Local)	1 – Dolnoslaskie County 2 – Kujawsko-Pomorskie County 3 – Lubelskie County 4 – Lubuskie County 5 – Lodzkie County 6 – Malopolskie County 7 – Mazowieckie County 8 – Opolskie County 9 – Podkarpackie County 10 – Podlaskie County 11 – Pomorskie County 12 – Slaskie County 13 – Swietokrzyskie County 14 – Warminsko-Mazurskie County 15 – Wielkopolskie County 16 – Zachodniopomorskie County
C3	Ownership structure (Structure)	1 – Budgetary Organisation 2 – Limited Liability Company – state-owned assets 3 – Limited Liability Company – private assets 4 – Limited Liability Company – mixed assets 5 – Partnership (Association of Communes) 6 – Joint-stock Company 9 – No answer (NA)
C4	Size (Size)	1 0 – 25 000 tonnes 2 over 25 000 – 50 000 tonnes 3 over 50 000 – 75 000 tonnes 4 over 75 000 – 100 000 tonnes 5 over 100 000 tonnes 9 No answer (NA)
C5	MWTF characteristic (MWTFchar) = Short description	1 – sorting/ or biogas production/ or composting/ or recycling 2 – sorting + composting/or sorting + biogas production/ or sorting + recycling/ or composting + recycling 3 – sorting + composting + recycling/ or sorting + biogas production + composting/ or sorting + biogas production + recycling/ or sorting + composting + incinerating 4 – all: sorting + biogas production + composting + recycling

The 2nd questionnaire

Column number	Variable (Label + Name)	Codes – categories (values)
C1	Respondent ID Number (ID)	001- 105

1. Why has your company decided to implement the environmental management system ISO 14001?
(Please, tick as many boxes that apply, but not more than five)

We wanted to:

- continually improve our environmental performance and operate according to the highest technological standards in the municipal waste sector
- reduce environmental impacts that may stem, for instance, from waste landfilling
- achieve a better image on the municipal waste market
- improve public understanding and confidence that their waste is being handled properly
- improve motivation of the staff by carrying out professional training and raising ecological awareness
- ensure fulfilment of the current environmental legislation
- improve documentation and organisation
- reduce costs

If yes: Would your company like to achieve cost efficiency thanks to:

- fewer environmental incidents
- lower insurance premiums
- better conditions of business loans
- wider access to the European Union funds
- others _____

- Others _____

Column number	Variable (Label + Name)	Codes – categories (values)
C8	Continual Improvement (ConImp) = Continually improve our environmental performance and operate according to the highest technological standards in the industry	1 – Yes 2 – No 9 – No answer (NA)
C9	Reduce Environmental Impacts (EnvImp) = Reduce environmental impacts that may stem, for instance, from waste landfilling	
C10	Better Image (Image) = Achieve a better image on municipal waste market in Poland	
C11	Public Understanding and Confidence (PubUnCon) = Improve public understanding and confidence that their waste is being handled properly	
C12	Improvement of Motivation of the Staff (MotStaff) = Improve motivation of the staff by carrying out professional training and raising ecological awareness	
C13	Fulfilment of the Current Environmental Legislation (FulLeg) = Ensure fulfilment of the current environmental legislation	
C14	Improvement of Documentation and Organisation (DocOrg) = Improve documentation and organisation	
C15	Reduction of Costs (RedCosts) = Reduce costs, for instance, by reducing the number of environmental incidents	

2. What are the most significant environmental aspects and potential environmental impacts resulting from your company activities – municipal solid waste management? *(Please, specify three of the most important)*

Activity/ Product/ Service	Environmental aspect	Environmental impact
Example: Municipal waste incineration	Air emissions (SO ₂ , NO _x , CO _x , metals, dioxins)	Air quality degradation

Column number	Variable (Label + Name)	Codes – categories (values)
C16	Waste Landfilling I (WLandI) = Municipal waste landfilling ↳ Emission of landfill gases ↳ Air quality degradation	1 – Yes 2 – No 9 – No answer (NA)
C17	Waste Landfilling II (WLandII) = Municipal waste landfilling ↳ Leachate ↳ Pollution of the surrounding geological and hydrological environment	
C18	Others_Environmental Aspects (OtEnvAsp) Example: Stationery usage ↳ Waste production (paper, floppy disks, compact disks) ↳ Environmental pollution	

What methods does your company use to identify the significant environmental aspects and their impact upon the environment?

