General Details	
Dataset Title:	Land Use Statistics (Generalised Land Use Database), 2005
Domain(s):	Physical Environment
Time Period of Dataset(s):	January 2005
Geographic Coverage:	England
Lowest Area Output:	Census Output Area (OA)
Supplier:	Communities & Local Government
Department:	Data & Statistics Infrastructure (DSI) Division
National Statistics Data?	**Experimental Statistics** - this information has been developed in accordance with the principles set out in the National Statistics Code of Practice but has yet to be fully accredited as a National Statistic.
No. of Variables (excluding area names and codes):	13

Scope and Purpose

Please Note: Because of changes in the underlying MasterMap® data source, users should note that 'Generalised Land Use Database 2005 (Enhanced Basemap)' statistics can NOT be compared with 'Generalised Land Use Database 2001' statistics for time series analysis.

The Generalised Land Use Database (GLUD), 2005 (Enhanced Basemap) figures are presented here as Experimental Statistics. They show the area of different land types for Census Output Areas (OAs), Lower Layer Super Output Areas (LSOAs), Middle Layer Super Output Areas (MSOAs), Local Authorities (LAs), and Government Office Regions (GORs) in England as at January 2005. England totals are also provided. The GLUD figures for 2005 provide a more up-to-date and a more accurate picture of land type than the GLUD figures for 2001, owing to improvements in the underlying OS MasterMap® data. However, the GLUD 2005 figures can NOT be compared with the GLUD estimates for 2001 owing to the enhancements to the underlying MasterMap® data. Therefore '(Enhanced Basemap)' has been added to each GLUD 2005 variable so that they can be differentiated from the GLUD 2001 variables, and to make it clear that users should NOT conduct time series analysis of GLUD over the 2001-2005 period.

In brief, a classification has been developed which allocates all identifiable land features on Ordnance Survey MasterMap® into nine simplified land categories and an additional 'unclassified' category. These are:

1. Domestic buildings;
2. Non-domestic buildings;
3. Roads;
4. Paths;
5. Rail;
6. Domestic gardens;
7. Greenspace;
8. Water;
9. Other land uses (largely hardstanding); and
10. Unclassified.

The data are presented in thousands of square metres ($000m^2$), to 2 decimal places. The statistics are therefore accurate to the nearest $10m^2$. Where there is no area of a given land type, a zero is shown in the cell. Where there is some area, but less than $5m^2$, this is shown by a dash (-) in the cell.

Three additional variables are supplied with this dataset: the summed area of all land categories 'Total Area of all Land Types', the size of the administrative area to the extent of the realm 'Area of Admin Geography', and the percentage difference between these two figures. The latter provides a 'Quality of Fit Indicator', and is only available at OA and LSOA levels. Note that due to rounding, the sum of the land categories may not add exactly to the 'area of all land categories' variable.

This simple classification provides the framework for analysis of land for each of the published geographic areas. The statistics provide a basis for comparing (for example) the availability of green space between administrative areas, and also provide input into analyses of housing density, and thus the capacity for building new housing. The GLUD statistics improve the local area evidence base on neighbourhood renewal, and support the creation of sustainable communities. This helps to raise the quality of life for people in urban areas, and other communities, as outlined in Communities & Local Government's strategic priorities and public service agreements (please see the 'Data Quality: Relevance' section for details).

Methodology - Background Information

In summary, these statistics are created via a computerised process, which identifies different land parcels and buildings on an Ordnance Survey digital map product, and records their 'type' and area. Each land parcel is then assigned to a specific Output Area based on its central point, and the information is aggregated to higher geographies.

Assigning land categories to buildings and land parcels

The building blocks for the statistics are objects in the electronic Ordnance Survey MasterMap® product (please see the 'Concepts and Definitions' section for details). These objects are shown as polygons which can represent, for example, a building or land parcel. Each has a known area in square metres recorded as an attribute in OS MasterMap® and is labelled by a unique code called a TOID (TOpographic IDentifier). One of the nine Generalised Land Use Database themes is assigned to each TOID based on the attributes assigned by OS.

The combination of OS MasterMap® attributes, contextual analysis, and information from an OS address product provide the basis for the nine generalised land classes. Each polygon on OS MasterMap® has attributes associated with it, and these provide information about the type of land covered, which can be used as a basis for generating a land use classification. Information about building types are derived by a combination of spatial analysis, using relevant rules, and an OS MasterMap® address product to determine whether the building use is domestic or non-domestic.

The original methodology and software for the GLUD 2001 pilot project were developed for government by Infoterra Ltd. Communities & Local Government has arranged for Amtec Consulting plc to adapt the software to provide GLUD statistics for the whole of England and for 2005. Although this methodology is not as robust as the fuller Land Use Statistics (National Land Use Database 'Baseline') approach (which uses several external data sources and complex rules to discriminate between land uses), it nonetheless provides useful and acceptable statistics at ward and local authority levels. Note that the "Land Use Statistics (Previously Developed Land)" data can also be found on the NeSS website.

