Newsletter Vol. 3

The Study for the Development of an Integrated Solution Related to Industrial Waste Management in the Industrial Pole of Manaus

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This newsletter is published by

JICA Study Team (SUFRAMA)
Av. Mario Andreazza 1424
Distrito Industrial, CEP 69075-380
Manaus, Amazonas, Brazil
TEL: (092) 3321-7281,
FAX: (092) 3321-7280

Please contact us with comments or questions

Report on the Study Findings

As the Study nears its second phase, we have completed the initial surveys of current conditions and issues. Based on these findings, an industrial waste management master plan for the Industrial Pole of Manaus in the Manaus Free Trade Zone will be drafted. This newsletter (vol. 3) contains a summary of our findings through the end of August, which were presented at the recent opinion gathering workshop held on September 11th — please keep an eye out for more news about the workshop and its results in the next volume of the newsletter.

The findings presented here are the result of five surveys which were conducted. These can be put into two main categories: *On-Site Waste Management* and *Off-Site Waste Management*. As always, the JICA Study Team welcomes you to contact us with any questions, comments or suggestions concerning these findings in order to create a more practical, achievable and effective master plan.

On-Site Waste Management

The study categorized industrial wastes into 4 categories of construction, health and radioactive wastes, as well as general industrial wastes that do not fall into those categories. These categories were made based on the fact that there are management requirements for each according to various rules and regulations by CONAMA, ANVISA, ABNT, CNEN and so on.

Hazardous Health Waste

Of the 600 PIM factories operating in MFZ, the study contacted 334 of them. Of these, it was found that 124 had attached clinics, a generation source for hazardous health waste (HHW), of which nine were surveyed directly to estimate the rate at which they generated HHW; the rate was calculated to be 1.23 kg/day per clinic. This rate, in addition to data from a general hospital located in MFZ, was then used to extrapolate the rate at which HHW is generated at PIM factories overall, which is 228.6 kg/day (see flow chart for health waste on page 3).

Given that some 100,000 people work in the study area, this amount was not surprising. However, some problems were apparent in the responses to the study survey, such as the use of non-standard containers for storage which do not meet ABNT NBR 12809 technical rules, and the mixed collection of class A and B hazardous wastes (note: this categorization will be revised according to CONAMA Resolution 358) at some locations. There were also some issues identified for off-site management of health wastes which indicated a need for improvements in the waste manifest system and more clearly defined discharger responsibilities due to the fact that many could not identify the disposal methods used by waste management companies they hired and that some HHW are disposed of in a special pit at the landfill while others are incinerated, although appropriate incinerator operation is yet to be confirmed.

Construction Waste

In the case of construction waste, the study identified the factories that had construction projects in the past year from June 2008 to May 2009, which turned out to be 123 of the 334 contacted. Construction waste is categorized into four items under CONAMA Resolution 307, but the study used 44 items to identify the wastes in further detail and it was found that over 80% are mixed construction waste generated at a rate of 184.66 kg/day/site, producing 29.92 tons/day in PIM on average. The total amount of construction waste generated is 36.97 tons/day (see flow chart for construction waste on page 3). Of this amount, in terms of the CONAMA classes, 36.8 tons are reusable or recyclable as aggregate (Class A), and 0.2 tons are recyclable as non-aggregate (Class B), with classes C and D being insignificantly minimal.

There were a number of potential issues identified through the responses received in the survey, such as the fact that only 50% made a construction waste management plan according to CONAMA Resolution 307. Furthermore, less than 23% of responses indicated the use of a manifest for waste discharge. Another issue is the extremely low recycling rate of 0.1%, which is apparent in the high percentage of mixed wastes, nearly 97% of which are disposed of at the Manaus City landfill.

