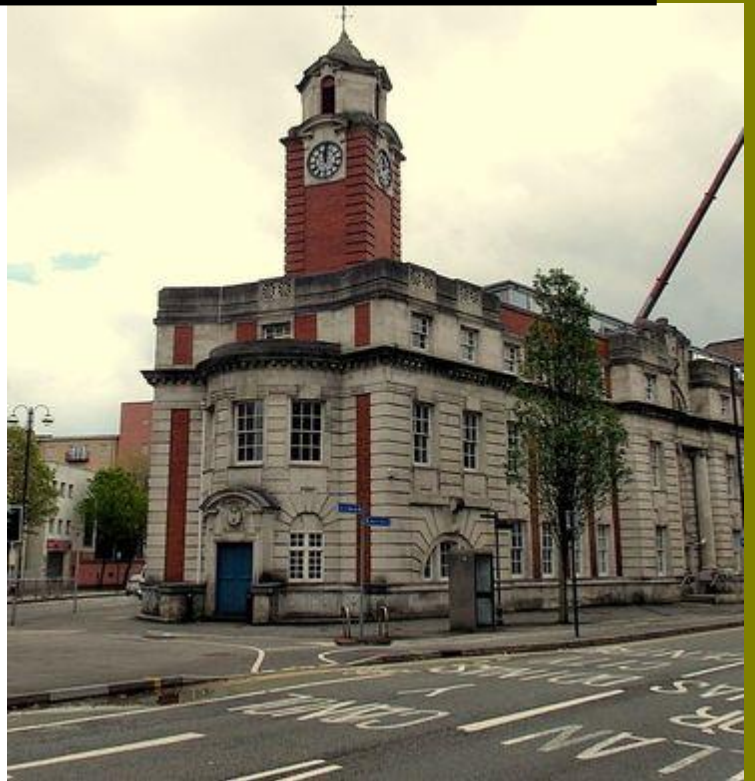


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Evaluating the use of GIS software as a modelling tool for environmental analysis



(Jaggery, 2014)

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Computer software can be used to analyse a range of data by modelling events and informing decision makers. In an environmental context, the merits of this include the ability to handle large quantities of data, analyse data over a large geographical area, and presenting the data in a visually aesthetic way. The availability of large amounts of baseline data for free is also a relative merit, as it allows data to be compared across a variety of disciplines. For example, topographical data can be combined with road and transport infrastructure and protected habitats to provide a map of where these might intersect and cause conflict. Data can be obtained from a variety of sources, including UK Data Services (2012-2019) and Strategi (Ordnance Survey, 2016). Further statistical analysis could have been performed using a software package such as IBM's SPSS programme (2019).

The application of statistical modelling to environmental data is known as "environmental statistics", where random variables are used to model as-yet little-understood components of environmental processes; the components which are understood are also utilised, as it is possible to predict how they will behave (British Geological Survey, 2019). Environmental statistics are widely used within the scientific community and by governing bodies such as DEFRA in the UK, allowing areas which are diverse geographically to be compared for different variables.

GIS and data modelling software can be used to build models which can help with solving environmental management problems. By looking at historical data, connections and correlations can be drawn and a theory of causation established. This can then be used to predict the future, and anticipate certain outcomes of a planned development, the population of a particular species, or waste arisings, to suggest a few.

This study centred around evaluating the effect of incentives on student recycling behaviour in Llys Glas, a University-owned Halls of Residence in Swansea, South Wales. The property is managed by the University of Wales, Trinity St. David, and has 80 rooms available for rent by students of the University. During the course of the study, 78 rooms were occupied. Over three months, the contents of the bins housed in ten communal kitchen areas was monitored for incorrect items, known as "contaminants". Each bin was awarded a "score for it's contents: 1 for entirely correct contents, -1 if even one incorrect item was present, and 0 if the bin was empty. This allowed the contamination rate of bins to be measured over time, by kitchen, the type of bin (e.g. glass, refuse etc.) and also the type of contaminant (e.g. plastic, food waste etc.). The bin contents was monitored both before and after the introduction of an incentive (awarding the "best" recyclers with cinema tickets) and improving the service provision (updating the signage to reflect current collection practices and introducing food waste bins). It was not possible to produce a GIS model of the collected data due to GIS software's reliance on postcode or x y coordinates for mapping: all data collected was pertinent to the same postcode (SA1 5AJ). Similarly, the building is four stories, with the kitchens (and therefore bins) spread across three floors. If mapped in this way, data points across separate floors would appear to be on top of each other and therefore indistinguishable. No floor layout plan was provided by the Universities Accommodation Department upon request, so an accurate map of the buildings internal layout could not be devised (Thomas, 2019). A floor plan could potentially be obtained from the obligatory fire escape plans available on every floor, but the author did not have access to these at the time of writing.

For this study, it may have been more informative to use a GIS software specifically designed to be used in an estates management context, and therefore accurate to 10cm rather than 10m, and for creating maps at an individual building scale rather than a town, county or country scale. In this way, it may have been possible to provide a 3D illustration of the contamination rate of different bin types and kitchen areas over space and time, identifying key areas for action and showing contamination rates before and after the intervention. Comparing the suitability of different estates management

software was beyond the scope and resources of this study. Traditionally, this may have been achieved by other methods such as producing a hand-drawn map and indicating the bins on it, with the limitation that, once completed, it could not be updated once new data was collected. This study shows that, whilst GIS is a valuable and innovative tool, not every GIS software package is suitable for every kind of environmental analysis. The geographical scale of the data is a crucial factor to consider when deciding which GIS software to use, as is the three-dimensional aspect (i.e. is the data spread across multiple floors of the same building?).

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