

German Waste Legislation and Sustainable Development:

- Development of waste legislation in Germany towards a sustainable closed substance cycle -

Guest lecture by Dr. Helmut Schnurer,

Section Head at the Federal Environment Ministry,
at the workshop being organised by the Alexander von Humboldt Foundation at
the International Institute for Advanced Studies (IIAS)
in Kyoto/Japan vom 29.11. – 1.12.2002

1. Introduction

In recent decades, the industrialised countries, as well as many developing and newly industrialising countries, have been confronted with a sharp increase in waste volumes. The reasons for this trend include the escalating consumption of mass-produced, often cheaply manufactured goods, the trend towards a throw-away society, coupled with rising wages, all of which make it more expensive to repair an item than to purchase a replacement for defective goods.

However, it is not only waste volumes which have grown. At the same time, production processes and products have become more complex, with the result that production waste and waste products now consist of a wide variety of different materials, and often contain harmful organic and inorganic pollutants as well.

These developments have had a number of consequences. The former common practice of cost-effective waste disposal on simple landfill sites or in incinerators is no longer sufficient, since it does not actually eliminate waste and the pollutants it contains. Pollutants enter the environment via leachate or landfill gas from landfill sites, or via the waste gas from incinerator plants, causing harmful environmental impacts and in some cases leading to health impairments for the local population. In some cases, the consequences of this form of waste disposal may be irreversible. In Germany, this has led to the creation of countless contaminated sites in the form of derelict landfill sites, as well as contaminated former industrial or military facilities.

Only much later, when the consequences of these actions became visible to everyone, did the realisation spread that these cheap methods were patently inadequate as a means of disposing of the many and complex types of waste.

2. The start of controlled waste management in Germany

Thirty years ago, in the early Seventies, there were some 50,000 refuse dumps in the Federal Republic of Germany. Most of these were unregulated, uncontrolled dumping grounds for domestic and commercial waste situated on the outskirts of all major towns and communities.

When the risks, particularly to groundwater, of these uncontrolled refuse dumps were recognised, especially as groundwater is often used for the extraction of drinking water, the Government was forced to rethink its policy.

The first independent Waste Disposal Act [1] was adopted in Germany in 1972, which was rather late compared with other environmental legislation, e.g. in the field of air pollution control and water protection. Its primary aim was to shut down the uncontrolled refuse dumps and replace them with central, regulated and supervised landfill sites which would fall under the responsibility of the regional and local governments. This was successfully achieved within a few years, as a

result of which there are now only 300 or so landfill sites for household waste in Germany, and these are adequate.

The incineration of household waste, which became established in Europe back at the end of the 19th century, was originally designed to make waste more hygienic, particularly in large conurbations and cities which did not have space for large landfills. Following the first energy crisis in 1973, waste incineration in Germany became linked to the extraction of electrical or thermal energy as a way of saving expensive primary fuels. These days, all of the 56 waste incineration plants currently existing in Germany use the energy contained in the waste via the extraction of electricity and/or heat, and generally operate efficiently.

However, the operation of large, central waste disposal plants, with waste sometimes being shipped long distances to reach them, created a different set of problems. A growing environmental awareness amongst the general public created resistance to the siting of landfill sites or waste incineration plants amongst local residents. In particular, affected residents were fiercely opposed to the designation of new sites. Political implementation proved impossible for some sites, due to the lack of public acceptance; at the very least, the licensing procedures for new sites faced severe delays due to numerous appeals and court proceedings.

Although fairly good techniques were available for waste disposal, their practical implementation often failed. This in turn led to waste disposal shortfalls, at least at a regional level, because the capacity of disposal facilities was inadequate to cope with the rising tide of waste.

3. New objectives in the 1986 Waste Avoidance and Management Act

The impending waste disposal crisis at that time prompted calls for a drastic reduction in waste volumes, which would at least ameliorate the waste disposal problems. Instead of creating new landfill sites and incineration plants, the plan

was to avoid waste at source wherever possible, or failing that, to recycle it. The new Waste Avoidance and Management Act of 1986 [2] therefore introduced the principle that the avoidance and recycling of waste were to be given precedence over waste disposal. Unfortunately, the newly created legislation proved inadequate to tackle the existing problems. Nevertheless, this marked the first step towards a policy reorientation.

For one thing, the new law created the foundations for what we now know as product responsibility. It obligated the petroleum industry to organise the free collection of waste oil from consumers and to dispose of it in a controlled, environmentally compatible manner. Illegal disposal methods and the blending of waste oil with harmful substances such as PCB were largely eliminated as a result. A strict code of environmental penalties also proved helpful in this respect, whereby the illegal disposal of hazardous wastes was liable to severe punishment.

4. Packaging regulation

The German **Packaging Ordinance** of 1991 [3] is a key product of waste policy based on the Waste Avoidance and Management Act of 1986. In order to relieve the local authorities from the task of disposing of vast quantities of packaging – at that time, around one-half of the volume of household waste and around one-third of the weight was comprised of packaging – the onus shifted instead to industry, i.e. the manufacturers, fillers and distributors of packaged products, who were to be required to assume responsibility for packaging waste disposal.

Essentially, the rule was that manufacturers of packaging, and distributors of packaged products, were to accept the return of empty packaging from its most recent owner and to recycle it.

