Identifying the Accessibility Problems of Disadvantaged Groups & Generating Solutions

Application to the Barnsley Dearne Area of South Yorkshire

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1. Introduction

This report forms part of the output of Project B of the DISTILLATE consortium research, funded by EPSRC under the 'SUE' (Sustainable Urban Environments) research programme. Project B is concerned with developing a range of tools to assist in the process of transport/land use option generation, at both strategic and scheme levels, that either draw on existing knowledge (leading to 'inside-the-box' solutions) or use methods that encourage more innovative thinking (resulting in 'outside-the-box' solutions)[1].

The spreadsheet tool described in this report covers strategic level option generation, in the context of developing a sub-regional Accessibility Planning strategy. It recognises that the starting point of such an exercise is to obtain a detailed and comprehensive understanding of the kinds of practical problems experienced by various population groups living in different communities, so that appropriately targeted solutions can be developed. The tool then helps practitioners to develop solutions aimed at particular kinds of problem, by using a combination of 'inside-the-box' and 'outside-the-box' option generation methods.

The tool has been developed in conjunction with officers in South Yorkshire PTE and Barnsley Council, with funding to cover local meeting and survey costs from Yorkshire Forward and One Barnsley. The information contained in the tool, covering problem identification and potential inside-the-box option generation solutions has been derived from work with local residents in the Barnsley Dearne area (covering three ex-coalmining communities) and with the agencies that provide services for these communities, through a series of focus groups[2] and professional workshop sessions[3].

Components of the tool were tested during a workshop with representatives of the delivery agencies for the Dearne (including education, health, housing, regeneration, policing and public transport) held in Barnsley in December 2007. This workshop also included a local councillor and two representatives of the local residents (a single mother and a retired lady)

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[1] Jones, P. and Lucas, K. (2005) 'DISTILLATE, Project B: Option Generation - Literature Review'. December. DISTILLATE Working Paper, TSG, Westminster, December.

[2] Snell, C, and Jones, P. (2007) 'Accessibility problems in the Dearne: Experiences of some local residents and their suggestions for solutions. A case study for developing Accessibility Planning tools for problem identification and option generation. DISTILLATE Working Paper, CTS, UCL, December.

[3] Jones, P. and Thoreau, R. (2008) 'Engaging with professional stakeholders in the Dearne Valley Area of South Yorkshire. Strategic problem identification and option generation: the case of Accessibility Planning.' DISTILLATE Working Paper, CTS, UCL, March.

2. Overview of the Tool

The Accessibility Planning problem identification/option generation tool has four main components, as illustrated in Figure 1.
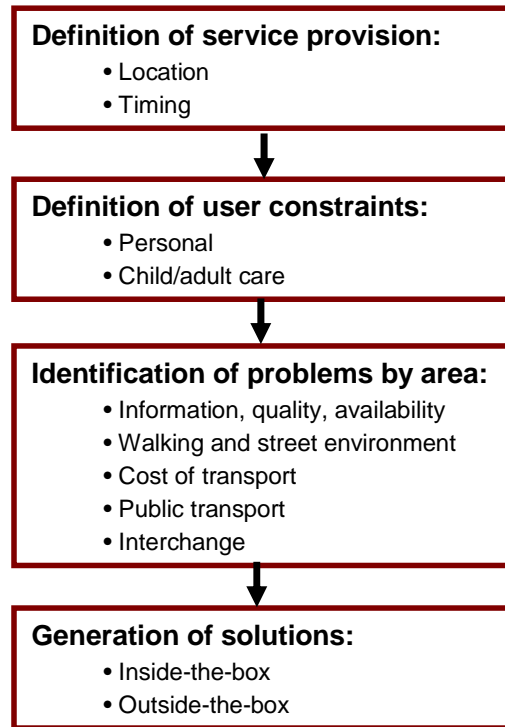
Definition of service provision:
- Location
- Timing

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Definition of user constraints:
- Personal
- Child/adult care

↓

Identification of problems by area:
- Information, quality, availability
- Walking and street environment
- Cost of transport
- Public transport
- Interchange

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Generation of solutions:
- Inside-the-box
- Outside-the-box

Figure 1: The main components of the spreadsheet tool

The first component summarises details of the timing and location of provision of the particular service of interest. The second component considers the client groups for that service, and identifies the timing constraints that limit when they can take part in particular activities associated with that service, without having to make major changes to their daily schedules. The third component turns to the particular areas where prospective clients live, and looks at the kinds of accessibility problems that people might face, under five headings; those categories which will apply partly depend on where services are located in relation to clients' homes. Finally, the fourth component considers potential solutions to the problems that have been identified, both at general and very specific levels, using a mixture of inside-the-box and outside-the-box option generation techniques.

Each section of the tool is described and illustrated in turn, in the remainder of this report.

3.   Service Provision

Figure 2 shows the main screen for the Service Provision spreadsheet. The user needs to provide details of the type of service that is being described (in this case, Hospital Outpatient services), where these services are provided in relation to people's homes, and the times of day that the services are provided on weekdays, Saturdays and Sundays.

