National Reporting to CSD 18/19 by Switzerland

WASTE MANAGEMENT

1. Overview

The tradition of developing and using environmental technologies especially for waste management has existed in Switzerland for a long time. As early as the 1960s the country became a pioneer in this domain by rigorously installing treatment and incineration plants with stringent emission standards. Today it can be acknowledged that Switzerland has succeeded in moving from basic waste removal to an environmentally friendly process of waste disposal and recycling. Now, incineration plants are efficient power plants which produce clean heat and electricity.

However, Switzerland will soon be faced with new considerable challenges which it will not be able to master alone. If the objective is to sensibly reduce the environmental impacts due to the huge flow of goods worldwide, it will not be sufficient to act at the end of the production supply chain. Therefore, in order to work towards sustainable development, it will be even more necessary to improve social and environmental criteria all along the life cycle of goods and services.

Municipal solid waste

From year to year municipal solid waste (MSW) arisings in Switzerland have been on the increase. By 2007 they had reached 720 kg per person. Today, half of all MSW arisings are collected separately and recovered – a ratio that has more than doubled over the past 20 years. The recycling principle was also applied very swiftly everywhere and Swiss recycling rates are among the highest in the world. The remaining wastes are incinerated in clean processes which generate electricity and heat, meeting some 2 % of the country's final energy requirements. In recent years, the Swiss Confederation's waste management policy has significantly reduced the level of environmental pressure caused by waste management despite continuous growth in the total volume of MSW arisings. This trend can be attributed to the introduction of high waste management standards, to a highly effective infrastructure, and to a financing system that makes the waste producers responsible for the costs of disposal. Nonetheless, even a highly effective waste policy is by itself insufficient in reducing the country's overall consumption of resources.

Hazardous wastes

Hazardous waste thus accounts for about 6 % of all waste. Each year around 1.2 million tonnes hazardous wastes are consigned to special reprocessing, are disposed of within the country, or are exported in line with the provisions of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Unless appropriately managed, hazardous waste poses risks to the environment. The remediation of disused hazardous waste landfill sites will cost the Swiss economy well over 1 billion francs.

2. Prevention and minimization and environmentally sound management of hazardous wastes

Since 2000, the total volume of hazardous waste in Switzerland has been approximately 1.2 million tonnes per year. Hazardous waste thus accounts for about 6 % of all waste. In 2005, 43 % of the hazardous waste was incinerated, 22 % was landfilled after appropriate pretreatment, 23 % underwent chemical/physical treatment and 12 % was directly recycled. Chemical/physical treatment takes place mainly in Switzerland. This approach is applied to polluted wastewater, soil from contaminated site remediation and emulsions.

The disposal of hazardous waste, which came into force in 2006, is regulated by the Ordinance on Movements of Waste (VeVA[1]). The objectives concerning the disposal of hazardous waste are as follows: avoid their production, recycle them wherever possible, treat those that are not recyclable so that they can be deposited in landfills in an eco-compatible manner, and dispose of them mainly in Switzerland. The accomplishment of these objectives resulted in the creation of an efficient disposal infrastructure in Switzerland, and the establishment of an infallible legislation on hazardous waste flows. Industry in particular has improved its management of hazardous waste by taking measures to prevent it and to recycle unavoidable waste more efficiently.

Recycling of hazardous waste

The recycling of hazardous waste is being promoted by the implementation of the Ordinance on Movements of Waste and Technical Ordinance on Waste, the development of new treatment methods and rising raw material prices.

Cement plants

In 2008, there were 6 cement plants operating in Switzerland, producing close to 4.2 million tonnes of cement. The production of 1 tonne of clinker requires about 135 kg of coal or 86 kg of heavy oil. In principle, cement plants can use suitable types of waste as an alternative fuel or raw material. However, this must not increase the emission of air pollutants from kilns or reduce the quality of the cement produced. Accordingly, guidelines on disposal of wastes in cement plants were developed[2] in close collaboration with the industry and the cantonal authorities.