For *transport packaging*, details of the return scheme and responsibility for costs were open to individual negotiation between the supplier and the customer. For so-called *secondary packaging*, i.e. the packaging surrounding several individually packaged products, the point of sale was required to accept its return. Since retailers are reluctant to use up precious shop floor space in order to

accommodate containers for the collection of used secondary packaging, they cut down considerably on this type of packaging, and in some cases dispensed with it altogether. This was a visible success for efforts to avoid patently unnecessary waste.

The principal regulation concerns the area of so-called *retail packaging*. In this respect, the Packaging Ordinance applied a carrot-and-stick principle. The stick is the obligation on retailers to accept the free return of used, empty packaging at or near the point of sale from the end user. Retailers can exempt themselves from this obligation by participating in a scheme which ensures the free collection of such retail packaging from all households. However, this is only admissible provided these types of near-consumer collection system verifiably achieve certain collection and recycling quotas, which are set at a comparatively high level.

In the early Nineties, this regulation led to the establishment of the DSD dual system in Germany, now a stock corporation owned by a large number of packaging manufacturers, product manufacturers, retail companies and waste management companies, which organises the nationwide collection and transportation of packaging waste and sorts it into individual, recyclable fractions. The system contracts private and public waste management companies to provide these services on its behalf. The DSD scheme cooperates with guarantors to ensure and verify the adequate recycling of the individual packaging materials (glass, metals, paper/board, plastics and composites). The system is financed by the so-called "green dot", a licence fee which manufacturers or users of packaging must pay to the dual system. The licence fee amount has been set at varying levels by the market players, depending on the actual cost of collecting, sorting and recycling the individual packaging materials.

Another provision of the German Packaging Ordinance stipulates that retailers may only be exempt from accepting the return of drinks packaging at the point of sale if they comply with certain nationwide quotas of refillable, reusable packaging. These refillable types of packaging are generally more ecologically advantageous than non-refillable, disposable packaging. For mass-produced drinks, this quota

has been set at 72% under the current status. If this quota is not met, it will be rechecked after one year; if the quota still has not been met by that date, mandatory deposits for disposable packaging will automatically enter into force six months after the announcement of the results, in those areas responsible for the industry's failure to meet the reusable packaging quota. Such a situation was ascertained for the first time in 1997 and was confirmed in subsequent years. Following the Federal Government's publication of the data on 2 July 2002, mandatory deposits will now be introduced for disposable packaging for beer, mineral water and soft drinks as of 1 January 2003. This ruling has attracted a great deal of controversy, and industry groups with a vested interest in disposable packaging are opposing it with all the legal means at their disposal.

In Germany, the Packaging Ordinance has led to a noticeable reduction in packaging consumption of around 15 %, as well as recycling quotas of between 60 and 80 % for most packaging materials. Moreover, new recycling technologies have been developed and used for plastic packaging in particular, which also serve as a model for the sorting, conditioning and recycling of waste from other areas (such as end-of-life vehicles, scrap disposal etc.).

Admittedly, the introduction of the dual system in Germany has led to the emergence of a monopolistic structure. In 1998, the first amendment to the German Packaging Ordinance [4] was prompted by endeavours to generate greater competition, and these efforts will need to be continued in future.

5. Requirements governing the disposal of waste

Unfortunately, the provisions of the 1986 Waste Avoidance and Management Act did not make a clear distinction between waste and product, or between waste and raw material; it also omitted to confer powers for the adoption of ordinances with legally binding validity on the disposal of waste.

Nevertheless, at that time, the Federal Government set about creating Europe's first concrete material requirements on the disposal of waste. This led to the adoption of the Federal Government's first general administrative provisions, namely the Technical Instructions on the Storage, Chemical, Physical and Biological Treatment, Incineration and Storage of Waste Requiring Particular Supervision [5] (for hazardous wastes) in 1991, and the Technical Instructions on Waste from Human Settlements [6] in 1993. In particular, these administrative provisions stipulate requirements on the construction and operation of landfill sites, as well as the properties of waste admitted for disposal at such sites.

The general principle is that only waste which cannot be considered for recycling (to which priority must be given) for technical, ecological or economic reasons may be disposed of.

The new philosophy of waste disposal centred around the realisation that the disposal of mixed waste with organic and soluble components on landfill sites is inconsistent with an environmentally compatible solution. In a reactor landfill of this kind, harmful emissions of landfill gas and leachate are produced as a result of biological, chemical and physical degradation processes. These kinds of processes cannot be permanently contained via the use of technical barriers (seals).

The only possible solution to this problem is to pretreat the waste so as to render it suitable for landfilling. In other words, the biodegradable, organic waste components must first be removed or mineralised. Furthermore, soluble pollutant components, such as heavy metals, must first be eliminated or immobilised so that they are unable to escape from the landfill into the environment.

The thermal treatment of such waste, i.e. waste incineration, is one possible solution to these tasks. During the course of this process, the organic components in the waste are mineralised. Once processed, the residual slag can then be used, for example, in road-building. Heavy metals are, for the most part, retained by the

flue gas scrubbing systems, and can then be disposed of separately with the filter dust.

The Technical Instructions also contain concrete criteria regulating the properties of waste acceptable for disposal, such as stability levels, residual content of organic substances, measured as incandescent heat loss or TOC, as well as a series of eluate criteria. Waste may only be deposited in landfill sites if it is proven to meet these criteria.