Radioactive Waste

According to the National Commission of Nuclear Energy (CNEN), 14 PIM institutions are licensed to use radioactive materials. Of these, seven factories and one medical institution were surveyed to analyze the generation of any radioactive waste; however, the responses indicated that none was generated. The answers from the seven factories concerning their use of the radioactive materials revealed that the purpose is to control production processes, such as PVC sailcloth measurements, and products, such as dimension control. Furthermore, responses indicated appropriate radioactive materials management is being carried out, as such materials are either storage in a special container or installed in a particular device and used within a controlled area.

Off-Site Waste Management

To conduct the surveys on off-site waste management, the study categorized waste management companies into four categories: (1) collection and transportation, (2) treatment, (3) final disposal, and (4) reuse/recycle. A total of 85 companies were surveyed, and in addition, were cross-checked against the environmental licenses issued by IPAAM. Based on these surveys, it was estimated that 3,332 tons of wastes, (including municipal wastes), are collected by waste management companies per day. However, according to survey responses, 23 companies indicated that they do not have a license for waste management, although over 90% of these are small companies of less than 10 employees. After cross-checking the IPAAM licensing records, it was found that about 12% of industrial wastes are collected by companies that did not have the corresponding license. In addition, the license cross-check revealed that none of the companies conducting final disposal of industrial waste had obtained the proper license, although, nearly 99% of the waste is non-hazardous.

Overall, the survey results allowed an important observation to be made concerning the ratio of off-site disposal. This was highlighted by comparing the results for the Industrial Pole of Manaus (PIM) and those from a similar study done for the Bangkok Metropolitan Area (BMA) in Thailand. As can be seen in the table below, there is a strong tendancy

Table: Comparison of PIM and Bangkok Metro Area

Study Area	Waste	Ratio of On-Site Disposal	Ratio of Off-Site Disposal
PIM	Industrial Waste	2.7%	97.3%
	Non-HIW	2.6%	97.4%
	HIW	**3.2%**	**96.8%**
Bangkok Metropolitan Area[1]	Non-HIW	29.9%	70.1%
	HIW	**56.3%**	**43.7%**

toward off-site industrial waste disposal in PIM, whereas in BMA, the ratio is more balanced, particularly for hazardous industrial wastes (HIW).

[1] Source of data is "The Study on Master Plan on Industrial Waste Management in the Bangkok Metropolitan Area and its Vicinity in the Kingdom of Thailand", November 2002

Other issues that were identified according to waste management companies surveyed are the need to strengthen the capacity for monitoring and enforcing laws dealing with industrial waste management, and fortify infrastructure that will reduce business costs and improve the business environment. Also, according to various interviews, the IPAAM database for environmental licenses would benefit from improvements that would enable faster processing times, and more detailed codes and classification. Another issue to be addressed is the fact that not all dischargers use waste manifests (i.e. industrial waste management sheets), and those which do rely on non-uniform sheets received from waste management companies.

Waste Flow Diagrams

As mentioned above, the study has created flow diagrams showing health waste (Figure 1) and construction waste (Figure 2), which show the amounts generated per day and their destination. The study also produced a waste flow diagram showing the waste flow for the average of all industrial waste in PIM (Figure 3). The study also categorized industrial waste into two large categories: hazardous waste in PIM (Figure 4) and non-hazardous waste in PIM (Figure 5).