[1] VeVA: http://www.admin.ch/ch/d/sr/c814_610.html

[2] Guidelines: http://www.bafu.admin.ch/abfall/01495/01506/index.html?lang=en

These guidelines prohibit the incineration in cement plants of municipal waste and problematic special wastes (e.g. chlorinated solvents or paint residues with a high heavy metal content). However, bulk wastes with a low pollution potential and high calorific value - such as used oil, sewage sludge, animal flour/animal fat, low-chlorinated solvents, plastics, used tyres etc. - may be used as alternative fuels. In 2008, the cement plants consumed a total of approximately 270'000 tonnes of combustible waste and 250'000 tonnes of alternative raw materials.

Waste disposal facilities

Requirements for disposal facilities are specified in the Technical Ordinance on Waste (TVA[3]). It specifies stringent requirements for waste that is to be landfilled. Today, three different types of landfill site exist in Switzerland, corresponding to different types of waste:

- Landfills for inert materials: only rock-like wastes may be disposed of, from which virtually no pollutants will be leached out by rainwater. These include materials such as construction waste (concrete, bricks, glass, road rubble) and uncontaminated soil that cannot be used elsewhere. At suitable locations, landfills for inert materials do not require any special sealing.
- Landfills for stabilized residues: are designed for the disposal of materials of known composition, with high concentrations of heavy metals and only a small organic component, and which cannot release either gases or substances readily soluble in water. Typical materials include solidified fly ash and flue gas cleaning residues from municipal waste incinerators, and vitrified treatment residues. These sites are subject to more stringent requirements than landfills for inert materials. Impermeable linings are required for the base and sides of the landfill, and leachate is to be collected and, if necessary, treated.
- Bioreactor landfills: chemical and biological processes are expected to occur. At these sites, drainage controls are also required. In addition, any gases emitted are to be captured and treated. Given the unpredictable composition of their contents, bioreactor landfills are at greatest risk of requiring expensive remediation at a later date. Certain types of waste (e.g. incinerator slag) are required to be disposed of in separate compartments, isolated from other types of waste. If these wastes were intermixed, heavy metals would be leached out in much greater quantities as a result of the relatively low pH of incinerator slag. Compartments for residual wastes have also been established at numerous bioreactor landfill sites.

Bioreactor landfills require long-term efforts to monitor and treat gases and contaminated leachate. The processes occurring within the landfill continue for decades and cannot, in the event of an incident, be "switched off" within a matter of hours like the furnace of a municipal waste incinerator. Over a period of decades, despite the use of gas capture systems, substantial amounts of methane and other undesirable gases are released into the atmosphere from bioreactor landfills.

[3] TVA Technical Ordinance on Waste: http://www.admin.ch/ch/d/sr/c814_600.html

There is also a non-negligible risk of defects in sealing systems leading to contamination of groundwater. These crucial factors underlie the prohibition on the direct landfilling of municipal waste, sewage sludge and other types of combustible waste which came into effect on 2000. At the end of 2002, the total capacity available at bioreactor landfill sites was about 19.1 million cubic metres, including 10.8 million for incinerator slag.

At landfills for stabilized residues, Switzerland has a reserve capacity of about 2.5 million cubic metres. With annual disposal volumes of just under 500'000 cubic metres of slag and 50'000 cubic metres of residual wastes, this capacity is sufficient for more than 25 years. With regard to reserve capacity at the inert-material landfills operating in this country, the data available are incomplete at present. Even if sufficient capacity is available overall, there is a lack of space for landfilling in geologically unfavourable regions. As a result of the rapid growth in waste streams, cantonal authorities will be forced to continue reviewing their landfill planning in a coordinated fashion. In addition, appropriate funding of landfill maintenance and aftercare will become increasingly important in future.

Exports of hazardous waste

Exports of hazardous waste are only authorised if it will undergo environmentally sound disposal abroad[4]. Exports to non-OECD countries are prohibited. About 14 % of all hazardous waste is exported for recycling, treatment or landfilling, with around 63 % of this total being disposed of in Germany, and the rest almost exclusively in other EU countries – Belgium, France, Italy, the Netherlands and Austria. The federal authorities permit exports of hazardous waste mainly for recycling. Special arrangements are applicable for the disposal of filter cake from municipal waste incinerators in German underground landfills, and non-metallic shredder residue in incinerators abroad.

Contaminated sites

Areas where wastes have been deposited or have infiltrated the underground are known as "polluted sites". Around 50'000 such sites are to be found in Switzerland, including 13'000 that require closer investigation. Responsibility for this task rests with the cantonal agencies and a number of federal authorities. Registers of polluted sites are due to be completed by all the cantons and federal authorities concerned by 2011.