Furthermore, these administrative provisions also contain technical and organisational requirements governing the construction and operation of landfill sites. In this respect, the technical requirements relating to barrier systems such as geological barriers, bottom sealing and surface sealing, are particularly important, as are the systems for detecting and disposing of leachate and landfill gas.

Hence, these administrative provisions contain all the key requirements governing the properties of landfill sites and the types of waste which may be admitted to them, which must be observed by the licensing authorities when approving new landfill sites and when monitoring existing ones.

Admittedly, the legislators felt that a comparatively long transitional period of up to twelve years was necessary in order to implement all these stringent requirements, which means that the provisions on the disposal of household waste do not come into force throughout the whole of Germany until 2005.

In order to prevent a one-sided fixation on waste incineration technology, in 2001 a resolution was adopted which opened up the arena to alternative treatment methods. Under the new regulations, mechanical-biological treatment methods are now also admissible, although these too are likewise subject to stringent requirements [7, 8]. In particular, these stipulate that waste must be treated in closed systems with guaranteed monitoring of the waste air produced. The waste

fraction from these types of pretreatment processes, which is high in calorific value, must be incinerated; landfilling is prohibited.

The new waste disposal philosophy contains two further important peripheral conditions which required statutory regulation:

(1) In order to avoid harmful emissions to the air from the now-widespread practice of waste incineration, it became necessary to apply stringent air pollution control standards. To this end, an immission control ordinance was adopted in 1990 which created global standards [9]. For the first time, the ordinance set a limit for dioxins/furans at 0.1 ng toxicity equivalents per m³ of waste air, together with strict limits for heavy metals, in particular. Under the new provisions, waste incineration plants were required to install complex filter systems in order to retain such pollutants.

(2) The pollutants retained in the flue gas scrubbing process (particularly heavy metals) accumulate in the filter dust. Suitable disposal methods must be available for these types of waste. In Germany, such filter dust is deposited deep underground in geologically suitable rock formations (such as salt mines, which almost guarantee exclusion from the biosphere).

By applying such stringent safety standards, Germany has largely broken down the general public's former resistance to waste disposal facilities, particularly to waste incineration plants. These days, plants of this kind are recognised as being particularly environmentally compatible, even by so-called critical scientists.

The European Union has since anchored a largely identical safety philosophy for waste disposal in directives applicable to the entire European Union. Essentially, the EU Directive on the landfill of waste of 1999 [10] and the EU Directive on the incineration of waste of 2000 [11] follow the basic principles and requirements for the disposal of waste and waste incineration developed in Germany and a few

other European countries. In order to ensure the precise contextual implementation of such European legislative provisions, the main content of Germany's former Technical Instructions has been upgraded to the level of statutory ordinances, with binding validity for everyone. These statutory ordinances now also stipulate that landfills which fail to meet the required standards must be shut down by the year 2005, or with a provisional regulation permitting only minor deviations, by 2009 at the latest [12].

As a landfill site will continue to generate costs for several decades after it has been shut down, due to the after-care required, this poses serious legal and financial problems for the respective owners/operators of such derelict landfill sites. No compensation entitlements have been agreed for the operators of such plants, which were previously licensed for an unlimited period but which must now be decommissioned prematurely. As some 200 landfill sites for household waste and a further 200 or so sites for industrial waste now need to be decommissioned in Germany under these new provisions, the Federal Government is endeavouring to provide assistance and support for the affected parties by drawing up legal, organisational and technical recommendations.

6. The failed attempt to reorganise waste management via economic mechanisms

In the early Nineties, the Federal Government endeavoured to gain better control of the escalating waste problems by drafting a Waste Charges Act. When disposing of waste on landfill sites or in incineration plants, the Act required the operator of the disposal facility to pay a fee for each tonne of waste. The fee was to be graduated according to the nature and toxicity of the waste. The charge would be waived for waste which was recycled. By making waste disposal significantly more expensive in this way, the Act aimed to create incentives for the more widespread avoidance and recycling of waste.

The significant proceeds generated from these large volumes of waste were to be used, in the first instance, to promote new technologies for the avoidance and

recycling of waste; however, around half of the total amount was also earmarked for the remediation of residual pollution, particularly of the numerous contaminated sites discovered in the former GDR following Germany's reunification. However, the draft act met with fierce resistance, particularly from industry segments which generate large volumes of waste and which would therefore be subject to a correspondingly high level of charges. Eventually, the government abandoned it, leaving the way clear instead for the Closed Substance Cycle and Waste Management Act, which further expanded the regulatory approach to waste avoidance, whilst at the same time implementing the EC Framework Directive on Waste (see below), which was long overdue. Nevertheless, similar systems of charges exist in a number of European countries, at least for the disposal of waste in landfill sites.

Implementation of the charges solution was also hampered by constitutional considerations. Financial law requires that the proceeds should serve the common good, but this proved impossible to verify, since around half of the proceeds were earmarked for other purposes, namely the remediation of residual pollution, and would not therefore benefit the payers of the charges in full.

7. **The route to the closed substance cycle**

Essentially, the need to create a new statutory framework for waste management in Germany was prompted by three factors:

(1) The attempt to stem the flow of waste via economic mechanisms (waste charges) had failed.

