

## The 'Solid Waste Management Information System' (SWMIS) of Zhejiang, China

### 1. Background

Hazardous waste management and its monitoring is a crucial issue in the global perspective. More and more countries have started using information systems to manage and monitor the HW shipment by making use of electronic information transfer.

In China huge amounts of hazardous waste are generated every year due to fast economic growth and increasing industrial production. In Zhejiang, one of China's most developed provinces (see Fig. 1), hazardous waste generation from registered enterprises reached 440,400 tons in 2006, according to official figures. In order to strengthen the enforcement of national HW related regulation and to streamline the approval procedures and control functions of hazardous waste shipment, the 'Zhejiang Solid Waste Management and Supervision Centre' in collaboration with the Sino-German Cooperation Program, 'Environment-oriented Enterprise Consultancy Zhejiang' (EECZ), developed the 'Solid Waste Management Information System' (SWMIS) to enable the electronic processing and standardization of the Chinese "Hazardous Waste Transfer Plan and Manifest Regulation". This regulation is the Chinese analogue to the German "[Ordinance on Waste Recovery and Disposal Records](#)". The SWMIS supports all Zhejiang-based 'Environmental Protection Bureaus' (EPB's) to monitor and control hazardous waste.



Fig. 1: Zhejiang Province in China and its eleven city districts

#### 1.1. Features of the 'Solid Waste Management Information System'

The 'Solid Waste Management Information System' is unique in its design and the first of its kind in China. The system:

- Provides system access to 103 EPB departments dealing with hazardous waste in Zhejiang at the provincial, city and county level as well as to 57 licensed operators of hazardous waste recovery and disposal facilities
- Enables electronic implementation of China's core regulation for hazardous waste disposal and utilization through the "Hazardous Waste Transfer Plan and Manifest Regulation"
- Requires operators to enter hazardous waste related data into the system on behalf of approx. 3,000 registered hazardous waste producers
- Provides records of all relevant documentation in editable electronic formats
- Links data entered and performs plausibility checks, creates reports and generates statistical data for the competent authorities
- Is internet-based, and does not require users to install special software

The SWMIS was jointly developed by the 'Zhejiang Solid Waste Management and Supervision Center' (ZSWMSC), local IT experts and the consulting agency ERM GmbH subcontracted for implementing the HWM component of the Sino-German EECZ Program. The development of the SWMIS was delayed due to amendments of China's national hazardous waste legislation and lasted from April 2004 to December 2007.

#### 1.2. How does it work?

The Solid Waste Management Information System is composed of a Regulatory Module which feeds into Control and Statistical Functions.

The regulatory module processes data to enable the electronic management of (i) licenses for hazardous waste recovery and disposal facilities, of (ii) transfer plans and of (iii) manifests.

##### Licenses

Operational licenses are issued to operators of hazardous waste recovery and disposal facilities. Licenses specify hazardous waste types and maximum quantities that operators are permitted to accept per calendar year.

##### Transfer Plan

The Transfer Plan is the Chinese analogue to the German "Record of Proper Waste Management". Prior to sending hazardous waste to an

external recovery or disposal facility, the waste producer has to submit a “Transfer Plan” application to his competent authority in order to get the approval for the intended waste management procedure of the waste type under consideration.<sup>1</sup>

In contrast to the standard paper-based application procedure, operators of recovery or disposal facilities enter the transfer plan data into the SWMIS on behalf of the hazardous waste producers who do not have access to the system. All data from waste producers, waste transporters and waste receiving units is entered into the system. The transfer plan is then submitted to the competent authority of the waste producer for approval or denial. The transfer plan enables the editing of all relevant documents in EXCEL format for the convenience of the competent authorities, operators and waste producers. Fig. 2 shows the information flow between the relevant stakeholders during transfer plan application. It should be noted that for legal purpose the paper-based application procedure has yet to be retained in parallel because exclusive electronic implementation of the procedure requires recognition of the electronic signature which is obligatory in China.