Polluted sites causing harmful environmental effects or nuisances are known as "contaminated sites". Of a total of 3'000–4'000 contaminated sites, more than 250 have been remediated to date. Investigations of polluted sites are to be completed by 2015. Remediation efforts must be undertaken by 2017 in urgent cases and by 2025 at the remaining contaminated sites. This step-by-step procedure is specified by the Contaminated Sites Ordinance (ALTLV).

Financial support for the management of contaminated sites can be provided by the federal authorities. Around 26 million francs per year is available for this purpose, thanks to charges levied on the landfilling of waste, which flow into the VASA[5] fund. This allows the authorities

[4] Notification process: http://www.bafu.admin.ch/abfall/01508/06061/index.html?lang=en

[5] VASA: http://www.bafu.admin.ch/vasa/index.html?lang=en

to initiate the necessary investigation, monitoring and remediation measures rapidly and in an environmentally sound and cost-effective manner, using the best available technologies.

Registration of the polluted sites

All polluted sites such as waste disposal sites and company or accident related sites are entered in the register maintained by the cantonal office in charge. In order that the owner of the property or the company not to be subjected to the whims of the canton, the canton is obliged to inform the owner prior to recording a site in the register. The owner receives the opportunity to take a position regarding the project at that time or to make additional clarifications. The authorities are also empowered to get information from the owner concerning the site. The publically accessible register is not only intended to contribute to general transparency and clear relationships. It is also intended to help minimize today's insecurities in construction project planning, property transactions or loan procedures where polluted sites are concerned.

3. Environmentally sound management of solid (non-hazardous) wastes and sewage, in the context of integrated planning and management of land resources

In 2007, some 5.5 million tonnes of municipal solid waste (MSW) were generated, which equates to approx. 720 kg per inhabitant. The percentage of all MSW collected separately was 51 % or 2.8 million tonnes. In 1989, the peak year to date for MSW incineration, the figure was only 27 %. Since then, the volume of segregated MSW has more than doubled from 160 to 370 kg per person per year.

It is thanks to this increase that the level of MSW incineration has remained relatively stable in recent years despite population growth, averaging 2.6 million tonnes per annum. The per capita volume of refuse for disposal fell from 440 to 350 kg per year. Financing waste disposal on the polluter-pays principle (e.g. Switzerland's refuse-bag levy) has contributed to progress in this area.

The success of separate collections[6] is also reflected in the composition of the household waste left for regular refuse collection. Changing consumption patterns are making a significant difference. Goods made of natural products such as wood, leather or metal are being replaced by composite products which cannot be separated and the majority of which contain plastic.

Biogenic waste from the kitchen or garden as well as food left overs account for 27 % of incinerated waste, the largest category by weight. Paper and card come next, accounting for 20 %, while composite products and composite packaging weigh in at 18 % and plastics at 15 %.

In recent years, the Swiss Confederation's waste management policy has significantly reduced the level of environmental pressure caused by waste management, despite

[6] Separate collections in Switzerland: http://www.bafu.admin.ch/abfall/01472/index.html?lang=en

continuous growth in the total volume of MSW arisings. This trend can be attributed to the introduction of high waste management standards, to a highly effective infrastructure, and to a financing system that makes the waste producers responsible for the costs of disposal.

Causality principle

The causality principle implies that anyone harming the environment must bear the costs. In 2001 the private sector – i.e. companies, households and farmers – committed 530 million francs to waste management, to which 1.5 billion francs were added from public expenditure. Out of this, a little less than 1.1 billion francs was passed on to responsible parties through taxes. The remaining 418 million francs, funded through tax receipts, represent a shortfall: it is the amount still to be charged to responsible parties for the causality principle to be fully enforced in Switzerland.

The environmentally friendly disposal of municipal waste in Switzerland costs only 30 centimes per person and per day. The huge investment made to introduce the separate collection for new incineration plants did not increase this amount because the plants were able to rapidly market the heat, electricity and metal they produced. Today the costs per person and per day are lower than at the end of the 1980's.

Information activities

There is a need for guidance on day-to-day management of waste. The provision of information and educational work are a central element of modern waste management. Each year a campaign takes place and allows everybody the possibility to take action towards a better waste and resource management.