(2) Furthermore, the Federal Republic of Germany had been found guilty by the European Court of Justice of failing to adopt the broad definition of waste as stipulated by the EC Framework Directive on Waste [13]. Where waste-identical substances were recycled, this generally occurred under a different name (e.g.

residual material, substitute fuel, economic asset etc.) and fell outside the scope of waste legislation. Essentially, the old definition of waste only referred to waste intended for disposal. However, because EC law stipulated that waste destined for recycling should also be included under the waste regime, this led to a further increase in the volumes of waste to be regulated, thereby further exacerbating the existing shortfalls in waste disposal.

(3) The final deciding factor for a new legal initiative was the 1992 World Conference on Environment and Development in Rio de Janeiro, at which the concept of sustainability and calls for sustainable production, particularly by the industrialised countries, took centre stage. The German Environment Minister at the time, Prof. Klaus Töpfer, highlighted resource conservation as the new target of waste management, and also coined the term ***closed substance cycle***. Under this concept, waste was to remain predominantly within the economic cycle of production, distribution and consumption, and would ultimately be used as a substitute for primary raw materials in the form of secondary raw materials. For a country such as the Federal Republic of Germany lacking in raw materials, this new target may even offer attractive economic prospects under certain circumstances.

The new act, programmatically entitled the "Closed Substance Cycle and Waste Management Act" [14], was promulgated in 1994, whilst at the same time, provisions on the import, export and transit of waste derived from the Basel Convention and the EC Regulation on the supervision and control of shipments of waste were laid down in a separate statutory provision. The act entered into force in 1996 with a transitional period of two years, and consistently pursued the following hierarchy of targets: waste avoidance – recycling – disposal. Article 1 defines the purpose of the Act as being "to promote the closed substance cycle in waste management in order to conserve natural resources", and since this is not 100 % immediately achievable, "to ensure the environmentally compatible

disposal of waste”.

To begin with, the new Act adopts the broad definition of waste as stipulated by European waste law. Under this definition, all substances not purposefully created in production processes are generally classified as waste. Furthermore, all products become waste at the end of their life cycle unless followed immediately by a further concrete, designated purpose.

In keeping with the objective of the closed substance cycle, all waste which is not avoidable should primarily be materially or energetically recycled. Articles 4 and 5 of the Act regulate the basic principles and basic obligations in this respect.

Compliance with these obligations by the producers, owners and disposers of waste are subject to two conditions: firstly, recycling must be conducted properly, i.e. in accordance with the provisions of this Act and other provisions under public law; and secondly, recycling must be conducted safely, i.e. in particular, there must be no accumulation of pollutants in the recoverable materials cycle.

Furthermore, all producers and owners of waste are required to pursue the high-grade, i.e. particularly resource-conserving, recycling of their waste. Other peripheral conditions include technical feasibility, the economic reasonability of additional costs compared with waste disposal, and the existence of a market for extracted substances and energy, or the opportunity of creating such a market.

Given that there was still substantial resistance to the incineration of waste – even for the purposes of energetic recycling – from the general public and politicians in the early Nineties, Article 6 of the Act specifies a number of somewhat restrictive preconditions regulating the admissibility of energetic recycling, specifically, a minimum thermal value of 11,000 kJoule/kg for the waste being incinerated.

However, household waste for disposal by the local authorities was exempt from the precedence of energetic recycling, since this type of waste generally has a lower thermal value. This was designed in part to ensure that domestic waste remained within the competence of the local waste management authorities, and

was disposed of in line with the principle of national autarchy as granted by European law. A number of on-going proceedings before the European Court of Justice are examining the restriction of recycling conditions and could lead to a re-assessment in future, depending on the outcome of these proceedings.

Finally, the Federal Government may issue statutory ordinances giving priority to the material or energetic recycling of waste, depending on which is the more environmentally compatible procedure. This is the case, for example, in the German Packaging Ordinance, which contains specified quotas for the material, raw material or energetic recycling of plastic packaging waste.

For the most part, the aforementioned objectives of the closed substance cycle are set out in the form of unspecified legal concepts, and should therefore be further concretised in order to avoid varying or contradictory interpretations where possible. However, the legislators were aware of these application difficulties, and have opted not to impose fines in the event of failure to comply with certain basic principles or fundamental obligations relating to the closed substance cycle.

Nevertheless, the Act does authorise the Federal Government to further concretise the requirements of the closed substance cycle by means of statutory ordinances (Articles 7, 8, 22 ff.).

Compliance with the obligations of the closed substance cycle, and the environmentally compatible disposal of non-recyclable wastes in production plants (both those requiring licences and those exempt from licences under the Federal Immission Control Act [15]) is the responsibility of the plant operators, and is based on the provisions of said Act. The manner and nature of the ordinance, on the other hand, correspond to the provisions of the Closed Substance Cycle and Waste Management Act.

Products which later become waste represent a key area, and Articles 22 to 26 contain new regulations on the anchoring of product responsibility, aimed

primarily at the responsibility of the manufacturer (and importer) of products. Wherever possible, manufacturers and importers are required to produce and market their products in a manner consistent with the principles of the closed substance cycle (e.g. products should be durable, easily repairable, recycling-friendly etc.).

The provisions of Articles 19 and 20 are part of the supporting regulations to expand the closed substance cycle, under which producers of certain quantities of waste are required to prepare five-year waste management concepts, and to provide annual assessments of the targets actually achieved. This is intended primarily to strengthen the autonomy and awareness of operators to comply with the closed substance cycle.