3. As the ISO 14001 system has continual improvement as its basis, could you provide chosen environmental objectives and targets related to municipal solid waste management performed by your company. What needed to be changed in the company operation to execute these targets? *(Please, provide some examples)*

Column number	Variable (Label + Name)	Codes – categories (values)
C19	Separation of Waste (WSeparation) = Separation of waste in the city ↳ To shift waste away from landfill in order to extend the landfill life ↳ Introduction of off-site collection of dry recyclables	1 – Yes 2 – No 9 – No answer (NA)
C20	Minimise Emission of Landfill Gases (MinEmission) = Minimise emission of landfill gases ↳ To reduce landfill gases emission to the atmosphere in order to fulfill the current environmental legislation ↳ Construction of a degassing installation	
C21	Eliminating the Seepage of Leachate (ElmLeachate) = Eliminating the seepage of leachate from the landfill site ↳ To reduce the percolation of leachate from landfill site ↳ Construction of the landfill liners	
C22	Others_Environmental Objectives (OtEnvObj) Example: = Lessen Stationary Usage ↳ To reduce the stationary usage in the coming year ↳ Purchase of the internet connection and installation of the local area network	

4. Could you finish the following sentences, regarding the process of the ISO 14001 implementation and operation. (Please, state only one alternative)

4.1. The best person for the position of an environmental management representative is:

- someone familiar with the company's operation someone outside the company
ex. _____

4.2. The most effective procedures for internal communication in our company seem to be:

- employee newsletters webpage and email staff meetings others

4.3. Our company kept the documentation in:

- written format electronic format both written and electronic format

Column number	Variable (Label + Name)	Codes – categories (values)
C23	Environmental Management Representative (EMRep) = The best person for the position of an environmental management representative is:	1 – someone from the company = someone familiar with the company's operation 2 – Someone outside the company = someone outside the company familiar with the municipal waste sector 9 – No answer (NA)
C24	Internal Communication (IntCom) = The most effective procedures for internal communication in our company seem to be:	1 – Employee newsletters 2 – Webpage and email 3 – Staff meetings 9 – No answer (NA)
C25	Documentation (Doc) = Our company kept the documentation in:	1 – Written format 2 – Electronic format 3 – Both written and electronic format 9 – No answer (NA)

5. Does your company communicate externally a commitment to the environment to interested parties, for instance customers and the public?

Yes

<p>If yes: What communication procedures does your company apply?</p> <p><input type="checkbox"/> Annual reports <input type="checkbox"/> Environmental reports</p> <p><input type="checkbox"/> Company webpage <input type="checkbox"/> Press releases</p> <p><input type="checkbox"/> Others _____</p>
--

No, we do not communicate externally

Column number	Variable (Label + Name)	Codes – categories (values)
C26	External Communication (ExtCom) = Does your company communicate commitment to the environment to its customers and the public?	1 – Yes 2 – No 9 – No answer (NA)
C27	Communication Procedures (ComProc) = What communication procedures does your company apply?	0 – Not applicable (NAP) 1 – Annual reports 2 – Environmental reports 3 – Company webpage 4 – Press releases 5 – Mix (2+3+4) 6 – Others 9 – No answer (NA)

6. Does your company identify potential emergency situations and establish a plan of corrective and preventive actions? *(Please, provide some examples)*

Column number	Variable (Label + Name)	Codes – categories (values)
C28	Potential Emergency Situations (EmergencySit) = Does your company identify potential emergency situations and establish a plan of corrective and preventive actions?	1 – Yes 2 – No 9 – No answer (NA)

7. Which element of the ISO 14001 implementation was the most expensive in your company?

Column number	Variable (Label + Name)	Codes – categories (values)
C29	Most Expensive Elements (ExpElements) = Which element of the ISO 14001 implementation was the most expensive in your company?	1 – Initial Environmental Review (Analysis of Environmental Impacts) 2 – External auditing + certification 3 – Others 9 – No answer (NA)

8. Which elements of the environmental management system ISO 14001 does your company experience as being the most difficult? *(Please, tick as many boxes that apply, but not more than three)*

- Assessment of significant environmental aspects
- Establishment of environmental targets
- Environmental management programme
- Training
- Communication
- Documentation
- Preparedness for emergency situations
- Monitoring and measurement
- Nonconformance, corrective and preventive actions
- Auditing
- Management review