Improvements to underlying OS Mastermap in GLUD 2005

1. GLUD 2005 is based on analysis of OS MasterMap® for January 2005, whereas GLUD 2001 uses OS MasterMap® for November 2001. Use of OS MasterMap® for January 2005 for GLUD 2005 provides a number of database enhancements. These include, for example, Positional Accuracy Improvement (PAI) in some rural areas, improvements to the attributes that are used to produce the GLUD classification, and improved coverage of foreshore areas. As a result GLUD 2005 statistics are more accurate than those of GLUD 2001. In particular GLUD 2005 estimates provide improved figures for the extent of Domestic Gardens in rural areas, of Paths, Roads and Greenspace more generally, and of Water in coastal areas. However, the changes to the underlying data do mean that the GLUD 2005 statistics are NOT comparable with those from GLUD 2001.

2. GLUD 2005 draws on OS MasterMap® Address Layer for address information, whereas GLUD 2001 uses OS ADDRESS-POINT® via a link through the National Buildings DataSet (NBDS).

Calculating proportions of land types for administrative areas
The statistics for each area are calculated in terms of square metres for each category of land use within the Generalised Land Use Database. Statistics for each Output Area are calculated first, which are then aggregated to produce the figures for larger geographies.

However, not all OS MasterMap® polygons nest exactly within a single Output Area, and an allocation rule had to be devised for those that straddle boundaries (see 'Geographic Referencing' section for details). In particular some 'rail' or 'water' TOIDs are large and overlap Output Area boundaries to a noticeable extent. Therefore the difference between the known area of each geographic area, and the sum of the assigned land parcels is provided as an extra 'quality of fit' variable. This helps interpretation of the GLUD statistics.

Concepts and Definitions

Ordnance Survey MasterMap® and TOIDs

Ordnance Survey MasterMap® is a large scale digital map for use in geographical information systems (GIS) and database systems. Real world objects are represented as explicit features, by polygons, each identified by a unique number called the TOID (TOpographic IDentifier). Each polygon also has digital attributes such as a theme, which enable querying and searching for specified features. The TOID enables linking to other datasets. The 2005 release of Generalised Land Use Database statistics uses the January 2005 version of OS MasterMap®. In some rural areas it includes enhancements as a result of Ordnance Survey's Positional Accuracy Improvement (PAI) programme, as well as other improvements to the OS MasterMap® database since the first release of November 2001 that is the basis of GLUD 2001 statistics.

Ordnance Survey MasterMap® Address Layer

The OS MasterMap® Address Layer provides precise coordinates for more than 26 million residential and commercial properties in Great Britain – the most accurate and up-to-date link between any property address and its location on the map. The Address Layer originates from the Royal Mail's postcode address file (PAF®). Ordnance Survey uses on-the-ground GPS survey, aerial imagery and various other techniques to establish precise coordinates for each address and match this to the property on the map – effectively joining up postal and topographic geography, creating a fixed link between the property and its address.

The Generalised Land Use Database for England for 2005 uses OS MasterMap® Address Layer for January 2005. Information from the Address Layer is used to help determine whether a building is either a 'Domestic Building' or a 'Non-Domestic Building'.

Positional Accuracy Improvement (PAI)

As part of an ongoing commitment to data quality, Ordnance Survey engaged on a national PAI programme. This programme was developed to enable capture of data at 1:2500 scale to a greater absolute accuracy (absolute accuracy is the position of features in relation to the Ordnance Survey National Grid). The PAI programme has resulted in an improved and more consistent accuracy standard of mapping data for rural areas. Furthermore, it has future proofed the data for the addition of new building development and other change. Work started on PAI in April 2001 on the two elements to the national programme; one covering 210 rural towns, the other covering the remaining rural areas (about 155,000 km^2). The rural towns completed in December 2004 and the programme for all other 1:2500 scale rural areas completed in March 2006. GLUD 2005 uses OS MasterMap® as at January 2005 and therefore includes the positional accuracy improvements made within OS MasterMap® up to that point in time.

The effect of PAI on GLUD 2005 statistics is that some features in OS MasterMap® will have been 'moved' to a more accurate position. This has the effect of improving the accuracy of the GLUD 2005 statistics, but does mitigate against comparing GLUD 2001 statistics with those for GLUD 2005, since in affected areas, GLUD statistics will have changed irrespective of any real-world land type change. For example, a TOID allocated to one particular Output Area for GLUD 2001 might, after being 'moved' by PAI, be allocated to an adjacent different Output Area, so generating a change in the GLUD statistics, due solely to the improvement in the positioning.