Article 37 of the Act contains a provision which has been inadequately enforced to date. It outlines obligations on the part of the public sector to promote compliance with the objectives of the closed substance cycle within its particular sphere of responsibility (particularly for the procurement or use of materials and commodities, during building projects and other purchase orders), and thus serve as a role model for industry and the general public.

Of course, the Act also regulates the conventional areas of waste disposal, the licensing of landfill sites (the licensing of other waste treatment facilities is regulated by the Federal Immission Control Act), and the monitoring and documentation of waste flows. With regard to the latter, preparations are currently underway for a radical reform of the control and documentation processes under waste law, aimed particularly at increasing efficiency whilst at the same time reducing the administrative effort for waste producers and disposers, as well as the supervisory authorities.

The fact that responsibility for the disposal of certain waste types is linked to their future disposal channel remains an unsatisfactory aspect of the new Closed

Substance Cycle and Waste Management Act. When waste is recycled, responsibility lies with the producers or private waste management companies commissioned by them. As such, waste disposal has been liberalised in line with the requirements of European law (freedom of movement for recycling waste (see below)), so as to facilitate the return of recyclable waste into the production cycle by the economic players themselves. On the other hand, the disposal of waste remains the fundamental responsibility of the public waste management authorities or state-owned companies set up in some *Länder* for the disposal of hazardous wastes. Waste from private households likewise remains the responsibility of the public waste management authorities (large local authorities, counties or special-purpose associations). Article 13 of the Act regulates these types of responsibilities, including a number of exemptions.

Because waste avoidance and waste recycling measures have proven highly successful, thereby reducing the volume of waste requiring disposal, some of the public waste disposal facilities are now faced with a problem of excess capacity, and waste is virtually being “fought over” between public and private disposal agencies, as well as within these two groups. Conflicts have arisen with one party questioning the other’s intention to recycle. As such, it would make more sense for waste disposal responsibility to be linked to the origin of the waste, rather than to its intended future purpose. A debate is now in progress on whether or not waste from commercial operations should be liberalised, i.e. declared the responsibility of the waste producers and the private waste management industry, irrespective of whether such waste is to be disposed of or recycled. On the other hand, there are no plans to alter the obligation to surrender waste from private households to the local authorities. The local authorities may, of course, choose to utilise the services of third-party private waste management agencies, and indeed are doing so to an increasing extent.

When the Closed Substance Cycle and Waste Management Act entered into force

in 1996, an extensive raft of sub-statutory provisions entered into force at the same time, comprising seven ordinances and one guideline. These were aimed, firstly, at adopting the uniform waste nomenclature in Europe (European Waste Catalogue) and distinguishing between waste requiring special supervision, waste requiring simple supervision and waste requiring no supervision; one ordinance regulates details of the procedures for documentation and control under waste law; a further ordinance imposes mandatory licensing for transporters of waste, whilst other provisions regulate the maintenance of waste management concepts and waste life-cycle analyses. One peculiarity is the option created in the Act, and specified in greater detail by an ordinance and a guideline, whereby particularly highly-qualified waste management agencies (specialised waste management companies or members of a waste management association) maybe certified, thereby entitling them to certain concessions, e.g. with respect to the documentation procedures required under waste law. Commercial producers of waste would be well-advised to utilise the services of such specialised waste management companies when disposing of their waste, since in the event of liability, they can verify compliance with their duty of care vis-à-vis the selection and monitoring of waste management companies.

Some of these sub-statutory regulations have since been amended and updated [16-22].

8. Problems associated with the demarcation of waste recycling and waste disposal

Both in European waste law and its implementation in Germany, there is a lack of clarity regarding the distinction between a recycling operation and an operation to dispose of waste. This has led to discord and disputes. The EU Framework Directive on Waste contains two Annexes listing, firstly, waste disposal procedures, and secondly, waste recycling procedures. However, some of the terms used are imprecise, incomplete or even contradictory. For example, waste incineration is cited as an option both in the list of disposal procedures and in the

list of recycling procedures. Other, more recent recycling procedures, such as the underground stowage of waste in mine chambers, to act as a substitute for other filler materials and mining damage on the earth's surface, as practised in Germany, are not listed at all.

Although the Appendix to Germany's Closed Substance Cycle and Waste Management Act adopts these lists verbatim, additional attempts are being made to achieve differentiation by means of so-called main purpose clauses. The main emphasis of a given treatment process may either be on the recovery of materials or energy, or on the separation or destruction of pollutants, whereby the fact that resources are also used to a certain extent is merely a side-effect. However, even this main purpose ruling is fairly imprecise, and open to interpretation.

From a technical point of view, it is immaterial whether a given treatment process is labelled recycling or disposal. The main issue is whether or not such a process is environmentally compatible. This is ensured under the provisions of the law. From a legal point of view, on the other hand, a procedure's classification as recycling or disposal determines whether responsibility lies with private or public waste management agencies. Furthermore, the EC Framework Directive on Waste stipulates the same freedom of movement within the European single market for waste destined for recovery as for merchandise, whereas waste destined for disposal is subject to the autarchic principle of the Member States, whereby export may also be prohibited if waste intended for disposal is recycled.