(Could you briefly justify your answer)

Column number	Variable (Label + Name)	Codes – categories (values)
C30	Significant Environmental Aspects (EnvAspects) = Assessment of significant environmental aspects	1 – Yes 2 – No 9 – No answer (NA)
C31	Environmental Targets (EnvTargets) = Establishment of environmental targets	
C32	Environmental Management Programme (EnvProgramme)	
C33	Training (Training)	
C34	Communication (Communication)	
C35	Documentation (Documentation)	
C36	Emergency Situations (EmSituations) = Preparedness for emergency situations	
C37	Monitoring and Measurement (MonMeas)	
C38	Nonconformance, Corrective and Preventive Actions (NCPActions)	
C39	Auditing (Audit)	
C40	Management Review (ManReview)	

9. What was the approximate cost of the ISO 14001 implementation in your company?
(If you do not wish to answer this question, please feel free to go to the next question)

Environmental management representative: _____ man-days

Consultancy cost: _____ zł

Certification cost: _____ zł

10. What has your company achieved by implementing the environmental management system ISO 14001?
(Please, tick as many boxes that apply, but not more than five)

We:

- have continually improved our environmental performance
- have reduced environmental impacts
- have achieved a better image on the municipal waste market
- have improved public understanding and confidence that their waste is being handled properly
- have got better staff motivation
- better fulfil the current environmental legislation
- have improved documentation and organisation
- have reduced costs

If yes: State the three greatest cost savings which environmental management work has resulted in.

Others _____

Column number	Variable (Label + Name)	Codes – categories (values)
C41	Continual Improvement (A_ConImp) = We have continually improved our environmental performance	1 – Yes 2 – No 9 – No answer (NA)
C42	Reduce Environmental Impacts (A_EnvImp) = We have reduced environmental impacts	
C43	Better Image (A_Image) = We have achieved a better image on municipal waste market	
C44	Public Understanding and Confidence (A_PubUnCon) = We have improved public understanding and confidence that their waste is being handled properly	
C45	Improvement of Motivation of the Staff (A_MotStaff) = We have got better staff motivation	
C46	Fulfillment of the Current Environmental Legislation (A_FulLeg) = We better fulfil the current environmental legislation	
C47	Improvement of Documentation and Organisation (A_DocOrg) = We have improved documentation and organisation	
C48	Reduction of Costs (A_RedCosts) = We have reduced costs	

11. While pursuing certification of the ISO 14001 standard, what were the major obstacles that your company encountered? What was done by the company to overcome these difficulties? *(Please, order your answers from the most to the least significant)*

Major obstacle 1 2 3 Minor obstacle

Incorporating the standard with the management system operating in the company

Insufficient human resources to develop the environmental management system

Costs of certification and maintaining the environmental management system

(Could you briefly justify your answer)

Column number	Variable (Label + Name)	Codes – categories (values)
C49	Incorporating the Standard with the Current Management System (IncStan) = Incorporating the standard with the current management system operating in the company	1 – Major obstacle 2 – Mean obstacle 3 – Minor obstacle 9 – No answer (NA)
C50	Insufficient Human Resources (HumRes) = Insufficient human resources to develop the environmental management system	
C51	Costs of Certification and Maintaining EMS (Costs) = Costs of certification and maintaining the environmental management system	

12. What, in your opinion, could most help in the implementation and operation of the environmental management system ISO 14001 in your company? *(Please, tick the most appropriate box)*

- Branch specific guideline
- Ready to use software
- Experience exchange with other companies from the municipal waste sector
- Others _____

Column number	Variable (Label + Name)	Codes – categories (values)
C52	Help in the ISO 14001 implementation and operation (Help) = What, in your opinion, could most help in the implementation and operation of the environmental management system ISO 14001 in your company?	1 – Branch specific guideline 2 – Ready to use software 3 – Experience exchange with other companies from the municipal waste sector 9 – No answer (NA)

13. How would you describe the relationship between benefits and total costs of implementing the ISO 14001 standard?
(Please, tick the most appropriate box)

Positive Equal Negative We do not yet know

Column number	Variable (Label + Name)	Codes – categories (values)
C53	Relationship between Benefits and Costs (BenefitCost) = How would you describe the relationship between benefits and total costs of implementing the ISO 14001 standard?	1 – Positive 2 – Equal 3 – Negative 4 – We do not yet know (DK) 9 – No answer (NA)