For developing the electronic management function of the transfer plan, principal similarity between the regulations on hazardous waste transfer and manifest in both countries, China and Germany, was conducive, because it enabled adoption of proven and tested features from the German system, such as the separate legal statements to be made by waste producers and operators, including the “Declaration of Responsibility” of the waste producer and the “Declaration of Acceptance” of the operator. The ‘Zhejiang ‘Environmental Protection Bureau’ decided to integrate these formats also into the paper-based application procedure.

### Manifest

The Hazardous Waste Manifest, also known as “consignment note procedure”, is a tool for tracking the shipment of hazardous waste while it is transferred from a waste producer to a disposal or recovery facility. The

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<sup>1</sup> This is in contrast to the German “Record of Proper Waste Management” procedure where the application is approved by the authority responsible for the waste recovery or disposal facility.

Manifest is completed after the waste has arrived at its destination. Operators then enter the manifest data (= information on waste producer, carrier, waste type and quantity) into the 'Solid Waste Management Information System'.

#### Control and Statistical Functions

The control function connects license data, transfer plan data and manifest data and performs plausibility checks. The statistical function is based on the transfer plan data and manifest data and generates statistics, tables and figures, using parameters such as industrial sectors, locations, time periods, waste codes, enterprise details, types of utilization and disposal, and types of shipments (inter-county, inter-city, inter-province).