Waste management facilities

Switzerland has a well-developed network of waste management facilities. Virtually every region possesses the infrastructure required in order to dispose of its own wastes. This helps to minimize transport costs and vehicle emissions. Since the introduction of the landfilling ban on 1 January 2000, all non recycled combustible waste in Switzerland must be incinerated in appropriate plants and end up in one of the country's 28 municipal solid waste (MSW) incinerators. Since the plant "Thun MSWI" came on stream in 2004, a total incineration capacity of 3.29 million tonnes has been available in Switzerland. This is sufficient to allow the landfilling of combustible waste to be dispensed with altogether from now on.

Innovation: production of renewable energy with waste

Since 1997, the Confederation has been awarding grants to support the development of innovations in environmental technologies.

Projects supported aim to introduce these innovations onto the market. Production of renewable energy connected with waste treatment is an essential preoccupation in the field of waste management. Whether it be diesel fuel production from plastic waste or used edible oils, that of biogas from organic waste or sewage sludge fermentation, the search for all possible technological solutions has attracted more attention since the increase in energy prices. The reclaiming of metallic elements (copper, zinc, nickel) in slag or ashes from electrofilters also benefits from the price escalation on the minerals market.

Electricity, heat and fertilizers production with biomass

In Switzerland, some 1.3 million tonnes of biogenic wastes are generated every year. 740'000 tonnes are processed in the country's 333 composting and anaerobic digestion plants with an annual capacity in excess of 100 tonnes/year, while 300'000 tonnes are reckoned to be recycled in private gardens and on neighbourhood compost heaps. Nevertheless, a further 250'000 tonnes or so still finds its way into the municipal solid waste (MSW) incinerators along with the normal domestic refuse.

Biogenic wastes are useful for the production of electricity, heat and fertilizer. During the last 10 years the production of industrial and agricultural waste production from electricity, heat, gas with biogenic waste from farms, and industrial factories has increased six-fold.

Due to the increasing interest in biomass for energy and heat production, and in order to ensure that other sectors which need this resource are not disadvantaged, the four federal agencies concerned developed a common strategy on biomass[7] usage. This strategy is based on the cascade classification for the use of biomass. The production of high value added products such as food and construction materials should remain a top priority. Synergies should be checked and applied consequently. For example waste and byproducts from the food industry can be used for animal feed. Wastages coming from the husbandry of animals can be used for energy production in biogas plants. While other organic wastes can be used for digestion and the production of fertilizer for agriculture. The energy produced in biogas plants can support the digestion process and heating required by industry.

Commodities stock of the future

A large part of the commodities which will be needed in future, for example metal, are now stored in infrastructures, factories, machines, cars, and other goods. So that these resources can be used efficiently in future it is necessary not only to have an inventory of the amount of goods processed but also to be able to identify the right operations and set material preparation plants to recover those resources.

Future optimization

There is still room for waste management structures to be optimized locally. For example, many regionalizations would be possible for the collection of waste. Further measures can also be taken for the standardization of the collection systems. And finally, to further increase the efficiency of waste management, it will be necessary to act on product design and improve social and environmental criteria all along the life cycle of goods and services.

Life cycle assessment, cradle to grave

Evaluating the ecological effects of a product from cradle to grave is a new instrument which can help increase further efficiency in waste management. Life cycle assessment is therefore attracting widespread interest. This instrument provides a list of all the environmental impacts that a product creates during its entire life cycle, from the extraction of the raw materials to produce it, to the manufacture and the use of a product until it is disposed of as waste. It is a useful way of making a practical numerical summary of the approach to products in terms of

[7] Biomass Strategy: http://www.blw.admin.ch/themen/00010/index.html?lang=fr

their life cycles in relation to their ecological effects. The ecological scarcity method [8] allows for the assessment of the impacts generated by the release of pollutants and extraction of resources identified in a life cycle inventory analysis.

4. Radioactive wastes and their environmentally sound management (safe storage, transportation and disposal of radioactive waste)

The 10-year average annual proportion of nuclear energy used for producing electricity is 39% (up to 45% in winter), which is above the European average of 33%. Switzerland's five nuclear power plants have a total capacity of 3.2 GW, and an annual availability rate of approximately 90%.