For more on these Concepts and Definitions go to www.ordnancesurvey.gov.uk

Data Classifications

Standard Classifications used (if any):	Not Applicable.
Further Details about Classifications:	The Generalised Land Use Database for England classifies land into nine generalised land classes for the purposes of this dataset as listed under Scope and Purpose. These themes are more generalised than the

	fuller National Land Use Database baseline (NLUD) classification. Detailed MasterMap data attributes were used to identify the GLUD land use category of each land parcel (MasterMap 'TOID'). Relevant categories include (for example) 'Greenspace', 'Road' or 'Water'. All building TOIDs were classified as 'Domestic Buildings', unless any one or more of the following conditions were met: a) it was seen to be adjacent to an area of hard-standing (such as a tarred car park or estate road) which was more than 300 square metres; b) it contained an address point with a business or organisation name; or c) it had an area greater than 1,000 square metres and did not contain any address point. Building TOIDs fulfilling any one or more of these criteria were recorded and classed as 'Non-Domestic Buildings'. The category 'Other' is largely areas of hard-standing such as car parks, estate roads and hard tennis courts.

Edit and Imputation Procedures

Not Applicable.

Validation and Quality Assurance

The methodology for the initial processing of GLUD 2001 for London and the South East built upon Infoterra Ltd's previous experience in this type of work. This method was reviewed as it was developed, piloted for a number of areas where comparative information was available, and results were further validated using a range of procedures.

A similar process was applied to the validation of the results of GLUD 2005 for all of England. A pilot stage included review of GLUD data at OS MasterMap® TOID (land parcel) level for a sample of areas across England. This involved inspection of the land parcel level maps and validating that the methodology was assigning the correct land uses. A baseline for comparison was achieved by viewing areas known to the operator, and interpretation of the topographic elements of the map.

The tests also showed that land type attribution in GLUD 2005 statistics and maps is more accurate than that was achieved with GLUD 2001. Improvements in the OS MasterMap® database of January 2005 mean that GLUD 2005 estimates provide improved figures for the extent of Domestic Gardens in rural areas, of Paths, Roads and Greenspace more generally, and of Water in coastal areas. The extent of the improvements was assessed and it was concluded that the nature of the changes to the underlying data mean that the GLUD 2005 statistics are NOT comparable with those from GLUD 2001. An Explanatory Paper is available from the Communities & Local Government website at www.communities.gov.uk/statistics/gluc and see Background Information above.

The tests also revealed that one part of the rules used to differentiate Non-Domestic Buildings (c) was not operating exactly as expected. The impact of this on figures for Domestic Buildings and Non-Domestic buildings is only really noticeable in a small number of local areas and is otherwise nil or negligible.

The 'quality of fit' of OS MasterMap® TOID land parcels to OAs and lower SOAs was reviewed. In most cases there is a good fit of TOIDs to the reporting geography. For example, for about 75% of lower super output areas the fit of TOIDs is within + or - 5% of the lower Super Output Area's size. Since output areas are smaller in size the effect of overlapping TOIDs is a little larger. For about 52% (around 86,000) of output areas the fit is within + or - 5% of the output area's size.

There were also checks to ensure that the published statistics at aggregated levels were correctly summed from component land parcel figures. Checks also confirmed that figures were presented for all of the required areas at each geographic level, and that data at each geographic level were consistent with the data for the other levels. The tests confirmed that the methodology was assigning appropriate values to land parcels, and extracting summary statistics correctly.

Detailed maps of GLUD at OS MasterMap® TOID level are available from the Data & Statistics Infrastructure Division at Communities & Local Government. Viewing the GLUD statistics in conjunction with these maps is a further method by which users can better understand the data. GLUD maps are available to those holding an appropriate licence for OS MasterMap®.

As a result of the outcome of the tests applied, it was concluded that the GLUD 2005 statistics for OAs, LSOAs, MSOAs, and local authorities are, within the context of their purpose, and limits of their methodology, suitable for continued publication as Experimental Statistics.

Geographic Referencing

Data are provided for Census Output Areas (OAs), Lower Layer Super Output Areas (LSOAs), Middle Layer Super Output Areas (MSOAs), Local Authorities (LAs), and Government Office Regions (GORs). The data are referenced to ONS Standard Names and Codes (SNAC).

The location of each land parcel about which information is sought is already recorded precisely on the OS MasterMap® digital map, and the techniques employed are designed to assign each land parcel to the classification scheme, and to assign each land parcel to the appropriate Output Area. The statistics for each Output Area are calculated by assigning each TOID to an Output Area on the basis of the location of its centroid in that Output Area. However, not all OS MasterMap® land parcels nest exactly within a single Output Area, and an allocation rule had to be devised for those that straddle boundaries. The operational rule was to assign a TOID (and attributes) to an Output Area if the centroid (centre point) of its OS MasterMap® polygon fell within the boundary of that OA. In many cases large polygons such as those representing lengths of railway, expanses of water, or agricultural fields, overlap boundaries, and for this reason the sum area of all land uses in an Output Area, or Super Output Area, may not equate exactly to the known area of the respective administrative area. Therefore, at OA and SOA levels, the difference between the known area of each geographic area, and the sum of the assigned land parcels is provided as an extra 'quality of fit' variable.