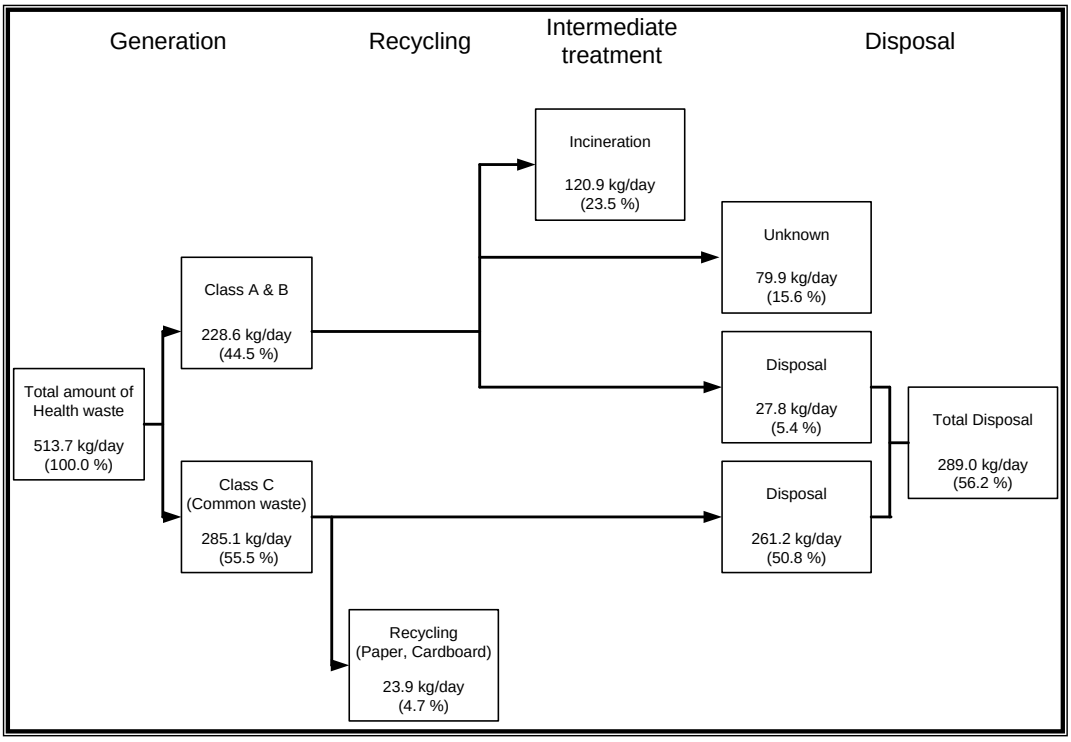
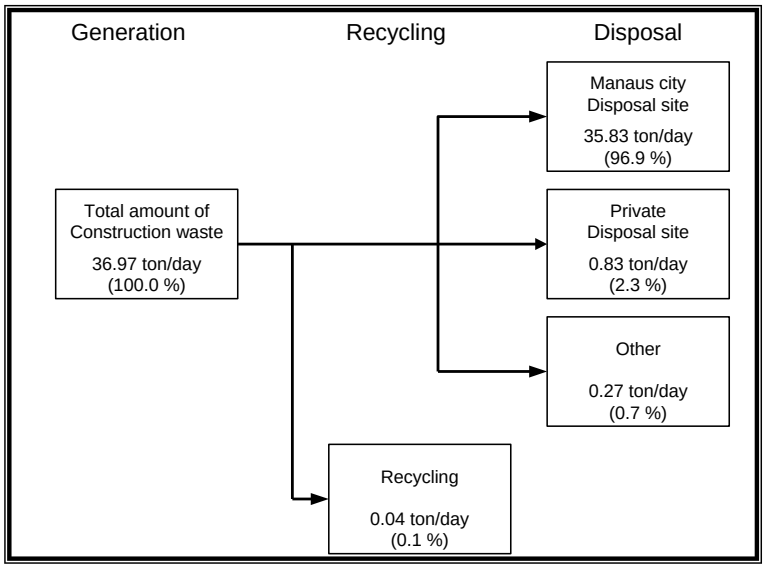


Figure 1 (above) shows the number of kilograms of Health waste generated in PIM per day and the flow to recycling, intermediate treatment and disposal;

Figure 2 (right) shows the number of tons of construction waste generated in PIM and the flow to recycling and disposal.