14. Why, in your opinion, are there still only a few municipal waste treatment facilities being eco-certified in Poland?

Column number	Variable (Label + Name)	Codes – categories (values)
C54	Low interest in ISO 14001 system (Interest) = Why, in your opinion, there are still only few municipal waste treatment facilities being eco-certified in Poland?	1 – High introduction and operation costs 2 – Contradictory opinions on environmental improvement potential of ISO 14001 3 – Others 9 – No answer (NA)

Company/Organisation details

Name: _____

Ownership structure: _____

Total no. of employees: _____

Short description: Our company does:

biogas production composting recycling sorting

Size: Current processing capacity - _____ tonnes of solid municipal waste per annum

Declaration: Our company is registered to: ISO 14001 ISO 9001

ISO 14001 certificate year: _____

Does your company intend to implement EMAS II? Yes No

Please find attached: Environmental Policy Environmental Management Programme

Column number	Variable (Label + Name)	Codes – categories (values)
C2	Localisation (Local)	<ul style="list-style-type: none"> 1 – Dolnoslaskie County 2 – Kujawsko-Pomorskie County 3 – Lubelskie County 4 – Lubuskie County 5 – Lodzkie County 6 – Malopolskie County 7 – Mazowieckie County 8 – Opolskie County 9 – Podkarpackie County 10 – Podlaskie County 11 – Pomorskie County 12 – Slaskie County 13 – Swietokrzyskie County 14 – Warminsko-Mazurskie County 15 – Wielkopolskie County 16 – Zachodniopomorskie County
C3	Ownership structure (Structure)	<ul style="list-style-type: none"> 1 – Budgetary Organisation 2 – Limited Liability Company – state-owned assets 3 – Limited Liability Company – private assets 4 – Limited Liability Company – mixed assets 5 – Partnership (Association of Communes) 6 – Joint-stock Company 9 – No answer (NA)
C4	Size (Size)	<ul style="list-style-type: none"> 1 0 – 25 000 tonnes 2 over 25 000 – 50 000 tonnes 3 over 50 000 – 75 000 tonnes 4 over 75 000 – 100 000 tonnes 5 over 100 000 tonnes 9 No answer (NA)
C5	MWTF characteristic (MWTFchar) = Short description	<ul style="list-style-type: none"> 1 – sorting/ or biogas production/ or composting/ or recycling 2 – sorting + composting/or sorting + biogas production/ or sorting + recycling/ or composting + recycling 3 – sorting + composting + recycling/ or sorting + biogas production + composting/ or sorting + biogas production + recycling/ or sorting + composting + incinerating 4 – all: sorting + biogas production + composting + recycling
C6	No. of employees (NoEmployees) = Total number of employees	<ul style="list-style-type: none"> 1 0 – 50 people 2 51 – 100 people 3 101 – 150 people 4 151 – 200 people 5 201 – 250 people 6 over 250 people 9 No answer (NA)
C7	Environmental Management System (EMS)	<ul style="list-style-type: none"> 1 – Yes, registered to ISO 9001 2 – Yes, registered to ISO 14001 3 – Yes, registered to ISO 9001 and ISO 14001 4 – No, not yet, ISO 14001 is in the implementation stage 5 – No, but our company has set a goal to implement ISO 14001 6 – No, our company does not intend to register 9 – No answer (NA)

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
ID	Local Structure	Size	MWTFchar	NoEmployees	EMS	ConImp	EnvImp	Image	PubUnCon	MotStaff	FullLeg	DocOrg	RedCosts	
18	3	2	9	2	6	3	1	1	1	1	2	2	1	2
21	3	2	2	2	4	3	2	1	2	1	1	2	1	2
24	4	2	2	3	2	3	1	1	1	2	1	2	2	2
30	5	2	4	2	2	3	1	2	1	2	2	1	1	2
35	6	2	1	1	2	3	1	1	1	2	1	2	2	2
44	7	2	5	4	2	2	1	1	2	1	2	2	2	2
77	12	2	9	2	5	2	1	1	1	2	1	2	2	1
87	15	9	4	2	9	2	1	2	2	1	2	2	2	2
91	15	6	1	1	9	3	1	2	1	1	2	2	2	2

