Using geographical information systems to study the impact of a rail development in inner London

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Introduction

Geographical information systems (GIS) represent a powerful and versatile tool for learning and teaching in geography. They enable students to examine the patterns and processes that shape the landscapes around us, explore relationships between geographical variables and assist in the task of managing our environment. Furthermore they provide a practical, engaging and stimulating field of activity, which invariably motivates geography students possessing a wide range of prior knowledge and experience.

This Becta ICT Advice case study outlines the way in which GIS methods were used by students studying in Kingston College, a centre for further, higher and adult education college in south-west London. It discusses the way in which a GIS was used to integrate the processes of data collection, manipulation, analysis and presentation in order to examine the impact of a major railway development. In so doing it illustrates how this valuable technology may be applied to examine an important issue in urban planning.

The study examined the proposed Thameslink 2000 rail development in the London Borough of Southwark. The particular focus of the study was on the potential impact of the rail development in the vicinity of Borough Market in Southwark. A central element in the project was a collaboration between the students from Kingston College and an environmental organisation opposed to the rail development, the Save Borough Market Campaign. The students worked in co-operation with this body and thus developed a wide range of project management and communication skills in addition to extending their geographical understanding and technical skills.

The Borough Market rail development

Borough Market

Borough Market is a long-standing fruit and vegetable market in the Bankside district of London SE1. The present market now operates as a wholesale market during the early hours of the morning, mainly supplying London hotel chains with fresh produce, and as a retail food market on a Fridays and Saturdays. The market is surrounded by late Georgian and Victorian terraced houses, converted industrial buildings and the medieval Southwark Cathedral.

Numerous railway lines slice through the vicinity of the market, built in the mid to late 19th century to connect the south east of London with the centre of the capital. They include the lines between London Bridge and Charing Cross and links from both stations across the Thames to Cannon Street station. Their construction lead to enormous disruption and upheaval in the area with some 40,000 people being displaced from their homes during a 25 year period of Victorian railway development in the area.

Network Rail proposals

After all the upheaval of the last century a new project threatens to cause further demolition at the start of the 21st century. The **Thameslink 2000** scheme is a proposed extension and enhancement of the Thameslink service, which links destinations to the north and south of London by a direct link across the capital. The initiative will involve a number of railway-related construction projects along the course of the line including the widening of a stretch of track immediately to the west of London Bridge Station in the vicinity of Borough Market. The Borough

Market rail widening project would remove a major bottleneck in the London rail network. This stretch of line is presently shared by Thameslink and Charing Cross trains and services on the line are frequently subject to delays brought about by the sheer volume of traffic on the line.

The rail development will cause immense disruption to the area around Borough Market. The works fall within a conservation area that is also an archaeological priority area. Some 18 properties, all Victorian or older, will need to be demolished or partly demolished and some under rail arch space will be lost. The plans, put forward (originally by Railtrack, now Network Rail), were firmly resisted by several community groups and local MPs and consequently the planning proposal was the subject to a public enquiry. A decision has now been made to proceed with the rail development, subject to a number of minor amendments.

Opposition to the proposals

Opposition has been co-ordinated by a group known as CARA (Cathedral Area Resident's Association). This body has established the **Save Borough Market Campaign**. They argue that the development would needlessly destroy the character and fabric of one of London's most important conservation areas and cause havoc for the market itself during the 6-year construction period. They also stress that an alternative route through Camberwell has not been given sufficient consideration.

Using GIS to examine the Borough Market rail development

The student project

The project described here was developed at Kingston College, principally for students studying on a BTEC National Certificate course in GIS. The College has a long-standing involvement in the delivery of education and training in the field of GIS and staff at the college have played an active role in promoting GIS within the school geography curriculum. Students study GIS on a wide range of courses ranging from an introductory course, which provides a supplementary qualification for A-level students to BSc programmes delivered in conjunction with Kingston University. A number of these different groups were involved in the Borough Market investigation although the field activities were undertaken by the BTEC National Certificate students.

