1. Stakeholders on the management of solid waste in WND

The stakeholders involved in solid waste management chain in Wuxi New District (WND) are presented in the following table:

<table>
<thead>
<tr>
<th>Waste streams</th>
<th>Management stage involved</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal Solid Wastes</td>
<td>Collection and Transportation</td>
<td>Citizen, citizen community committee, household management company, ESB, private transportation enterprise</td>
</tr>
<tr>
<td></td>
<td>Reuse /Recycling</td>
<td>Citizen, waste picker, workers in transfer station</td>
</tr>
<tr>
<td></td>
<td>Incineration</td>
<td>ESB, incineration plant, EPB</td>
</tr>
<tr>
<td></td>
<td>Landfill</td>
<td>ESB, landfill plant, EPB</td>
</tr>
<tr>
<td>Industrial Wastes</td>
<td>Collection and Transportation</td>
<td>Enterprises, transportation company, EPB</td>
</tr>
<tr>
<td></td>
<td>Reuse /Recycling</td>
<td>Enterprise, individuals, recycling company, partial environmental protection company</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>Enterprises, environmental protection company</td>
</tr>
<tr>
<td></td>
<td>Disposal</td>
<td>Enterprises, landfill plant, incineration plant, EPB</td>
</tr>
<tr>
<td>Hazardous Wastes</td>
<td>Collection and Transportation</td>
<td>Enterprises, transportation enterprises, EPB</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>Environmental protection company, institute, university, EPB</td>
</tr>
<tr>
<td></td>
<td>Incineration</td>
<td>Environmental protection company, EPB</td>
</tr>
<tr>
<td></td>
<td>Landfill</td>
<td>Safe landfill, EPB</td>
</tr>
</tbody>
</table>

EPB: Environmental Protection Bureau; ESB: Environmental Sanitary Bureau
1.1 Management of municipal solid waste (MSW)

1.1.1 Generation
In WND, the generation of MSW is from dwellers’ domesticities, work and commercial activities. As the producer, dwellers are in the grass roots related to benefits.

1.1.2 Collection process
Collections of MSW in WND are carried out by two institutions:

   a. First, citizen community committees or property management companies, they manage the waste by charging the citizens.

   b. Second, Environmental Sanitary Departments, they are financed by government, and their main duties are to collect MSW in public and in parts of resident communities.

1.1.3 Transportation process
There are many transportation forms:

   ▪ Individual transportation. Some individual chauffeurs perform the transportation. They are paid mainly by the community committees or related management institutions. The advantages of it are that it can save the expense of vehicle maintenance and workers’ salary.

   ▪ Transportation by Environmental Sanitary Departments: The departments take the responsibilities to collect and transport, but the personnel and vehicles belong to government. Also, the government pays all of those charges. Specialty in transportation and high-efficiency are its benefits.

     Kexin company, a waste transportation company, takes the responsibilities to the waste in industrial park in WND. The transportation fee is paid by enterprises, and the company transports the solid waste to the transfer stations.

1.1.4 Treatment process
After the MSW goes into the transfer stations, some of them will be compressed. In addition, workers will reclaim the valuable components in it. The benefits will be got only by the stations and their workers.

1.1.5 Ultimate disposal process
All of the MSW will be sent to landfill field or incineration plant eventually. Taohua Shan landfill field, Yiduo incineration plant, some thermo-power plants, Environmental Protection Bureau and departments in WND, Wuxi Government and Wuxi Public Entities are the main organizations join in the process.
1.1.6 Recycle process

The groups that participate in the recycle process contain individuals, individual recycle bin, private-owned recycle companies and the transfer stations with their workers. The Environmental Protection Departments supervise the whole process.

Figure 1: Relationship of stakeholders within MSW Management
1.2 Treatment of industrial and medical solid waste

1.2.1 Origins

Groups related to the industrial solid waste are divided into three parts: waste producing enterprises, disposal departments and supervising departments.

- All manufacture companies, wastewater treatment plants and medical institutions in WND are the producing enterprises.
- Environmental Protection Bureau and Sanitation Bureau are the supervising departments, and the later takes the responsibility to supervise the medical solid waste only.

1.2.2 Collection process

The manufacture companies collect the waste and the processes are supervised by Environmental Protection Bureau or Environmental Sanitary Bureau.

1.2.3 Transportation process

There are many transportation forms:

- The environmental protection companies transport themselves, with the fees from enterprises.
- Relying on special transportation companies.
- Transported by Environmental Sanitary Departments, but the only non-hazardous sections.

The Environmental Protection Bureau supervises the transportation processes and any law-breaking group will be fined.

1.2.4 Disposal process

Disposal of industrial and medical solid waste, especially the hazardous solid waste, must be performed by qualified companies. These companies are shown as follow:

- Zhongtian environmental protection company
- Fangtian environmental protection company
- Zhonghuan material recycle company
- Secure disposal center for industrial solid waste
- other protection companies outside Wuxi city

Environmental Protection Bureau, Wuxi Government and Wuxi Public Entities take the responsibility to supervise the disposal.
1.2.5 Recycle process

Groups that participate in the step include:

- MSW producing enterprises.
- Individual recycle bin, private-owned recycle companies, some transfer stations and some environmental protection companies.

The Environmental Protection Bureau and Environmental Sanitary Departments also take the responsibility to supervise.

The relationships of these groups are similar to those in the MSW treatment. The groups related to the hazardous solid waste circulation are relatively simple.

Fig. 7 The relationship of different stakeholders for hazardous waste

1.2.6 Gaps/problems, issues of concern and cause analysis

(1). Gaps/problems

Relationships among all related groups are not compact and they lack of a institution that can harmonize the relationships.

Informal waste pickers are usually highly disadvantaged: they are often from the neighboring country-side and have little legal standing in the city; their children often pick waste as well; they are very susceptible to fluctuating market prices for secondary materials; they work in hazardous conditions; and they are often loosely organized, which reduces the effectiveness of introduced assistance programs. Waste picking from collection points is not recommended because it interferes with waste containment and collection systems. Waste picking at landfills is also not recommended because it is dangerous to the individuals and makes proper site management difficult. Landfills should have a small working ‘face, and be compacted and covered regularly; all of which is incompatible with waste picking. It will cause the waste of resources and leaking of solid waste in the recycle processes because of the lack of special trains.
All groups just care themselves, which blocks the communication among them, and eventually prevents the treatment and reuse progress.

Governmental departments do not take the dominant function.

(2). Issues of concern

In the future, with the increasing amount of solid waste, the circulation will take up lots of time, and the treatment cost will increase also.

(3). Cause analysis

All groups belong to different kinds of departments. It still needs to deeply communicate with each.

All groups don’t pay enough attention to the whole processes.