C1	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27
ID	WLandfilling_I	WLandfilling_II	OtEnvAsp	WSeparation	MinEmission	ElimLeachate	OtEnvObj	EMRep	IntCom	Doc	ExtCom	ComProc
18	2	1	1	1	2	1	2	1	3	3	1	5
21	1	2	1	2	1	1	2	1	2	3	1	3
24	1	1	1	1	1	2	1	1	3	3	1	5
30	2	2	1	2	2	2	1	1	3	3	1	3
35	1	1	2	9	9	9	9	1	3	3	1	5
44	1	1	1	1	2	2	2	1	3	3	1	5
77	1	1	2	2	1	2	2	1	3	2	1	4
87	9	9	9	9	9	9	9	9	9	9	9	9
91	1	2	1	2	1	2	1	1	3	3	1	5

C1	C28	C29	C30	C31	C32	C33	C34	C35	C36
ID	EmergencySit	ExpElements	EnvAspects	EnvTargets	EnvProgramme	Training	Communication	Documentation	EmSituations
18	1	1	2	2	2	2	2	2	2
21	1	9	2	2	2	2	1	2	1
24	1	2	2	2	2	2	1	2	2
30	9	9	1	2	2	2	2	2	2
35	9	9	1	2	1	2	1	2	2
44	9	2	1	1	2	2	2	2	2
77	9	9	1	2	2	2	2	1	2
87	9	9	9	9	9	9	9	9	9
91	1	9	1	2	2	2	2	2	2

C1	C37	C38	C39	C40	C41	C42	C43	C44	C45	C46	C47
ID	MonMeas	NCPActions	Audit	ManReview	A_ConImp	A_EnvImp	A_Image	A_PubUnCon	A_MotStaff	A_FulLeg	A_DocOrg
18	1	1	1	2	1	1	1	1	1	2	2
21	2	2	2	2	2	2	2	1	1	2	1
24	2	1	2	1	1	1	1	2	2	1	2
30	2	2	2	2	2	2	1	2	2	2	1
35	2	1	2	2	1	1	1	2	1	2	2
44	2	2	2	2	1	1	2	1	2	2	2
77	2	1	2	2	1	1	1	2	1	2	2
87	9	9	9	9	9	9	9	9	9	9	9
91	2	2	1	2	1	1	1	2	2	2	2

C1	C48	C49	C50	C51	C52	C53	C54
ID	A_RedCosts	IncStan	HumRes	Costs	Help	BenefitCost	Interest
18	2	3	2	1	2	1	1
21	2	2	1	3	1	2	2
24	2	3	1	2	1	2	9
30	2	2	1	3	2	4	9
35	2	2	3	1	1	2	1
44	1	2	1	3	1	1	9
77	2	1	3	2	1	1	9
87	9	3	2	1	9	4	9
91	2	2	3	1	2	2	1

Appendix G

EXAMPLE OF AN ENQUIRE LETTER SENT TO THE CERTIFIED MUNICIPAL WASTE TREATMENT FACILITIES IN POLAND



Brandenburgische Technische Universität Cottbus

Humanökologisches Zentrum (HöZ)
BTU Cottbus
Lehrgebäude 10
Erich-Weinert Str. 1
03046 Cottbus

Mr Franciszek Josik
Director of the Municipal Waste Treatment Facility Ltd.
10 Krucza Street
22-400 Zamosc
Poland

Dear Mr Franciszek Josik,

I am writing to enquire about an appointment with the environmental manager or some other person responsible for coordinating the work of the ISO 14001 system in your facility. The obtained information will be used in the research on the application of the environmental management systems in the Polish municipal waste sector only. This research is conducted by Brandenburg Technical University in Cottbus in close co-operation with the University of Zielona Gora. I should be very grateful if you provide me your reply at the email address: magdalena.rybaczewska@tu-cottbus.de or at the phone number: 0048 697-124-288.

I look forward to hearing from you.