At the outset of the project, the Save Borough Market Campaign was invited to draw up specifications for the kind of investigation that they would find helpful. Their input was invaluable in shaping the data collection and analysis stages.

The students were then required to investigate the impact of the Thameslink 2000 rail development in the vicinity of Borough Market by using GIS techniques. They were divided into three groups, each examining a different aspect of the development. The following themes were investigated:

1. **The route of the proposed rail development**
2. **The social impact of the development**
3. **The environmental impact of the development**

The students were required to conceive, plan, implement and present a strategy to most effectively communicate the impact of the proposed development for the aspect of the development they were investigating. Their finished product was specified as a small set of linked web pages containing the results of their analysis. The three sets of web pages were then linked to form a small web site and made accessible to the Save Borough Market Campaign. The project was undertaken over a period of three months and involved meetings with the Campaign group at the beginning and end to agree on the plans and present the final output.

Data and software

The students investigating the impact of the rail development used a variety of primary and secondary data sources. Existing digital data sets included:

- Ordnance Survey large-scale landline data to represent building outlines, existing rail routes and roads.
- High-resolution aerial photography supplied by the GeoInformation Group.
- An extract from the UK Postal Address File for locating respondents to the questionnaire surveys.
- Data from the UK census.

Additional data was collected by the students during two field visits the Borough Market area. These activities are described below.

The software used by the students was ArcView 3.3 running on Windows PCs. ArcView is a widely-used desktop GIS and provides a versatile and powerful environment to manipulate, interrogate, interpret and visualise geographical information in a wide range of formats. The exercise provided an opportunity for the students to develop their practical skills in GIS in a wide variety of ways.

Practical activities

The early stages of the project involved students becoming familiar with the background to the Thameslink 2000 scheme in the Borough Market area and acquiring a range of GIS skills that they were able to deploy in executing their investigations.

Fieldwork formed an important element in the project during this phase with students visiting the Borough Market area on two occasions. The first involved an initial examination of the site and inspection of key features associated with the planned rail development. A second, more extensive, visit involved a presentation of draft proposals to a representative from the Save Borough Market Campaign followed by group-based activities to collect primary data around Borough Market. Each group pursued different data collection activities relating to the specific theme they were investigating:

- Rail route study: collection of height measurements of the buildings in the Borough Market area and existing rail lines; capture of digital photographs of the area.
- Social survey group: a questionnaire survey of visitors, residents and market traders to collect data on the awareness and attitudes to the proposed rail development.
- Environmental impact group: collection of noise measurements using a decibel recorder at points around the existing rail lines.

The students used a number of functions in ArcView to manipulate and analyse their data. These include the facilities available in the 3d Analyst Extension to model the urban environment in the area and the impact of noise generated by the railway.

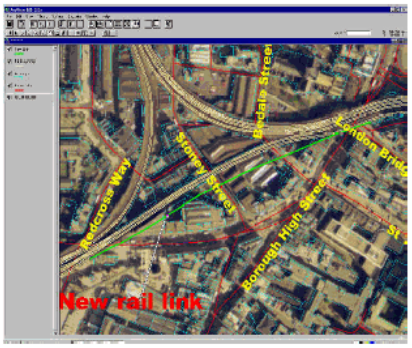
The students presented the results of the Borough Market study in the form of maps, tables and graphs. These were then incorporated with short explanatory texts and saved as a series of linked web pages. This stage involved the students being taught the rudiments of web page design and authoring. The web pages were then assembled into a single student web site. During this phase of the project the web site was made available to a representative from the Save Borough Market Campaign who provided constructive feedback on the products. The web material was hosted in the College's virtual learning environment (Blackboard).

