The Future of Solid Waste Management in Poland

Attempt at a Prognosis

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1 Introduction

On 1st May 2004, the European Union gained a new sales market with the admission of 10 new states. Although the economic power of the new countries Estonia, Latvia, Lithuania, Malta, Slovakia, Slovenia, Czech Republic, Hungary, Cyprus and Poland only corresponded approximately to that of Bavaria at the time of joining, they nevertheless demonstrated a much higher growth.

With a population of approx. 38 million people, Poland now constitutes one of the largest sales markets of central Europe. German companies are also benefitting from the steadily growing gross domestic product of recent years. These companies are heavily involved in this development, and are taking advantage of the new opportunities offered in Eastern Europe (Kaufmann, Bergner et al. 2006, P. 9).

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With a share of 24% of Polish imports, Germany as a direct neighbour is one of Poland’s most important trading partners. With 34 million visits to Poland since the end of the Cold War, the Germans have also manifested great interest in this former Socialist state (Mewaldt 2006, S. 7ff).

Nor is it only the geographically favourable, central location in the heart of Europe which makes the country interesting for direct investments. In addition to the possibility of influencing EU policy, EU membership also offers Poland access to the EU structural and cohesion funds. These provide financial support for certain projects, and also have a positive effect on the investment climate within the country (Polish Economics Ministry (Ministerstwo Gospodarki) 2008, P. 23).

The country has a great deal of catching up to do in terms of waste management. The failings of environmental protection in the past urgently require investments, so that the country can approach the European standard of waste management systems. The most important measures include, amongst other things, the reduction of the quantity of waste which is disposed of at the available landfills. The Polish waste management system is based predominantly on the dumping of waste. About 92.5% of the annual volume of waste created is disposed of at around 900 dumps. Poland’s
dumping quota is therefore the highest in the EU comparison. In order to comply with the European law or the reduction of dumping, and avoid having to make penalty payments to the EU, it is essential for Poland to invest in its own waste management system. This necessity has been recognised by the country, and has been formulated in the first and second national waste management plans (KGPO 2006 and KPGO 2010). These plans describe amongst other things the extension of the waste management system in the country by the construction of 12 waste incineration plants. This ambitious objective, with an investment volume of approx. €1.4 billion, is to be subsidised from EU funds with up to 85% of the total investment (Pajak 2009, P. 10).

The high level of subsidisation by the European Union for projects intended to contribute towards the improvement of waste management without doubt represents a great incentive for investors. However, this developing sales market also presents some risks. Due to the lack of information based on experience, developments are difficult to forecast. The outdated structures of waste collection businesses on the one hand and the planned new disposal possibilities on the other must orientate themselves according to a new, common legal basis. Due to the burgeoning market for waste and its rapid development, it cannot be excluded that alternative disposal technologies might come into competition with the planned waste incineration plants, thereby endangering these projects. The 50 years of isolation from the western part of Europe has also left its mark on the people and their mentality, and has created completely new market dynamics comparable to hardly any other country.

From the point of view of investors, these general conditions constitute many uncertainty factors. An assessment of the risks and estimation of the development is very difficult due to the complexity of the system and the many players in the market. Conventional processes of quantitative risk assessment using mainly financial parameters here come up against their limits, since they cannot take into account the many qualitative factors influencing such development. Already existing solutions and expertise of companies, including those from other countries, can only be applied with
difficulty, or cannot be applied at all, to a different country in which other general conditions prevail.

2 Status of waste management in Poland

The disposal system in Poland is not one of the most advanced in the European comparison. In order to comply with European law, the failures in environmental protection of recent decades must be compensated for by rapid investments. Waste management in Poland mostly takes the form of the dumping of waste, which in future will contravene the EU dumping ban (Pajak 2009).

Figure 1 gives an overview of the disposal systems in use in Europe from the year 2006. The blue shading shows the percentage of waste which is recycled. The green shading shows the percentage of waste which is composted. The purple shading shows the percentage of waste which is intended for incineration, and the yellow shading shows the percentage of waste which is simply dumped.

![Figure 1: Waste treatment processes in Europe](source: Deutsche Gesellschaft für Abfallwirtschaft e.V. (DGAW) 2009)
It can be seen that in the European comparison, Poland dumps by far the highest percentage of waste. Only 0.43% of municipal waste is incinerated in the only waste incineration plant, which is located in the capital city of Warsaw. In contrast to Germany, Poland expects an increase in the amount of waste by 6.08% by the year 2018 (KPGO 2010).