Yours sincerely,

Magdalena Rybaczewska-Błażejowska

BTU Cottbus / Humanökologisches Zentrum (HöZ)
Lehrgebäude 10
Erich-Weinert Str. 1
03046 Cottbus



Prezes Franciszek Josik

Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o.
ul. Krucza 10
22-400 Zamość

Uprzejmie proszę o umożliwienie mi spotkania z przedstawicielem kierownictwa odpowiedzialnym za funkcjonowanie systemu zarządzania środowiskowego ISO 14001 w Państwa przedsiębiorstwie. Uzyskane informacje będą wykorzystane wyłącznie w pracy naukowej poświęconej 'Zastosowaniu systemów zarządzania środowiskowego w gospodarce odpadami komunalnymi w Polsce', prowadzonej na Politechnice Brandenburskiej w Cottbus we współpracy z Uniwersytetem Zielonogórskim. Będę wdzięczna za udzielenie mi odpowiedzi drogą elektroniczną – magdalena.rybaczewska@tu-cottbus.de lub telefoniczną - 0697-124-288.

Z góry dziękuję za pozytywne rozpatrzenie mojej prośby.

Z wyrazami szacunku,

Magdalena Rybaczewska-Błazejowska

Appendix H

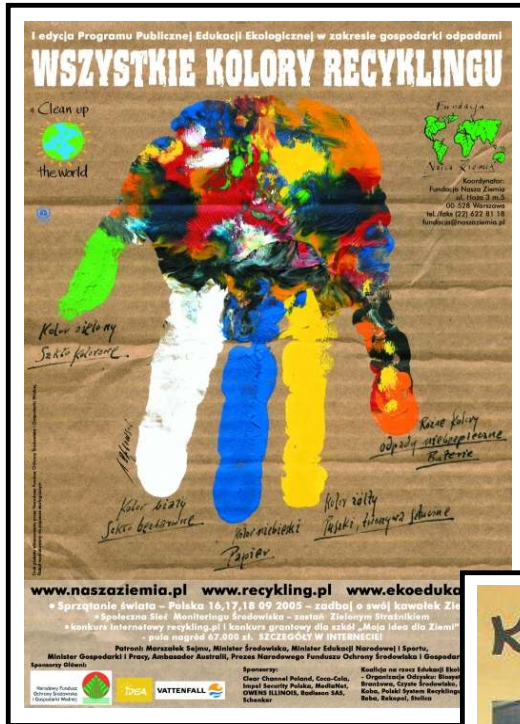
LIST OF THE ISO 14001 AND/OR ISO 9001 CERTIFIED MUNICIPAL WASTE TREATMENT FACILITIES IN POLAND

No.	Company Name	Localisation	Type of management system	Issued on	Issued by
1.	Tatrzańskie Przedsiębiorstwo Komunalne „TESKO” Sp. z o.o.	Zakopane	PN-EN ISO 9001 and PN-EN ISO 14001	2000	PCBC (Polskie Centrum Badań i Certyfikacji S.A.)
2.	Przedsiębiorstwo Produkcyjno Usługowo Handlowe "Radkom" Sp. z o.o.	Radom	PN-EN ISO 14001	2001	TÜV Rheinland
3.	Bytomskie Przedsiębiorstwo Komunalne Sp. z o.o.	Bytom	PN-EN ISO 14001	02.2002	BSI (British Standard Institution)
4.	Przedsiębiorstwo Oczyszczania Miasta "Eko serwis" Sp. z o.o.	Kutno	PN-EN ISO 9001	02.2002	RWTÜV Anlagentechnik GmbH
5.	Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o.	Zamość	PN-EN ISO 9001 and PN-EN ISO 14001	07.2002	RWTÜV (TÜV Nord Group)
6.	Przedsiębiorstwo Usługowo - Handlowo - Produkcyjne "Lech" Sp. z o.o.	Białystok	PN-EN ISO 9001, PN-EN ISO 14001 and PN-N 18001	12.2003	PCBC (Polskie Centrum Badań i Certyfikacji S.A.)