A large proportion of radioactive waste results from the production of electricity in Switzerland's five nuclear power plants, while other sources include the medical sector, industry and research. The disposal of radioactive waste is based on the principle of "user pays". Operators of nuclear power plants are responsible for the disposal of spent fuel elements and radioactive waste resulting from the operation of their plants, as well as from the later decommissioning and break-up of these facilities.

The financing of the disposal of nuclear waste is regulated in the Swiss Federal Nuclear Energy Act, and the Ordinance on the Decommissioning Fund and the Waste Disposal Fund for Nuclear Installations, which entered into effect on 7 December 2007, regulates the specific details. Two separate funds have been established in Switzerland (a decommissioning fund and a waste disposal fund) into which operators of nuclear facilities pay annual contributions.

According to the new calculations, the decommissioning costs for Switzerland's five nuclear power plants and the central interim waste storage facility amount to approximately 2.2 billion Swiss francs (pricing basis, 2006). These costs have to be covered in full by the two funds.

In 1972, the operators of the nuclear power plants and the Swiss Confederation set up the «National Cooperative for the Disposal of Radioactive Waste» (Nagra)[9] to prepare and implement solutions for waste management and disposal that ensure the long-term safety of man and the environment.

Decommissioning and waste disposal funds

The purpose of the Decommissioning Fund is to secure the costs for the decommissioning and subsequent break-up of nuclear installations, and for the disposal of the resulting waste. It was established in 1984. The proprietors of the nuclear power plants and of the interim waste storage facility are obliged to pay annual contributions into this fund.

[8] Ecological Scarcity Method - Eco-Factors 2006: http://www.bafu.admin.ch/publikationen/publikation/01031/index.html?lang=en
[9] http://www.nagra.ch

Disposal Fund

The purpose of the Waste Disposal Fund is to secure the costs for the disposal of nuclear waste resulting from the operation of nuclear installations, and of spent fuel elements following the decommissioning of a nuclear power plant. It was established in 2000.

Selection procedure for disposal sites

Based on current understanding, deep geological disposal is the only method for managing radioactive waste that meets the strict requirements relating to long-term safety. The Federal Council and Parliament have therefore decided that all waste arising in Switzerland will undergo deep geological disposal.

Switzerland's selection procedure for sites for deep geological repositories is specified in the Deep Geological Repositories sectoral plan[10] which was approved by the Federal Council on 2nd April 2008. Many important milestones in the waste management process have already been achieved: inventorying (characterisation) of the waste, processing (conditioning) and interim storage, as well as the demonstration that disposing of waste in Switzerland is technically feasible. Still to be realised is the construction of deep geological repositories.

The question of where to dispose of radioactive waste will be answered conclusively in the coming years. The selection of repository sites will be made in accordance with the conceptual part of the sectoral plan. The site selection process, which is divided into three stages, is under the lead of the federal authorities.

5. International Waste Policy

Basel Convention, transfer of environmentally sound technologies

Switzerland has a special relationship with the Basel Convention: Switzerland, together with Hungary, has initiated the development of the Basel Convention; Switzerland has hosted in 1989 in Basel the diplomatic conference when the convention was signed and thus given its name to the Convention; Switzerland is with Geneva the host of this Convention Secretariat; and Switzerland has initiated crucial initiatives within the Basel Convention, such as the Mobile Phone Partnership initiative which was the first Public Private Partnership within the Basel Convention; the newly initiated Public Private Partnership on Computing Equipment, and together with Indonesia the Country-Led Initiative with the goal to further protect vulnerable countries that are not able to ensure their sound treatment from unwanted imports.

Switzerland’s commitment to the Basel Convention is reflected by the following priorities: Efforts towards ensuring the sound management of materials throughout their life-cycle should be pursued and intensified; an appropriate mechanism must be developed to make sure that no hazardous wastes are exported to countries that cannot guarantee their sound disposal. Finally, the partnership approach developed by the Basel Convention should be continued.