In recent years, various attempts have been made to clarify the distinction between the two procedures by means of administrative provisions and ordinances. Consideration has also been given to a rewording of the law; however, all these endeavours have failed, partly due to conflicting political and/or economic interests.

Evidently, given the diversity of wastes and the equally diverse number of

methods for its recycling in industrial recycling processes, the only option is to create a legal framework stipulating material and process-related requirements for recycling. In this respect, of course, it is necessary to set priorities and give precedence to provisions on waste

- which is incurred in large quantities
- or which is particularly well-suited to recycling
- or for which recycling processes exist which are particularly attractive from an ecological and economic viewpoint
- or alternatively, for which there are fears of environmentally damaging disposal channels.

In Germany, in the past, such provisions have been implemented in the form of the Sewage Sludge Ordinance [23] and the Biological Waste Ordinance [24]. These contain requirements regulating the properties and origins of waste suitable for recycling, define the required pre-treatment methods or objectives (such as compliance with low pollutant levels, hygiene provisions), and also regulate the conditions for the use of treated sewage sludge or biowaste on agricultural or other land. There are also provisions regulating the required control and documentation procedures.

The use of such secondary raw material fertilisers is currently the subject of some controversy, since the application of sewage sludge and biowaste compost invariably spreads heavy metals and organic pollutants on the fields as well as the desired nutrients. In the interests of sustainable agriculture, tighter regulations on pollutant limits are currently under debate, both for these types of secondary raw material fertilisers and for commercially produced agricultural fertilisers and mineral fertilisers. A new regulatory framework is needed which will harmonise the objectives of the closed substance cycle, water management, soil conservation and agriculture.

A number of other substance- and process-related provisions governing the

recycling of certain types of waste have now been drawn up, some of which are already in force or are due to enter into force soon:

The **Commercial Wastes Ordinance** [25] enters into force on 1 January 2003, and is aimed at preventing so-called "illusory" recycling of mixed domestic-type waste from the commercial sector. It regulates the separation of certain types of waste suitable for recycling from commercial enterprises and the construction waste sector. Where mixtures are nevertheless submitted to recycling, they must only contain these specific, recyclable categories of waste but no other waste which could impair recycling; after a transitional period of two years, evidence must be given that at least 85 % of such waste mixtures are subjected to material and/or energetic recycling. The ordinance also obligates commercial enterprises to keep a residual waste container for wastes destined for disposal; it is assumed that as a general rule, commercial enterprises will also generate non-recyclable waste which must not be mixed together with the recyclable waste and must instead be disposed of separately.

A second example is the new **Waste Wood Ordinance** [26] which enters into force on 1 March 2003. In volume terms, the area regulated by this Ordinance is very large, with around 15 million tonnes of waste wood being generated per annum in Germany. The legal framework of the Ordinance divides waste wood into four categories, according to pollutant type. Certain material or energetic recycling processes are only admissible for individual or multiple waste wood categories. Affected parties are responsible for keeping records and arranging periodic external controls to verify their compliance with these provisions. Because waste wood can always be recycled, either materially or energetically, except contaminated waste wood, which must be thermally treated (incinerated), the dumping of waste wood on landfill sites is prohibited.

In a similar way, the **Ordinance on Underground Waste Stowage** [27] defines which types of waste may be used as underground stowage materials in which types of rock formations, and which documentation (in particular, a long-term safety record) must be provided.

Finally, the revised version of the **Ordinance on Waste Oils** [28], which entered into force on 1 May 2002, regulates which types of waste oil must be stored separately and subjected to priority material recycling. Here too, the waste must be within certain pollutant limits. This Ordinance was accompanied by a guideline giving priority to the processing of waste oil into base oil for the production of new lubricants, and offering financial subsidies for this purpose. For every tonne of base oil produced from waste oil, the waste oil refineries receive a non-repayable allowance. This is intended to make the material recycling of waste oil competitive compared with energetic use (e.g. in cement factories). In order to avoid a permanent subsidy situation, this scheme to promote the preferred form of waste oil recycling is structured degressively, and is limited to a certain time period and amount.

This could also serve as a model for other wastes, in order to facilitate market access to otherwise non-competitive but equally expedient recycling techniques.

It can be assumed that further material- and process-related requirements for recycling will be formulated in future. Harmonisation of these provisions at European level, and if possible at OECD level as well, would be desirable.

9. Implementation of product responsibility

The Closed Substance Cycle and Waste Management Act particularly stresses the anchoring of product responsibility, which is essentially aimed at all manufacturers and distributors of products. Manufacturers and distributors of products are called upon to try and meet the targets set out in Article 22 of the Closed Substance Cycle

Act through their own efforts, as far as possible. Voluntary measures by individual plants, voluntary commitments by industry sectors, or government provisions and intervention, are all ways of implementing product responsibility.

In practice, however, individual measures by individual plants will only succeed if this generates cost benefits, or at least competitive benefits for the plant concerned. Otherwise, fierce competition between companies within sectors generally prevents cost-effective, voluntary individual measures. Nevertheless, one such example of individual measures is the European-wide collection of ink cartridges from ink-jet printers by a US manufacturer and their recycling at a German recycling plant.

To date, voluntary commitments by a number of sectors within the framework of product responsibility have been successfully encouraged.