No.	Company Name	Localisation	Type of management system	Issued on	Issued by
7.	Miejskie Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o.	Chełm	PN-EN ISO 9001, PN-EN ISO 14001 and PN-N 18001	01.2004	RWTÜV (TÜV Nord Group)
8.	Przedsiębiorstwo Produkcyjno-Handlowo-Usługowe "Komart" Sp. z o.o.	Knurów	PN-EN ISO 9001 and PN-EN ISO 14001	07.2004	RWTÜV Systems GmbH
9.	Zakład Utylizacji Odpadów Sp. z o.o.	Gorzów Wielkopolski	PN-EN ISO 9001 and PN-EN ISO 14001	07.2004	RWTÜV Systems GmbH
10.	Cofinco - Poland Sp. z o.o.	Katowice	PN-EN ISO 9001 and PN-EN ISO 14001	07.2004	DNV (Det Norske Veritas)
11.	Zakład Utylizacji i Recyklingu Odpadów Komunalnych	Wrocław	PN-EN ISO 9001 and PN-EN ISO 14001	08.2004	TÜV NORD Polska Sp. z o.o.
12.	KOM-EKO Sp. z o.o.	Lublin	PN-EN ISO 9001	08.2004	Kema
13.	Przedsiębiorstwo Komunalne "SANIKOM" Sp. z o.o.	Bełchatów	PN-EN ISO 9001 and PN-EN ISO 14001	12.2004	PCBC (Polskie Centrum Badań i Certyfikacji S.A.)
14.	Wysypisko Odpadów Komunalnych	Poznań	PN-EN ISO 9001 and PN-EN ISO 14001	12.2004	PCBC (Polskie Centrum Badań i Certyfikacji S.A.)
15.	Zakład Utylizacji Odpadów Clean City Sp. z o.o.	Międzychód	PN-EN ISO 14001	2005	---

No.	Company Name	Localisation	Type of management system	Issued on	Issued by
16.	Zakład Oczyszczania i Gospodarki Odpadami "MZO" S.A.	Ostrów Wielkopolski	PN-EN ISO 9001 and PN-EN ISO 14001	2005	DEKRA Intertek Certification Sp. z o.o.
17.	Miejski Zakład Zieleni, Dróg i Ochrony Środowiska Sp. z o.o.	Koło	PN-EN ISO 9001	03.2005	---
18.	Beskid Sp. z o.o.	Żywiec	PN-EN ISO 9001 and PN-EN ISO 14001	04.2005	RWTÜV (TÜV Nord Group)
19.	Zakład Utylizacji Odpadów Komunalnych w Kobiernikach k/ Płocka Sp. z o.o.	Sikórz	PN-EN ISO 9001 and PN-EN ISO 14001	07.2005	PCBC (Polskie Centrum Badań i Certyfikacji S.A.)
20.	Miejskie Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o.	Zabrze	PN-EN ISO 9001 and PN-EN ISO 14001	07.2005	---
21.	Przedsiębiorstwo Gospodarki Komunalnej i Mieszkaniowej "Łęczna" Sp. z o.o.	Łęczna	PN-EN ISO 9001	07.2005	---
22.	Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o.	Koszalin	PN-EN ISO 9001 and PN-EN ISO 14001	08.2005	TÜV NORD Polska Sp. z o.o.
23.	Częstochowskie Przedsiębiorstwo Komunalne Sp. z o.o. w Sobuczynie	Wrzosowa	PN-EN ISO 9001, PN-EN ISO 14001 and PN-N 18001	08.2005	---
24.	Międzygminne Przedsiębiorstwo Gospodarki Odpadami "Master" Sp. z o.o.	Tychy	PN-EN ISO 9001 and PN-EN ISO 14001	12.2005	DNV (Det Norske Veritas)
25.	Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o.	Brodnica	PN-EN ISO 9001 and PN-EN ISO 14001	12.2005	---

National environmental education programmes



All colours of recycling

- an outdoor advertising campaign to promote unified system for the separate collection of municipal solid waste.

Collect paper – save horses

- an initiative, addressed to schools, which goal is to collect paper, glass and metals selectively and for gathered money buy horses that otherwise would go to slaughter. Saved horses are donated to organisations working with disable people.



Local environmental education schemes



3rd Festival of Recycling – Krakow

- an annual outdoor event to attract public interest in sustainable municipal solid waste management, through games, competitions and performances. Similar activities, with the help of municipal waste treatment facilities that have then open-doors, are organised in many big cities in Poland.