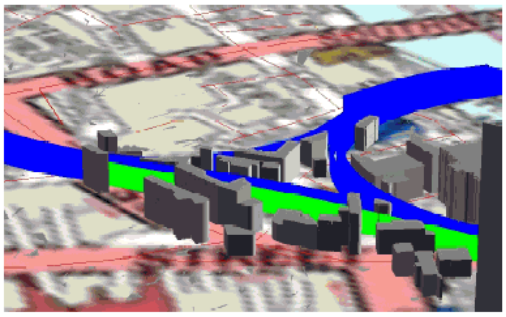
Promoting geographical understanding

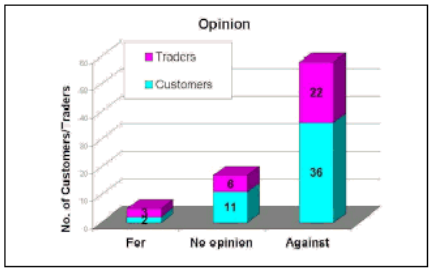
The project demonstrated the versatility and effectiveness of GIS as a tool for exploring the issues, question and problems associated with the study of Geography. Through their involvement in the study of the Borough Market campaign, in particular through engagement in a range of practical computer-based tasks, the students gained a genuine and deep insight into a "live" geographical issue.

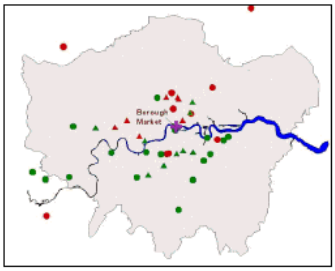
The issues, questions and problems raised by the expansion of the rail network in inner London reflect many of the broader matters involved in urban change. Issues of land planning, social impact, environmental consequences and community engagement are, of course, all important themes in contemporary society. Thus the project provided students with a perspective on some of the central questions in human geography at the beginning of the 21st century.

Feedback from the students on their experience of using GIS to study a practical topic, their involvement with a community organisation and the exposure to a wide range of new techniques was very positive. Through participation in a burning contemporary issue the students were able to see the relevance and importance of geography!









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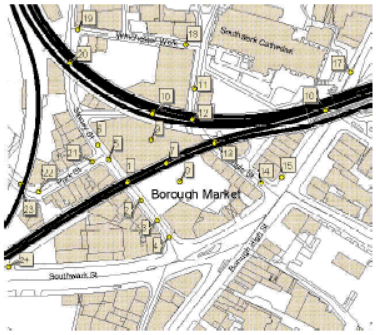
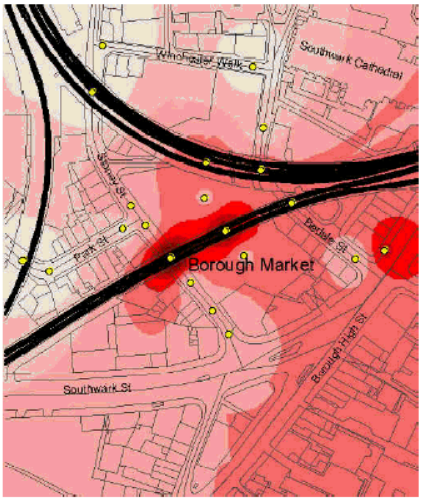
Point	4	65	70	5
Point	3	68	70	2
Point	2	65	70	5
Point	5	65	71	6
Point	6	70	72	2
Point	1	65	90	25
Point	7	68	84	16
Point	8	65	72	7
Point	9	60	72	14
Point	10	60	74	14
Point	11	60	67	7
Point	12	64	74	10
Point	13	64	74	10
Point	14	64	70	6
Point	15	73	73	0
Point	16	80	84	4
Point	17	75	75	0
Point	18	58	64	6
Point	19	60	64	4
Point	20	58	64	6
Point	21	61	66	5
Point	22	61	64	3
Point	23	64	64	0
Point	0	0	0	0
Point	24	70	70	0





Data generated by the GIS-based investigation of the Thameslink 2000 rail development in Borough Market.