[10] http://www.ensi.ch/index.php?id=177&L=2&L=0

Mobile Phone and Computer Waste Partnership

The Mobile Phone Partnerschaftsinitiative (MPPI[11]) was initiated within the Basel Convention Switzerland. At the sixth meeting of the Conference of the Parties in 2003 the Mobile Phone Partnership Initiative (MPPI) was established as a sustainable partnership on the environmentally sound management of used and end-of-life mobile telephones. In particular, the MPPI Work Programme was developed to:

- Achieve better product stewardship;
- Influence consumer behaviour towards more environmentally friendly actions;
- Promote the best refurbishing/recycling/disposal options;
- Mobilise political and institutional support for environmentally sound management;
- Result in an initiative that could be replicated to build new public/private partnerships for the environmentally sound management of hazardous and other waste streams.

Under the MPPI five technical guidelines (awareness raising on design considerations, collection of used and end-of-life mobile phones, transboundary movement of collected mobile phones, refurbishment of used mobile phones, and material recovery/recycling of end-of-life mobile phones) were developed. All five guidelines and the overall Guidance Document are now being used by Parties, BCRCs, industry, NGOs and other stakeholders in raising awareness on the environmentally sound management of used and end-of-life mobile phones.

On the basis of the success of the MPPI, a new partnership for the treatment of disused computers will be launched: PACE – Partnership on Action on Computing Equipment. Switzerland actively supports the PACE partnership and the creation of similar ones. Such direct interactions with the industry are in line with Switzerland's position and have the potential to play an important role in bridging political differences.

Country-led Initiative to strengthen the Basel Convention

In view of the need to explore means by which the objectives of the Ban Amendment might be achieved, Switzerland, together with Indonesia, has launched in 2008 at the 9th Conference of the Parties (COP) of the Basel Convention a Country-led Initiative to strengthen the Basel Convention. The objective of this Initiative is to develop recommendations for the tenth meeting of the Conference of the Parties to the Basel Convention (COP 10) for a way forward to protect vulnerable countries without adequate capacity to manage hazardous wastes in an environmentally sound manner from unwanted import of hazardous waste and to ensure that transboundary movement of hazardous wastes, especially to developing countries, constitute an environmentally sound management of hazardous wastes as required by the Basel Convention.

The work of the CLI will be undertaken in an open minded and dynamic consultation process among key players. The first meeting served to identify, analyse and enhance the understanding of the reasons for the transboundary movement of hazardous wastes where environmentally sound management cannot be ensured; the second meeting will allow for

[11] www.basel.int/industry/mppi.html

the continuation of this analysis and to begin developing options and solutions to address the problem; the third meeting will be dedicated to the formulation of recommendations for the consideration of the Parties at COP 10.

Support to implementation

In the context of the Basel Convention, the federal authorities are active in the transfer of technologies and the implementation of environmentally friendly disposal in Asia, Latin America and Africa. Particular examples of collaborations which have proven to be successful are partnerships between authorities, NGO's and private companies A pilot project in South Africa together with the world market leader Hewlett-Packard for the treatment of electronic waste (e-waste) is an example of this. This project was financed by the research institute for material sciences and technology development Empa and the State Secretariat for Economic Affairs SECO. In 2008, a treatment plant was built in Kapstad which could handle 58 tons disused computers and printers and led to the creation of 19 jobs. This pilot plant was a response to an important environmental concern in South Africa and the lessons learned are now spreading throughout the country. Similar projects have also been launched in China and India where technical guides have been developed and published, explaining how to recycle safely e-waste. EMPA and SECO will transfer the positive experiences to Peru and Colombia. With funding of the Secretariat of the Basel Convention, EMPA is conducting a feasibility study for e-waste recycling in West Africa.

Swiss Economic Development Cooperation

Under the Economic Development Cooperation of the Swiss State Secretariat for Economic Affairs (SECO), other programs related to the waste management besides the knowledge partnerships for the state-of-the-art recycling of e-waste mentioned above have been supported for many years in the Swiss partner countries. SECO's relevant cooperation, in the amount of several million Swiss francs per year includes[12]:

- together with UNIDO, the establishment of National Cleaner Production Centers which offer eco-efficient solutions to the chemical industry, and introduce innovative concepts such as chemical leasing;
- correct disposal of PCB from transformers (South East Europe);
- hospital waste incinerators;
- municipal waste management (China, Cuba);
- waste water treatment plants;
- reduction of pesticide use through organic farming, e.g. organic cotton.

[12] For more information, see: www.seco-cooperation.ch.