WIRUCIAMY
KARTONY, KRAJECZKI STARE
DZIECI PAPIERU DO PSZANIA,
BŁYTYCH, OPAKOWANIE
I WODNY PAPIERUSZE,
KARTONIKI, POKRZYWA, TĘSTOWE

NIE WIRUCIAMY
ODPOWIEDNIEGO
LUB TYSIĄCEK PAPIERU
TAKI NA WYMIAROWEJ
KARTONOWYCH OPAKOWANIEK POKRZYWAJĄCYCH TĘSTO

WIRUCIAMY
KOLORY, TUBY, KROKODY, WODKI
KOLOROWE, TUBY, KROKODY,
JEDEKALIZACJE, BUTELKI PO
MATELACIE, POKRZYWA,
PLASTIKOWE DO WYDZIAŁU
W POKRZYWA, SZKŁO,
ZŁAZO, ARTYKULY
SŁOŻE, OPAKOWANIE
I WODNY PAPIERUSZE,
KARTONIKI, POKRZYWA, TĘSTOWE

WIRUCIAMY
JEDEKALIZACJE,
BUTELKI, OPAKOWANIE,
BUTELKI PO ALKOHOLU,
KROKODY, WODKI,
KOLOROWE, TUBY, KROKODY,
JEDEKALIZACJE, BUTELKI PO
MATELACIE, POKRZYWA,
PLASTIKOWE DO WYDZIAŁU
W POKRZYWA, SZKŁO,
ZŁAZO, ARTYKULY
SŁOŻE, OPAKOWANIE
I WODNY PAPIERUSZE,
KARTONIKI, POKRZYWA, TĘSTOWE

W TAKI SPOSÓB SEGREGUJEMY ODPADY

**SEGREGACJA TO POWIĘKSZENIE GÓRY
SMAŁCEI, POSEGREGOWANE ODPADY
ZAJMUJĄ MNIJĄ MIEJSCA NA SKŁADOWISKU.
DODATKOWO CZĘŚĆ Z INCH, NP. SZKŁO,
OPAKOWANIE, PLASTIK MOŻNA PRZETWORZYĆ NA
NOWE PEŁNOWARTOŚCIOWE PRODUKTY.
CHCIEMY ABY SEGREGACJA NAPRAWDĘ SIĘ
ODBIŁA I BYŁA DLA WYMIAROWEJ NASZEGO
ZWIĄZKU JAK NAJBARDZIEJ WYGODNA.
DLATEGO TEŻ DZIĘKI POMOCY FUNDACJI
EKODUNIOŚCZ Z WARSZAWY ZOSTAŁY
ZAKUPIONE RÓŻNOKOLOROWE POLEBNIKI
TYPU IELLO I WODKI DO SELEKTYWNEJ
ZBIÓRKI ODPADÓW ORAZ SPECJALISTYCZNY
SPRZĘT DO ICH ODRÓŻNIWANIA. KAŻDA
SZKOŁA UCZESTNICZĄCA W TYM PROGRAMIE
ZOSTAŁA WYPOSAŻONA W POLEBNIKI
W NASTĘPUJĄCYCH KOLORACH: NIEBIESKI
NA PAPIER, SZYBY NA PLASTIK ORAZ
ZIEŁONY NA SZKŁO Z DODATKOWĄ
KIESZONKĄ NA BATERIE.**

JAKIE KORZYŚCI PRZYNOSI SEGREGACJA NAM WSZYSTKIM?

- UTRZYMUJEMY PORZĄDEK WOKÓŁ WŁASNYCH DOMÓW
- PRZEDŁUŻAMY ŻYWOĆNOŚĆ SKŁADOWISKI ODPADÓW
- ODZYSKUJEMY CENNE SUROWCE WTIÓRNE
- CHROŹIMY LAS, GLEBĘ, POWIETRZE, WODĘ I ENERGIĘ
- OGRANICZAMY EMISJĘ ZANIECZYSZCZEN DO ŚRODOWISKA
- LIKWIDUJEMY DZIKIE WYSYPISKA
- ZMNIĘJSZAMY ZAPOTRZEBOWANIE NA NOWE TERENY
POD KOLEJNE SKŁADOWISKA

WIRUCIAMY
KARTONY, KRAJECZKI STARE
DZIECI PAPIERU DO PSZANIA,
BŁYTYCH, OPAKOWANIE
I WODNY PAPIERUSZE,
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BŁYTYCH, OPAKOWANIE
I WODNY PAPIERUSZE,
KARTONIKI, POKRZYWA, TĘSTOWE

**EKOLOGICZNY ZWIĄZEK GMIN
DORZĘCZA KOPRZYWIANKI**
27-640 Klimontów, ul. Zysmana 1, tel./fax (0 15) 866 13 98
e-mail: ezgdk@pro.onet.pl www.ezgdk.pl

Example of information materials

- an example of information materials distributed by municipal waste treatment facilities among citizens and pupils before introducing the system for separate collection of municipal solid waste.