In the past, this has included the commitment by **battery manufacturers** and **retailers** to accept the return of batteries containing pollutants at the point of sale and to submit these to recycling. A similar voluntary commitment was also undertaken by **car manufacturers** and **car importers**, with the aim of achieving higher recycling quotas for used cars. Both of these voluntary commitments have since been replaced by binding statutory provisions, essentially because the parties involved were unable or unwilling to bear the costs for these types of recycling processes themselves.

A number of other voluntary commitments currently exist in Germany which work well in terms of attaining the targets set by the market players themselves. One is the commitment by industry to increase the recycling of **waste graphic paper**, and to stabilise this at the current high level of approximately 80 %. Another example is the **construction industry**, which has voluntarily undertaken to reduce construction waste deposited on landfill sites by half within a ten-year period, and instead to increase its recycling ratios accordingly. These types of voluntary commitments are generally linked to annual monitoring reports documenting the level of fulfilment of the commitments made.

In other areas, the Government was forced to prescribe a legally binding framework for market players in order to persuade them to assume product responsibility.

In addition to the aforementioned area of **packaging disposal**, this currently applies to the disposal of **used batteries** [29] and **end-of-life vehicles** [30]; these two areas will soon be joined by the disposal of **electrical and electronic equipment**, on the basis of a European regulation anticipated in early 2003.

All these regulations have one thing in common: namely, the obligation on the part of manufacturers to accept the return of used products which have become waste from their most recent owner, and to do so free of charge. This is linked to the obligation to subject the returned waste to environmentally compatible recycling, and to keep documented evidence to this effect. In the case of packaging, end-of-life vehicles, and in future electrical equipment as well, these regulations also contain specifications on the attainment of certain recycling quotas, most of which are set at a comparatively high level. They also regulate the extent to which these types of waste products must be materially and/or energetically recycled, and the final quantity of waste for disposal which may be produced. This involves fairly complex compliance monitoring procedures (volume flow records), as well as measures to prevent so-called free riders from utilising recycling services for their products without contributing to the financing thereof.

In order to enhance the efficiency of these types of return, treatment and recycling schemes, and for antitrust reasons (prevention of dominant market positions), we should be calling for manufacturer-specific endeavours and solutions. In practice, however, amongst many market players, and particularly in the global product markets, this leads to numerous problems for which there is no magic solution.

When creating the relevant legal framework conditions, allowance must be made for the fact that this is not merely a question of creating a system to finance and manage an appropriate waste disposal system in certain product areas. Instead, manufacturers should be given incentives, by internalising the external costs of

environmentally compatible recycling of their waste products, to design and produce new products which lend themselves to cost-effective recirculation from the outset. Companies which are successful in this respect will derive market benefits from the lower disposal costs of their products – as well as their positive environmental image.

10. **Future developments**

Based on its success to date, the closed substance cycle should continue to develop in the direction of sustainable waste management. To this end, even greater emphasis must be placed on resource conservation. In this respect, it is helpful to consider material flows and evaluate recycling endeavours on the basis of the natural resources thereby conserved. Particular weighting should also be given to the substitution of raw materials which are either non-renewable, whose existence is limited in the foreseeable future, or whose extraction is associated with high environmental impacts. In the interests of sustainability, this equation should not only consider the aspects of environmental protection, but also the economic effects, as well as the social aspects (e.g. jobs). First, we need to identify areas with further waste management potential to utilise such positive effects for sustainable development; and secondly, to identify and introduce the appropriate mechanisms for the implementation and use of such sustainability potential.

Another key aspect worth considering is the fact that recent scientific findings indicate that the efficient energetic use of certain types of waste can make a significant contribution to climate protection. This is partly due to the fact that under international standards, the incineration of biogenic waste content is considered climate-neutral. The energetic use of the energy thereby released – where possible, in the form of combined heat and power generation – allows other energy resources, usually fossil fuels, to be saved, thereby allowing the saved CO₂ emissions to be credited. Further credits are also derived from the fact that incineration, as opposed to landfilling, avoids emissions of landfill gases containing methane, which have a significantly more adverse effect on climate. All in all, therefore, the efficient

energetic use of domestic waste may contribute significantly towards the attainment of Germany's climate protection targets.

For both variants of sustainable waste management development (resource conservation and climate protection), it would seem expedient to consider the use of economic mechanisms, in addition to statutory regulations. In Germany, the Renewable Energy Resources Act [31] and the associated Biomass Ordinance [32] for the mono-incineration of certain types of biogenic waste (e.g. wood) ensure a high level of remuneration per kilowatt hour of electricity generated. This renders these types of procedures economically viable on the market, thereby offering a substitute for fossil fuels. Another suitable means of mobilising further sustainability potential would be to subsidise the expedient energetic use of the biogenic content in domestic waste.

In this connection, it is significant to note that back in 1993, the Technical Instructions on Waste from Human Settlements stipulated that by the year 2005 at the latest, the disposal of non-pretreated domestic waste would be prohibited in Germany. In the remaining 2 ½ years between now and mid-2005, therefore, we need to create the requirements for all domestic waste to be subjected either to thermal or combined mechanical/biological and thermal pre-treatment. This will put an end to the disposal of non-pretreated domestic waste, the adverse climatic effects of this, the worst variant of waste disposal, will be eliminated, and instead, opportunities will be created for the more widespread material and energetic use of domestic waste. The Government plans to further highlight the effects of this policy towards strengthening sustainability.

