Appendix 7

Results of the sensitivity analysis in the present work

Chapter 4.1.5.2 Construction waste management applicability

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As regards the **average cost estimation method**, in the case of *free tipping*, the waste cost for the gypsum wallboard inner wall waste fraction will be

10% * SEK 48 534 * 85 % = SEK 4125

for the Akka transportation fee only, excluding 15 % miscellaneous. Using expression (3.1)

$$\frac{A}{B + C} \qquad (3.1)$$

Where

A = quantity of the waste fraction in question produced
B = quantity of normal product output
C = sum of the quantities of the different waste fractions considered

adapted to the cost related conditions of Opus 1 gives the proportionality factor as follows:

[(SEK 4125 / (MSEK 32 + SEK 48 534 * 85%)] = 0, 01 %

This gives the estimation of the cost referable to gypsum inner wallboard waste as follows:

0, 01% * MSEK 32 = SEK 3200

to be allocated to the fraction in question. This gives a cost per tonne of the waste fraction of

SEK 3200 / 12 tonnes (Table 3.10) = SEK 267 / tonne

to be allocated to each tonne of the waste fraction.

The current cost per tonne of the gypsum inner wallboard waste fraction was estimated in 4.1.1.2 to SEK 800 to be allocated to each tonne of the waste fraction.

In the case of a *double tipping fee*, the waste cost for the gypsum wallboard inner wall waste fraction will be

10% * (SEK 53 791 * 2 + SEK 48 534 * 85 %) = SEK 14 884

for the double SYSAV tipping fee and the normal Akka transportation fee excluding 15 % miscellanous. Using expression (3.1) adapted to the cost related conditions of Opus 1 gives the proportionality factor as follows:

[(SEK 14 884 / (MSEK 32 + SEK 53 791 * 2 + SEK 48 534 * 85%)] = 0, 04 %

This gives the estimation of the cost referable to gypsum inner wallboard waste as follows:

0, 04% * MSEK 32 = SEK 12 800

to be allocated to the fraction in question. This gives a cost per tonne of the waste fraction of

SEK 12 800 / 12 tonnes (Table 3.10) = SEK 1067 / tonne

to be allocated to each tonne of the waste fraction.

As regards the **Polluter-Pays Principle** application approach, in the case of *free tipping*, the environmental adjustment cost for the gypsum wallboard inner wall waste fraction will be

10 % (50% * SEK 53 791 * 0 - SEK 48 534 * 85 % * 4/5) = SEK 3300

for a zero SYSAV tipping fee minus the Akka transportation fee cost excluding 15 % miscellaneous as an investment cost. Using expression (3.1) adapted to the cost related conditions of Opus 1 gives the proportionality factor as follows:

[(SEK 3300 / (MSEK 32 + SEK 48 534 * 85% * 4/5)] = 0, 01 %

This gives the estimation of the environmental adjustment cost referable to gypsum inner wallboard waste as follows:

SEK 3300 * 0, 01% = SEK 0, 33

to be allocated to the fraction in question. This gives a cost per tonne of the waste fraction of

SEK 0, 33 / 12 tonnes (Table 3.10) = SEK 0, 03 / tonne

to be allocated to each tonne of the waste fraction.

The current cost per tonne of the gypsum inner wallboard waste fraction was estimated in 4.1.3.2 to SEK 0, 15 to be allocated to each tonne of the waste fraction.

In the case of a *double tipping fee*, the environmental adjustment cost for the gypsum wallboard inner wall waste fraction will be

10% * (50% * SEK 53 791 * 2 - SEK 48 534 * 85 % * 4/5) = SEK 2079 (revenue)

for the double SYSAV tipping fee minus the normal Akka transportation fee excluding 15 % miscellaneous as an investment cost. Using expression (3.1) adapted to the cost related conditions of Opus 1 gives the proportionality factor as follows:

[(SEK 2079 / (MSEK 32 + 50% * SEK 53 791 * 2 + SEK 48 534 * 85% * 4/5)] = 0, 006 %

This gives the estimation of the environmental adjustment cost referable to gypsum inner wallboard waste as follows:

SEK 2079 * 0, 006% = SEK 0, 12 (revenue)

to be allocated to the fraction in question. This gives a cost per tonne of the waste fraction of

SEK 0, 12 / 12 tonnes (Table 3.10) = SEK 0, 01 / tonne (revenue)

to be allocated to each tonne of the waste fraction. The findings of the sensitivity analysis are summarised in table 1.

Table 1. Cost to be allocated per tonne of the gypsum wallboard inner wall waste fraction at Opus 1 for different SYSAV tipping fees as a sensitivity analysis (SEK).

Tipping fee	**The average cost estimation method**	**The Polluter-Pays Principle**
Free tipping	267	0, 03
Current fee	800 (+ 200%)	0, 15 (+400%)
Doubled fee	1067 (+ 33%)	0, 01 (revenue)