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REWARD - Regional & Welsh Appraisal of Resources & Development

Specification of the Waste Module

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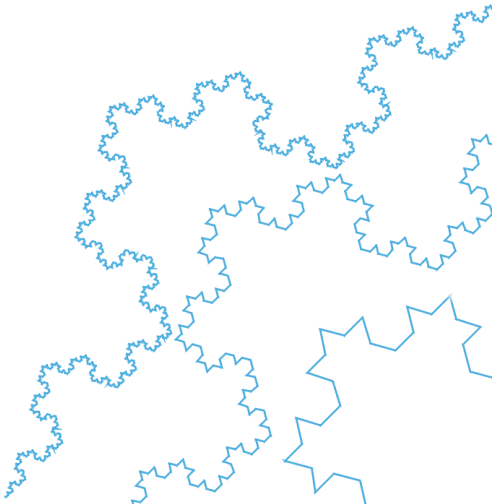

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1 CONTEXT

This document sets out the specification of the Waste Module to be developed for the REWARD[1] project. The specification was agreed between Cambridge Econometrics and the Project Board after a series of consultation meetings and discussions.

A provisional specification for the module was set out in our original proposal[2] and restated in the Inception Report dated 27 June for consideration by the Project Board and others. Comments from the Project Board on the initial specification and associated issues of functionality were discussed in a User Requirements document dated 13 September 2002 and have in turn led to the final specification set out below.

1 Originally known as WRERP - Welsh and Regional Environmental Economic Modelling.
2 Dated 5 April 2002.

2 THE SPECIFICATION OF THE WASTE MODULE

2.1 The Equations

The agreed approach is to model waste arisings by stream and the routes by which it is managed, using the following equations:

$$(W.1)\quad WA_{s,t} = \sum_{i}^{NQ}\sum_{j}^{NY}\{WAQYC_{s,i,j,t} \times QYC_{i,j,t} \times Y_{j,t}\} + \{WAPC_{s,t} \times POP_{t}\}$$

$$(W.2)\quad WD_{d,t} = \sum_{s}^{NS}\{WDWAC_{d,s,t} \times WA_{s,t}\}$$

$$(W.3)\quad WDH_{d,t} = WD_{d,t} + WDM_{d,t} - WDX_{d,t}$$

$$(W.4)\quad WDX_{d,t} = WDXC_{d,t} \times WD_{d,t}$$

where the variables have the following meaning:

NQ	number of products in the product classification
NS	number of streams in the waste streams classification
NY	number of industries in the industry classification
POP(t)	population in year t
QYC(i,j,t)	intermediate consumption of product i in industry j per unit of output of industry j in year t
WA(s,t)	waste arisings within the region for stream s in year t (in physical units)
WAPC(s,t)	waste arisings for stream s from households per capita in year t
WAQYC(s,i,j,t)	waste arisings for stream s per unit of intermediate consumption of product i in industry j in year t
WD(d,t)	waste disposals from the region by disposal route d in year t (in physical units)
WDH(d,t)	waste disposals within the region by disposal route d in year t (in physical units)
WDM(d,t)	waste disposals imported into the region by disposal route d in year t (in physical units)
WDX(d,t)	waste disposals exported from the region by disposal route d in year t (in physical units)
WDXC(d,t)	waste disposals exported from the region per unit of waste disposals from the region by disposal route d in year t (in physical units)
WDWAC(d,s,t)	waste disposals by disposal route d per unit of waste arisings for stream s in year t
Y(j,t)	gross output of industry j in year t (in constant prices)

2.2 The Classifications Adopted

The model will identify 27 waste arisings streams and seven management routes as listed below:

Waste streams

- Industrial - inert
- Industrial - non-inert biodegradable
- Industrial - non-inert non-biodegradable
- Industrial - hazardous
- Commercial - inert
- Commercial - non-inert biodegradable
- Commercial - non-inert non-biodegradable
- Commercial - hazardous
- Municipal - household - inert
- Municipal - household - non-inert biodegradable
- Municipal - household - non-inert non-biodegradable
- Municipal - household - hazardous
- Municipal - other waste - inert
- Municipal - other waste - non-inert biodegradable
- Municipal - other waste - non-inert non-biodegradable
- Municipal - other waste - hazardous
- Construction & demolition - inert
- Construction & demolition - non-inert biodegradable
- Construction & demolition - non-inert non-biodegradable
- Construction & demolition - hazardous
- Agricultural - inert
- Agricultural - non-inert biodegradable
- Agricultural - non-inert non-biodegradable
- Agricultural - hazardous
- Mining
- Sewage sludge
- Power station ash

Waste disposal routes

- landfill (active)
- landfill (inert)
- landfill (hazardous)
- recycling (excl composting)
- composting
- thermal
- other recovery processes

2.3 Data

Data available

It was envisaged that it could well be the case that the equation coefficients would be formed on the basis of a single year's data but that if time series data are available, the coefficients may be estimated econometrically, or assumptions for time trends may be introduced.

In implementing the model it was indeed the case that most of the data were only available for one year, 1999. The exception was for municpal waste, where data were available for total household municpal waste and total municpal waste for 1996/7-2000/1.

The following data were made available:

- waste arisings in 1999 disaggregated by stream
  - in the case of the separate Industrial, Commercial streams this data was further disaggregated by industry (49 industries identified in the model).
- waste produced in the region in 1999 to be managed disaggregated by stream and management route

Data not available

The model as described above in equations W.1-W.4 requires estimates for some data, which were not readily available. They are listed below together with a statement of how the data gap was managed.

- estimates for the waste arisings by stream associated with use of intermediate products (for example, the use of agriculture inputs in food manufacture)
  - the data has been constructed by making assumptions for which intermediate products are likely to produce the waste in each stream.
- imports of waste to the region disaggregated by management route
  - the data are calculated by assumptions for the level of waste imported to each management route as a share of waste produced in the region going into each management route.
- exports of waste from the region disaggregated by management route
  - the data are calculated by assumptions for the level of waste imported to each management route as a share of waste produced in the region going into each management route.