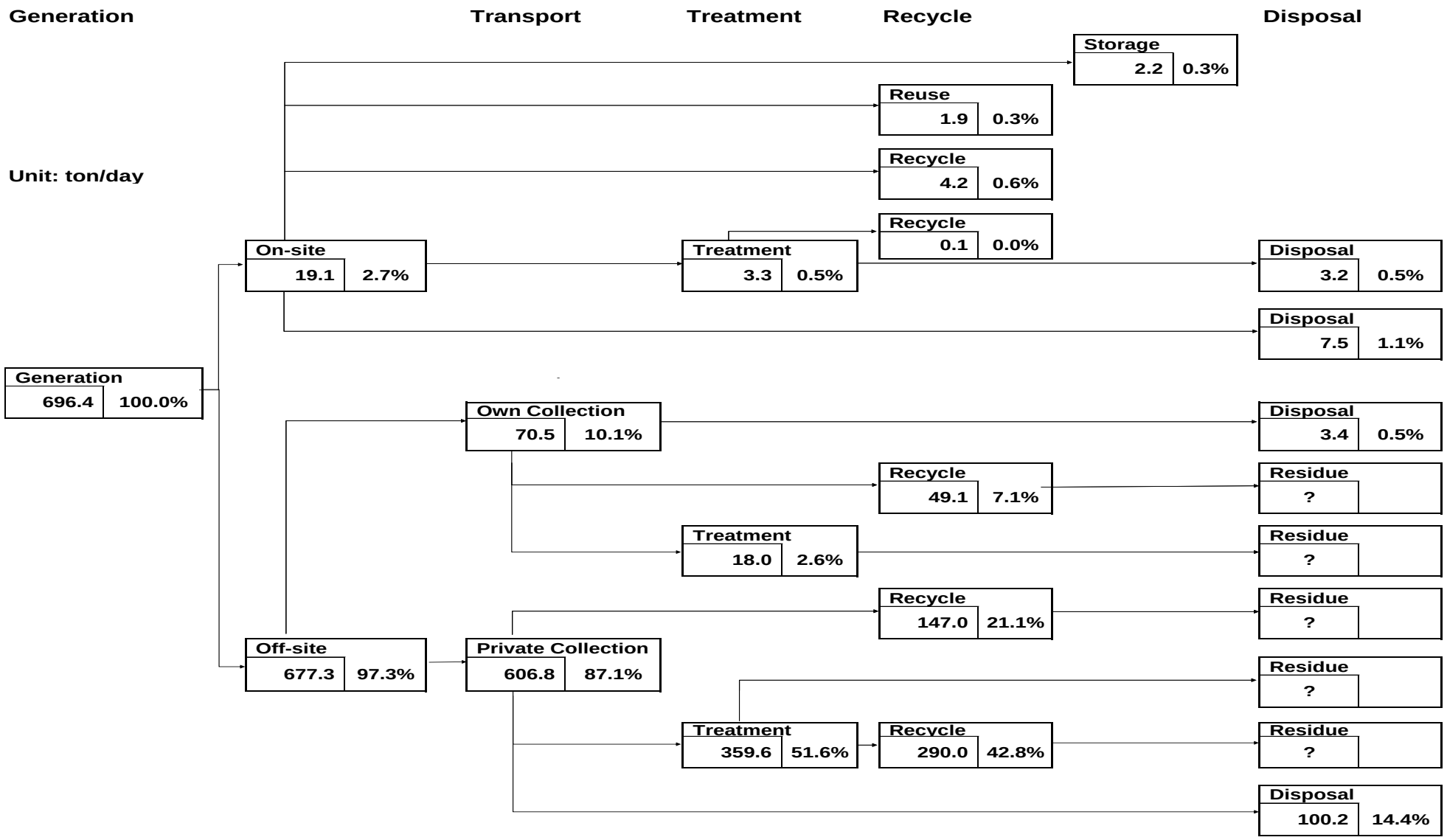


Figure 3: Waste Flow for all Industrial Wastes Generated in PIM (units are tons per day)