Moreover, in 1999 the Federal Environment Ministry set the political objective of phasing out the disposal of domestic waste altogether by the year 2020 at the latest, and replacing it instead with the complete avoidance, pretreatment and recycling of such waste wherever possible. If this is to be achieved, however, further research

and development work is needed in order to create appropriate usable technologies. Modern sorting techniques which enable certain recyclable waste components to be separated cleanly from mixed waste offer one promising prospect in this respect. In future, the gradual attainment of the 2020 target must be further anchored in statutory guidelines.

In conclusion, therefore, the closed substance cycle is becoming ever more technically advanced and moving closer to the modern technologies used in production, thereby becoming an integral part of production and consumption. The statutory framework conditions in this respect must help waste management to shake off its "end-of-the-pipe" mentality aimed at the cheapest possible disposal of waste from a wealthy society, and instead transform it into an essential pre-requisite for the procurement of raw materials and for the production of goods.

The relevant areas of law, which are currently distinct from one another, should therefore be linked together and viewed in a more integrated way. However, this is no easy task. Plans to combine the separate media-specific environmental protection laws into a single Environmental Code – analogous to Germany's Civil Code which was created a hundred years ago – have proven extremely difficult to implement, but nevertheless remain on the Federal Government's active agenda during the current legislative period.

Sources:

- [1] Waste Disposal Act, Federal Law Gazette I, page 873, 11 June 1972
- [2] Waste Avoidance and Management Act, Federal Law Gazette I, page 1410, 27 August 1986
- [3] Packaging Ordinance, Federal Law Gazette I, page 1434, 12 June 1991
- [4] Amendment to the Packaging Ordinance, Federal Law Gazette I, page 2379, 21 August 1998
- [5] Technical Instructions on the Storage, Chemical, Physical and Biological Treatment, Incineration and Storage of Waste requiring Particular Supervision, Joint Ministerial Gazette 170, 10 April 1990
- [6] Technical Instructions on Waste from Human Settlements, Federal Gazette No. 99 a, 19 May 1993
- [7] Ordinance on Environmentally Compatible Storage of Waste from Human Settlements and on Biological Waste Treatment Facilities, Federal Law Gazette I, page 305, 20 February 2001
- [8] 30th Federal Immission Control Ordinance, Federal Law Gazette I, page 305, 20 February 2001
- [9] 17th Federal Immission Control Ordinance, Federal Law Gazette I, page 2545, 23 November 1990
- [10] Council Directive on the landfill of waste, Official Journal of the EC No. L 182, 26 April 1999
- [11] EU Directive on the incineration of waste, Official Journal of the EC No. L 332, 28 December 2000
- [12] Landfill Ordinance, Federal Law Gazette I, page 2807, 24 July 2002
- [13] EC Framework Directive on Waste (75/442/EEC), Official Journal L 194, 31, 15 July 1975
- [14] Closed Substance Cycle and Waste Management Act <KrW/AbfG>, Federal Law Gazette I, page 2705, 27 September 1994
- [15] Federal Immission Control Act <BImSchG>, Federal Law Gazette I, page 2331, 14 May 1990
- [16] Ordinance on the Implementation of the European Waste Catalogue (Waste Catalogue Ordinance), Federal Law Gazette I, page 3379, 10 December 2001
- [17] Ordinance on the Codification of Waste for Recovery Requiring Supervision, Federal Law Gazette I, page 3379, 10 December 2001
- [18] Ordinance on Waste Recovery and Disposal Records, Federal Law Gazette I, page 2374, 17 June 2002
- [19] Ordinance on Transport Licences, Federal Law Gazette I, page 1411, 10 September 1996
- [20] Ordinance on Waste Management Concepts and Waste Life-Cycle Analysis, Federal Law Gazette I, page 1447, 13 September 1996
- [21] Ordinance on Specialised Waste Management Companies, Federal Law Gazette I, page 1421, 10 September 1996
- [22] Ordinance on Waste Management Associations, Federal Gazette 178, page 10908, 9 September 1996

- [23] Sewage Sludge Ordinance, Federal Law Gazette I, page 912, 15 April 1992
- [24] Biological Waste Ordinance, Federal Law Gazette I, page 2955, 21 September 1998
- [25] Ordinance on the Management of Municipal Wastes of Commercial Origin and of Certain Construction and Demolition Wastes (Commercial Wastes Ordinance), Federal Law Gazette I, page 1958, 19 July 2002
- [26] Waste Wood Ordinance, Federal Law Gazette I, page 3302, 23 August 2002
- [27] Ordinance on Underground Waste Stowage, Federal Law Gazette I, page 2833, 24 June 2002
- [28] Waste Oil Ordinance, Federal Law Gazette I, page 1368, 16 April 2002
- [29] Battery Ordinance, Federal Law Gazette I, page 1496, 2 July 2001
- [30] Ordinance on the Disposal of End-of-Life Vehicles, Federal Law Gazette I, page 2214, 21 June 2002
- [31] Renewable Energy Sources Act, Federal Law Gazette I, page 1872, 22 July 1976
- [32] Ordinance on the Generation of Electricity from Biomass (Biomass Ordinance), Federal Law Gazette I, page 1234, 21 June 2001

Further information can be found on the Federal Environment Ministry's homepage, at: www.bmu.de/Waste Management", or in German language "Abfallwirtschaft".