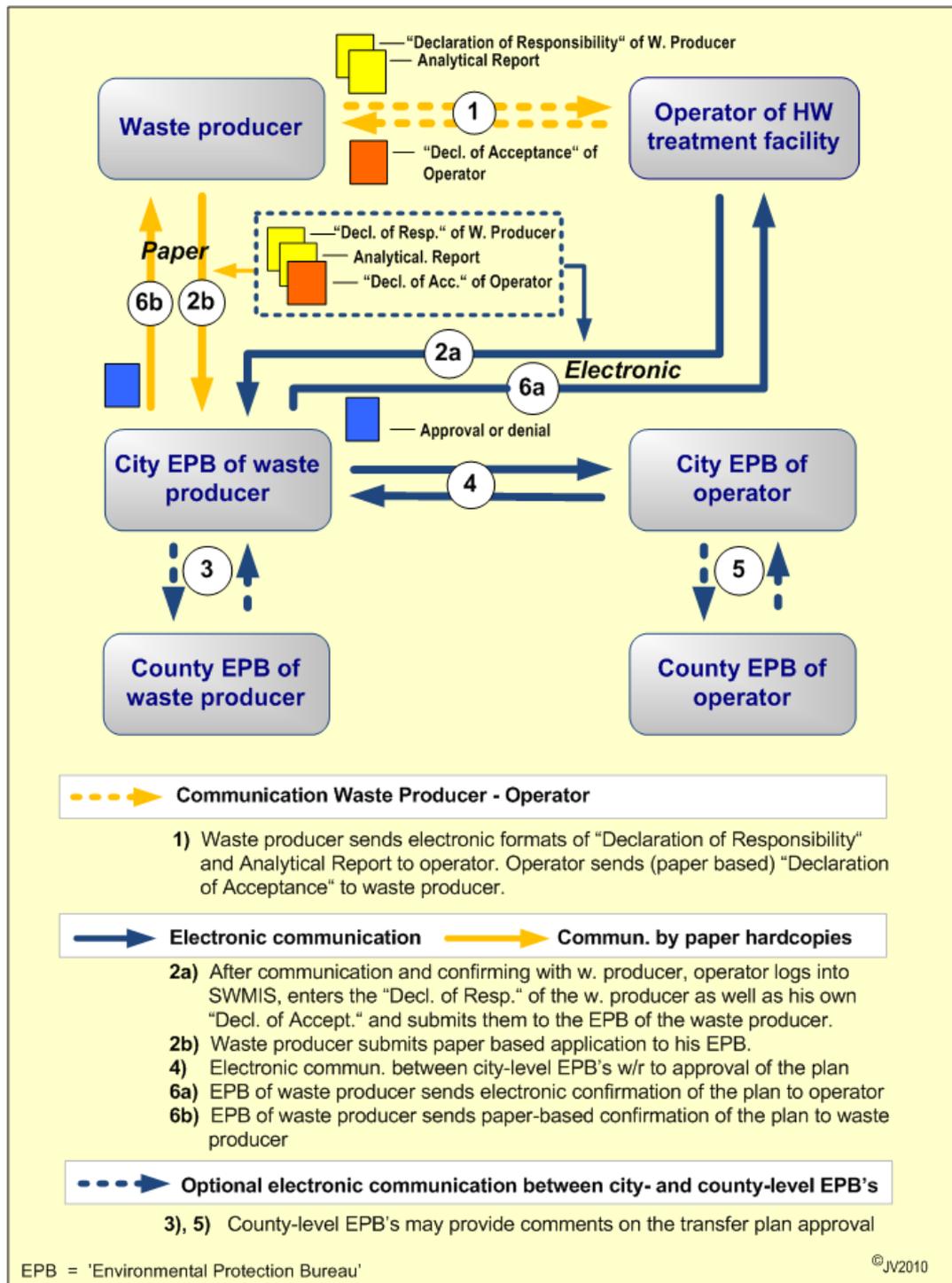


Fig. 2: Information flow between stakeholders during transfer plan application in Zhejiang, China. Paper based communication can be abandoned once the electronic signature has gained legal recognition.

Fig. 3: Electronic format of the Transfer Plan: Excerpt of the page for waste-specific data from the waste producer’s “Declaration of Responsibility” (English demo-version)

Table 1 shows the stakeholders and their access to functions of the SWMIS. EPB staff and operators were given special training on how to use the system.

Table 1: User groups and their access to system functions of the ‘Solid Waste Management Information System’

User Groups	FUNCTIONS				
	Regulatory Functions			Control and Statistical Functions	Access to General Information
	License Management	Transfer Plan Management	Manifest Management		
Environmental Authorities	✓	✓	✓	✓	✓
Waste Producers	(✓) Read only				✓
Operators	(✓) Read only	✓	✓		✓
Transporters	(✓) Read only	(✓) Read only	(✓) Read only		✓
The Public	(✓)				✓

	Read only				
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### 1.3. Benefits

Usage of the SWMIS is beneficial for stakeholders engaged in HWM.

- For the competent authorities:
  - Improved work efficiency, reduction of admin workload
  - Instant communication between the different competent authorities involved in hazardous waste shipment supervision, reducing the duration of transfer plan approval
  - Availability of all hazardous waste-related data for internal reporting, planning tasks and statistics in electronic formats
- For operators and hazardous waste producers:
  - Quicker decision of the competent authority with regard to approval or denial of the intended waste transport, compared to slow paper-based communication
  - Availability of relevant documentation related to HW recovery and disposal in electronic formats, useful for developing internal management and monitoring systems. The system features editing all relevant documents in MS EXCEL format which allows straightforward information exchange between operators and waste producers outside of the SWMIS.
  - Capacity to integrate data and electronic reports generated by the SWMIS into business software, e.g. for accounting (operators)

#### 1.3.1. Status

Operation of the Information System began on 1 January 2008. By the end of August 2008 1,510 transfer plans and 2,921 manifests had been processed. Meanwhile, the system has been adjusted to the new Chinese hazardous waste catalogue notified by the Central Government in August 2008. The results and experiences made in Zhejiang are presently being used for the development of a Solid Waste Management Information System at the national level.

## 2. Challenges and Lessons Learned

- Development of an information system should be initiated only after implementation of HWM legislation. Otherwise changes of the regulatory framework will cause delays by requiring extra efforts for re-adjusting the information system.
- System development has to be well documented to enable modifications to be made at a later stage or in case key software developers resign.
- Host organizations should be aware that information systems cause expenses also after completion of the system development due to servicing and maintenance.
- 'Solid Waste Management Information Systems' are only as good as the quality of the data entered. Results of the EECZ-Program's On-site Waste Investigation Campaign have shown that hazardous waste identification and declaration by waste producers is highly erratic and causes underestimation of hazardous waste generation and shipment. The competent authorities may use the time saved due to SWMIS support for training hazardous waste producers on classification and quantification of HW and for improved HWM.