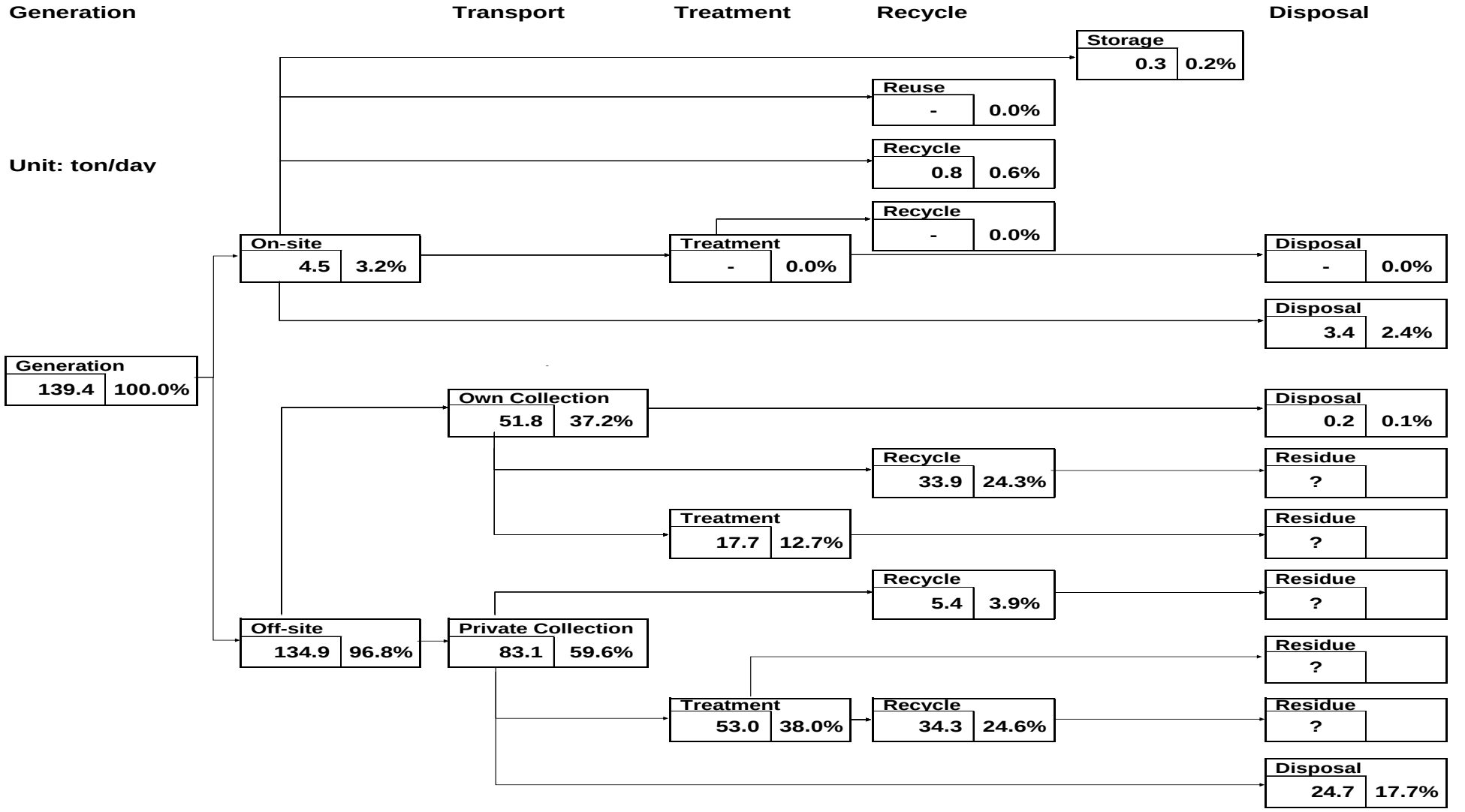


Figure 4: Waste Flow for All Hazardous Wastes Generated in PIM (units are tons per day)