In order to be able to meet the targets of the Dumping Directive, composting and the planned capacities of the mechanical-biological waste treatment plants will not suffice on their own. According to the calculations of the “Deutsche Gesellschaft für Abfallwirtschaft” (German Society for Waste Management), about 7 waste incineration plants will have to come into operation by the year 2010, and about 10 waste incineration plants by the year 2014, each with a capacity of 200,000 tonnes, in order to provide the necessary treatment capability (Obermeier 2009).

This great challenge for the country has also been recognised by the Polish government, which plans to construct a total of 11 waste incineration plants throughout the country. An overview of the planned projects is given in Figure 2.
The Polish government, with good reason, wants to implement these projects as quickly as possible. The huge investment costs for the construction of the waste incineration plants will be subsidised by up to 85% from the EU Cohesion Fund. The purpose of this fund is to support member states whose gross domestic product per head of population is below 90% of the EU average. Over the period 2007 - 2013, this will also include Poland, amongst others. In addition to various requirements of these subsidies, it is important to mention at this point that costs shown in the application as subject to subsidisation, but which are incurred after 01.01.2015, no longer qualify for subsidisation, and will not be reimbursed (Vattenfall 2009). In addition to organisational difficulties, the gaining of social acceptance may become an even greater challenge for the Polish government. While many

Figure 2: Planned waste incineration plant projects in Poland
Source: (TOMM-C 2009)
residents of major cities appear to understand the necessity for the construction of waste incineration plants, suitable sites must be found for such projects. The NIMBY syndrome (abbreviation for “not in my back yard”) appears to be so deeply ingrained in the minds of local residents concerned that it will become difficult to overcome this popular resistance. (Pajak 2009, P. 8).

The most important findings from the disposal situation in Poland are described briefly below.

2.1 Findings from the disposal situation in Poland

As one of the largest producers of waste in Europe, Poland has already made considerable progress in the implementation of EU-compliant waste management since becoming a member of the EU (Dr. Schäfer 2009). The country nevertheless still faces major challenges. The very specific legal situation (Kapsa 2009), such as the non-existent obligation on communities to supply waste, and the lacking acceptance of the population with regard to new waste recycling technologies, such as waste incineration (Pajak 2009), are inhibiting the waste management aims of the country. The very liberal market regulations in the country, which encourage competition, and the large number of waste collection companies, whose equipment is all in need of modernisation, make it more difficult to organise the disposal processes properly. The communities themselves have only inadequate control over disposal contracts between collectors and residents, and inadequate means for the prosecution of “polluters” (Kapsa 2009, P. 2).

Due to the increase in dumping charges in Poland and the implementation of the Dumping Directive in Germany, the country is struggling with an increasing level of transport and dumping of waste in a legal grey area, which also includes imports from the border regions of Germany. In some cases, dangerous waste is treated or dumped in the course of so-called “fake recycling” in waste disposal plants not licensed for this purpose. Even legal interim storage of waste for up to three years brings with it the danger
that this interim storage facility becomes a permanent fixture, which then produces uncontrolled emissions (Kapsa 2009, P. 2; Schäfer 2009, P. 251). An unresolved conflict of interest exists between politics and the disposal industry, which is also known in other countries such as Germany. While politics and society often impose idealised objectives such as the specification of recycling quotas, public and private disposal businesses work on the basis of the hard facts of business management and environmental legislation. The result is that waste is often disposed of by the most commercially viable (profitable) means. Intervention in this process often fails because of the lack of transparency or relevant decision-making information (Neugebauer 2008, P. 38). This state of affairs could be counteracted by increasing the number of controlling and supervising personnel, although this too often fails because of the tight financial budgets available to communities (Kapsa 2009, P. 2).

It may therefore be assumed that a yawning gap may occur between the theory, i.e. the laws at EU and national level, and the actual practices of the disposal industry.

However much potential this developing waste market of Poland offers for interested foreign investors, the market entry also brings with it just as many risks. The above general conditions in Poland and the many complex relationships between the individual factors combine to make any analysis of the Polish waste disposal system a difficult matter.

The following chapters form the basis on which Vattenfall Europe New Energy GmbH, in cooperation with the Work Science Institute of the University of Bremen, has developed an approach to make the complex relationships on the Polish waste market more transparent.

3 Systems thinking

Linear thinking is characteristic of the human mind. Everyone carries within them a number of so-called “mental models”. Mental models are assumptions, generalisations, images and symbols, which have a great influence on how people act and perceive the world (Klostermann and
Decisions may be made on the basis of an image from the past. This behaviour of people has been investigated many times. Private problems or investment decisions in the company are often based on previous situations already experienced, and future behaviour orientated along the same lines (Wagner 2004, P. 11). This process however could have fatal effects in the situation in question. Experiences gained with the waste management system in other countries, such as Germany, should therefore be applied to that of Poland. This may also be advisable in a large number of cases. In the case of unfavourable combinations of various factors however, such as underestimating the Polish mentality, or ignoring local circumstances, such as underestimating transport capacities of often poor country roads, this can lead to miscalculations and danger to the whole project.