Data Quality

Accuracy	The Generalised Land Use Database is designed as a streamlined and summary snapshot of land type covering all of England. The original contractor's assessment of the accuracy of the methodology at ward level suggested it provided fairly good matching with a fuller National Land Use Database (NLUD) classification of land use, for a sample area. However, validation showed that there are cases where at the detailed local level the classification of TOIDs does not always exactly match known uses. For example, in some situations Domestic Building TOIDs might be classed as Non-Domestic Buildings, and vice versa as a result of the rules for classification, the nature of the underlying source data, and the streamlined approach of this generalised methodology. The review process revealed that GLUD 2005 statistics are more accurate than those GLUD 2001, owing to improvements to the source dataset, OS MasterMap®. GLUD 2005 statistics include, for example, Positional Accuracy Improvement (PAI) in some rural areas, a better fit of TOIDs to Output Areas, some improved coverage of foreshore areas, improved identification of 'Domestic Gardens' in rural areas, better differentiation of 'Paths', and other improvements and changes affecting the Roads', 'Other' and 'Greenspace' classes. Reviews revealed that one part of the rules used to differentiate Non-Domestic Buildings (c) was not operating exactly as expected. The impact of this on figures for Domestic Buildings and Non-Domestic buildings is only really noticeable in a small number of local areas and is otherwise nil or negligible. GLUD 2005 also includes improvements to the software code instigated by Communities & Local Government to reduce the extent of areas assigned to as 'Unclassified', although inevitably some areas do remain 'Unclassified'. This only affects some areas and where it does the overall the area of such land parcels in the given administrative area is typically very small. The result of these improvements in GLUD 2005 is that the data is more accurate than GLUD 2001. One corollary of this is though that it is NOT possible to compare GLUD 2005 statistics with those of GLUD 2001 to conduct summary 2001-2005 time series analysis. The level of accuracy achieved is appropriate for the experimental purposes of the data.

Relevance	The data are especially relevant as an input to the assessment of neighbourhood physical environments, green space, liveability, urban residential density and sustainable communities. Specifically, these data will help the monitoring of Communities & Local Government's Public Service Agreement (PSA) 8, to: "*Lead the delivery of cleaner, safer and greener public spaces and improvement of the quality of the built environment in deprived areas and across the country, with measurable improvement by 2008.*" For example, a map based on these statistics, showing proportions of greenspace space at LSOA level can be seen at Appendix A of this document. The data presented here represents additional value as it allows the identification of small area data on the physical environment to support neighbourhood renewal and raising the quality of life for all in urban areas and other communities. The statistics exploit the potential created by the release of OS MasterMap® to calculate land use statistics for areas of interest.
Timeliness	These statistics show the position as at January 2005. They offer a more up-to-date snapshot than GLUD 2001.
Comparability	The statistics could have a wide range of uses, providing a basis for comparisons of land use composition between small areas, local authorities, regions, and England. Comparisons with other data sources are possible, and the figures may be used as a basis for additional more detailed land use information according to purpose. However, time series comparisons of GLUD 2005 statistics with GLUD 2001 statistics are NOT possible owing to changes in methodology brought about by improvements to the OS MasterMap® data underlying GLUD 2005.
Completeness	Data are presented for all Output Areas, Lower Super Output Areas, Middle Super Output Areas, Local Authorities, Government Offices for the Regions, and for all of England. GLUD 2005 data at the level of Census Area Statistics wards (2003 definition) is available separately via the Communities & Local Government website: www.communities.gov.uk/statistics/gluc
Coherence	The data are designed to provide a generalised and intuitive land type schema - the 'Generalised Land Use Database'.

Disclosure Control

The National Statistics Code of Practice requires that reasonable steps should be taken to ensure that all published or disseminated statistics produced by the Office for National Statistics (ONS) protect confidentiality.

Every effort has been made by the Communities & Local Government to ensure the data do not allow the disclosure of confidential information. In addition, ONS carries out a number of checks to safeguard confidentiality. In accordance with standard procedures, this dataset has been reviewed and approved for release.

Sources for Further Information or Advice

For further advice on GLUD please contact Communities & Local Government.

There is also an Explanatory Paper on GLUD available for download from www.communities.gov.uk/statistics/gluc

Email:
GIS@communities.gsi.gov.uk or contactus@communities.gsi.gov.uk indicating that your enquiry is about 'Generalised Land Use Database'

Appendix A: Map Showing Percentage of Land that is Green Space in the Manchester Area, 2005