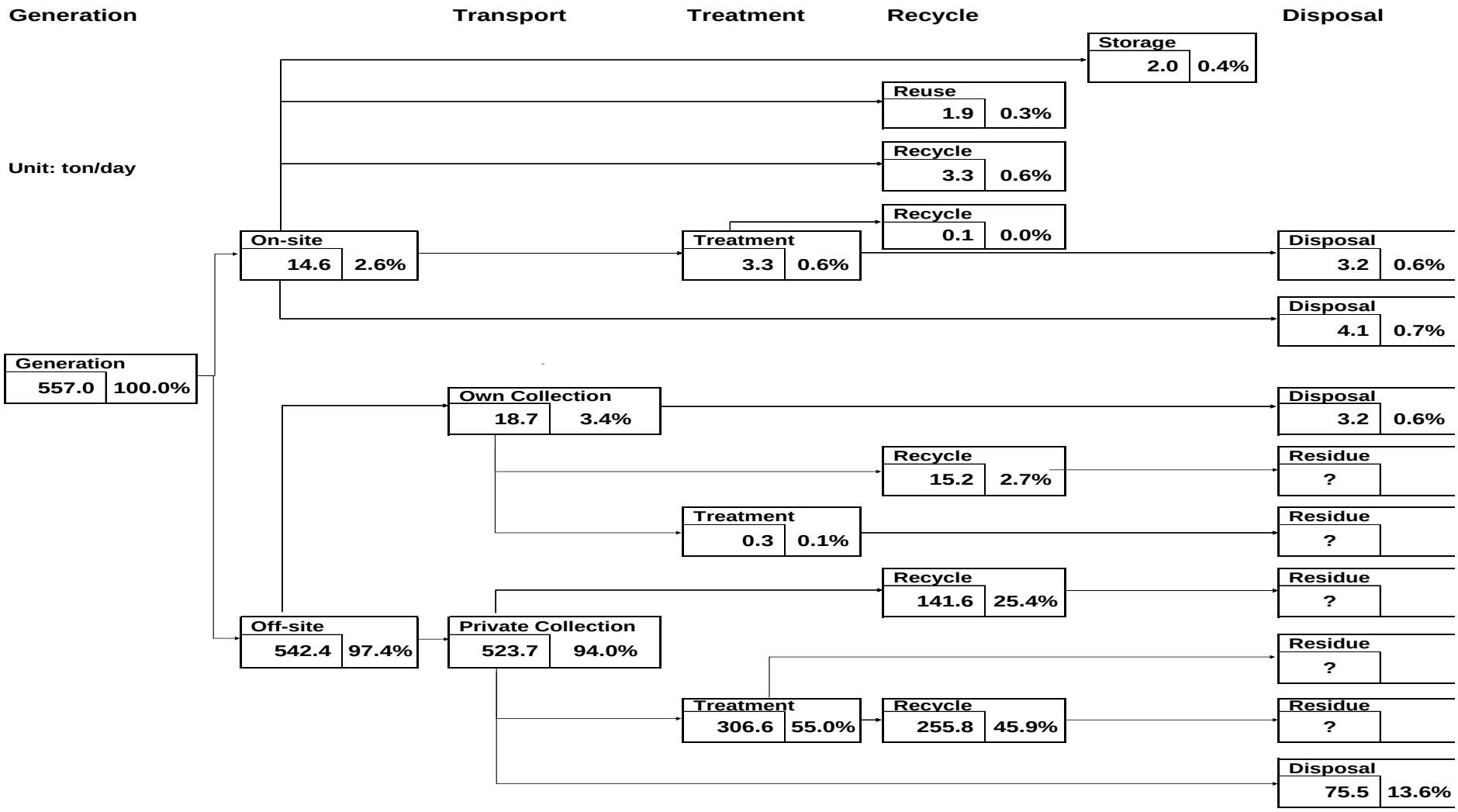


Figure 5: Waste Flow of All Non-Hazardous Wastes in PIM (units are tons per day)