Mental models are incomplete and imprecise. Incorrect assumptions, even with the best of intents, can therefore result in exactly the opposite of what was originally intended (Wagner 2004, P. 11).

### 3.1 Cross-Linking

The world “system” is derived from the Greek “systema”, which means roughly composition. This refers to a number of inter-related elements which together form a whole. What is important in this connection is the relationships of the system elements with each other. These are responsible for the behaviour and structure of the system. The often-quoted adage of ARISTOTLE “the whole is more than the sum of its parts” accurately describes the state of affairs, which is also referred to as emergence. This large number of inter-related elements results in a correspondingly large number of possible, different system conditions, which change over the course of time. The more elements and relationships in the system, the lower is the possibility of any exact development forecast. Such systems with a large number of variables and relationships between each other are referred to as “complex” (Wagner 2004, P. 8f).
SHERWOOD illustrates this state of affairs by an example: He compares the dropping of a coin with a price reduction of a product by 5% and asks what happens then. In the case of the coin, the answer is relatively simple: It falls to the ground. To question on the price reduction however cannot be answered ad hoc. This singular action could trigger a number of different consequences. For example, customers on the lookout for a bargain could be delighted. At the same time, other customers looking for exclusivity and image could be discouraged. This price reduction could also lead to a promotion within the company, or some years later drive the company into ruin. The sequence of possibilities can be continued ad infinitum. SHERWOOD states that the difference between a falling coin and a falling price consists in that the coin is dropped in a simple context, while the reduction of the price takes place in a complex context. This is due to the complexity and networking of the individual system elements. When dropping a coin, the only system elements are the person, the ground and the coin. When the price is reduced however, many elements interact with each other in a network. The customer via the price with the buying habits, the competitors, the behaviour of the markets etc. Due to the large number of elements involved, in which each element can behave in a different way, there is a large number of conceivable consequences, and the result of any single action is difficult to forecast. A look back into the past can also be helpful at this point. The question as to what lead to this action, and whether it was possibly just a reaction to the price reduction of a competitor, can be embedded in a causal chain with many possible results (Sherwood 2003, P. 18f).

When applied to the present examination context, this means that the same may apply to the disposal industry in Poland. Questions about the historical background which induced the Poles to this type of disposal, or the consequences of the introduction of new laws, are helpful at this point, and could enable a better assessment of the market circumstances. If one wants to understand systems therefore, one must analyse the system in its entirety, with all its components. However, this often opposes human intuition. Many people who are confronted with complexity attempt to simplify the matter by breaking it down into individual parts, and the examining every
aspect in isolation. This may appear reasonable to explain every component of the system, but destroys the complete system by breaking it down into its component parts. If the connections between the individual system elements are severed, the system takes on a completely different character. The same applies if one closely examines all the fine details and features of every system element. This is no indication however that the complete system demonstrates similar features. Teamwork for example is a feature of the system which is referred to as the “team”. The desired results can only be achieved if all the members in this system work together as a team. Every trainer however knows that it is not enough to be aware of the capabilities of each player in order to forecast the performance of the team (Sherwood 2003, P. 21).

In order to understand systems, one must also think in systems. The advantages of systematic thinking are explained below.

### 3.2 Dynamic systems

Systematic thinking offers an excellent aid in compensating for the inadequacies of human thinking. One method of mastering these inadequacies are dynamic models, by means of which one can point out with the aid of a computer the time-dependent behaviour of complex systems under different conditions (Sherwood 2003, P. 21). This modelling method was developed in the 1950’s by JAY W. FORRESTER at the Massachusetts Institute of Technology (MIT). In contrast to the mental models which people can only simulate to a limited degree, the system is simulated by means of computer software, thereby enabling the analysis of dynamic situations and systems.

Following on from the quantitative modelling approach to dynamic systems, systems thinking has taken on the task of bringing about an improvement in the human understanding of systems, without quantification and subsequent simulation of the system dimensions. Also known as qualitative system dynamics, this method attempts to enable systematic action by taking into
account feedback effects, time delays, remote effects and side effects (Wagner 2004, P. 14).

On the basis of its own modelling, Vattenfall Europe New Energy GmbH has simulated the waste management system in Poland, and will be presenting these results at the ISWA World Congress 2010.