

Modelling waste

Waste emissions from the household and services sectors

Emissions of hazardous, BMW and other non-BMW, non-hazardous waste are included. Disposition of each of these waste types is divided between landfill, recovery (including recycling), incineration and unknown.

We model these sectors together because in some cases the waste they generate is combined at the disposition stage. Waste generation is projected using a simple constant-elasticity demand model for each broad disposition: disposal (landfill/incineration), recovered and unknown. For unknown disposition, only activity drivers such as the number of households or sectoral output are taken into account. The recycling and disposal models include own-price and cross-price effects for households that are subject to volume- or weight-based charges. The shares of households facing these pay-by-use charges are parameterised, and we also allow for the effects of switching households from flat-rate charging to pay-by-use. At present, we do not explicitly model processing of municipal waste subsequent to collection, e.g. through the use of mechanical-biological treatment.

Once we have projected volumes for disposal, these are further disaggregated into landfill and incineration quantities based on the available incineration capacity. Quantities sent to landfill are also assumed to include the fraction of waste that is not combustible. We assume that BMW is incinerated first and non-BMW is incinerated if any capacity remains, while household and services waste are allocated for incineration *pro rata*. Ash generated by incineration is assumed to be placed in landfill as non-BMW waste by the services sector. In a materials balance sense, the ash represents an element of double-counting, since some material is reported both in the incineration and landfilled non-BMW totals.

Annual projections for percentage changes in household numbers, persons per household, real personal disposable income per capita and services sector output are obtained from the ESRI Medium Term Review (MTR). We make assumptions about price elasticities, forecasts of future price changes, the combustible fraction of BMW and non-BMW emitted by the sector, and the ash fraction that results when these materials are incinerated.

Miscellaneous waste

We produce simple waste emissions projections for the transport sector and for waste that lacks a sectoral assignment. Both of these waste streams are held constant over the forecast period at base year values.

Waste emissions from the industrial sectors

Emissions of hazardous and other (non-BMW, non-hazardous) waste are included; no BMW is emitted by these sectors. Disposition of each of these waste types is divided between landfill, recovery (including recycling), incineration and unknown.

Volumes are projected using a simple constant-elasticity demand model. There is a separate model for each disposition - landfill, incineration, recovery and unknown – in which changes in volumes are driven by forecast movements in the relevant sector's turnover and number of employees (and for some dispositions) by landfill and recovery prices.

Annual projections for percentage changes in sectoral employment and output are obtained from the MTR. We also make assumptions about the elasticity of price with respect to landfill charges (including the landfill levy) and forecasts of future price changes.

The basic equation is $Q_{ijt} = Q_{ij(t-1)} * (1 + \epsilon E_{it} + \delta Y_{it} + \alpha P_{jt} + \beta X_{it})$ for each sector i , disposition j and forecast period t , where E , Y , P and X are the percent changes in employment, turnover, price of disposition j and price of alternative disposition.

Waste emissions from the construction sector

Emissions of hazardous waste (in the form of contaminated soil) and other non hazardous, non-BMW are included; no BMW is emitted by this sector. Disposition of each of these waste types is divided between landfill, recovery (including recycling) and unknown.

Waste quantities are projected based on technological parameters relating the waste emissions to the level of construction activity. We divide construction into four sub-sectors (residential, private non-residential, social infrastructure and productive infrastructure), and each of these sub-sectors is in turn divided into new construction and repair/maintenance. Emissions from residential construction depend upon the number of properties built, while the other sub-sectors depend upon the predicted real value of construction activity. Shares for each disposition - landfill, recovery and unknown – are held constant at their base year values for soil and stones and other materials, but these materials are aggregated for reporting from ISus.

Annual projections for percentage changes in new housing construction and output of other sub-sectors are obtained from the MTR. We make assumptions about technical relationships between sub-sectoral activity and waste, as well as base year disposition shares for each sub-sector's waste.

For each disposition j , the quantity emitted $Q_{jt} = \left(Q_{j(t-1)} / \sum_j Q_{j(t-1)} \right) * \sum_i (Y_{it} * C_i)$ for each sub-activity i , technical conversion factor C_i and forecast period t , where Y_{it} is the level of real activity (either in volume or value terms) for the relevant sub-activity.

Organic waste emissions from the agricultural sector

We project organic waste from the agricultural sector, which we classify as other (non-BMW, non-hazardous) waste. We assume that this waste stream is recycled (via landspreading).

Waste volumes are projected from historical values based on the elasticity of waste with respect to agriculture sector output. Annual projections for percentage changes in output are obtained from the MTR, and the demand elasticity is assumed to be 1.

The equation used is $Q_t = Q_{(t-1)} * (1 + \epsilon Y_t)$ for each forecast period t , where Y is the percent change in agricultural output.