Figure 2: The Service Provision sheet

The blue text box next to the "What" section allows a text description of the service to be entered. The radio buttons in the "Where" section lets the spreadsheet user indicate where and how the service is provided. In the example shown in Figure 2, the service is provided in the wider area and is delivered by the service user travelling to the service site by public transport, usually requiring an interchange (e.g. if the hospital is sited on a Greenfield site). The "When" section is where the spreadsheet user enters the hours of operation of the service, on Mondays to Fridays, Saturdays and Sundays. Clicking the "Add Service Details" button brings up the dialogue box shown in Figure 3.

Figure 3: The "Add Service Details" dialogue box

3

The start and end times of the service that have been specified are then shown on the service time display, in blue. Discontinuous services (e.g. to represent morning and evening surgery hours) can be entered by using the "Add Service Details" dialogue box more than once. The "Reset" button removes all service timing details for that day of the week.

Clicking the button marked "View Location Map" takes the user to the type of map shown in Figure 4. This part of the spreadsheet allows the user to view the spatial distribution of the particular service that they are describing – in this case, hospital locations in the sub-region surrounding the Dearne Valley. The "Previous sheet" button returns the user to the initial "Service Provision" sheet (as shown in Figure 2).
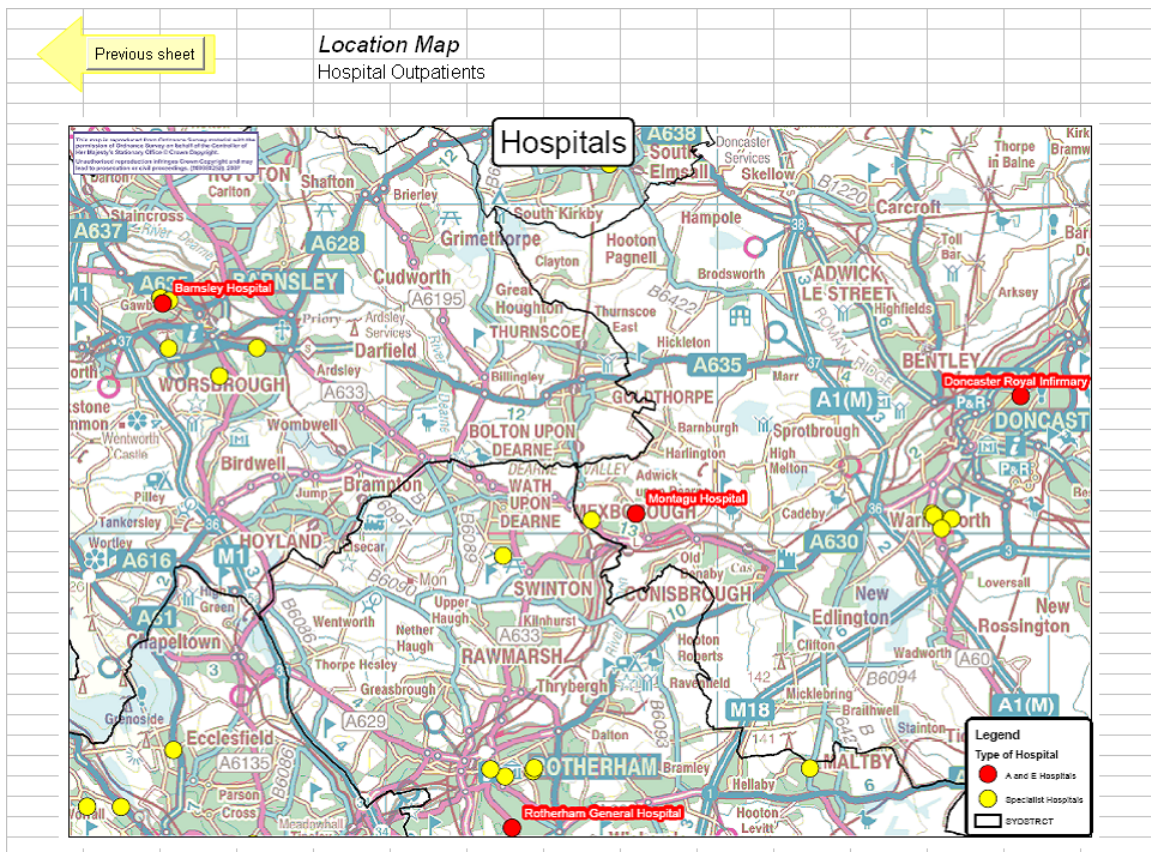
Figure 4: The "Location Map" sheet
showing the distribution of service provision

4. User Constraints

The second spreadsheet sets out information about the various temporal constraints typically faced by different service client groups, and relates this to information about service hours entered in the first sheet (Figure 2), to identify times of day when users could access the service without major inconvenience – taking into account public transport timings.

Figure 5 shows the layout of the main "User Constraints" sheet. The "Service" label and the weekday distribution of "Service hours" are automatically carried forward from the previous sheet.
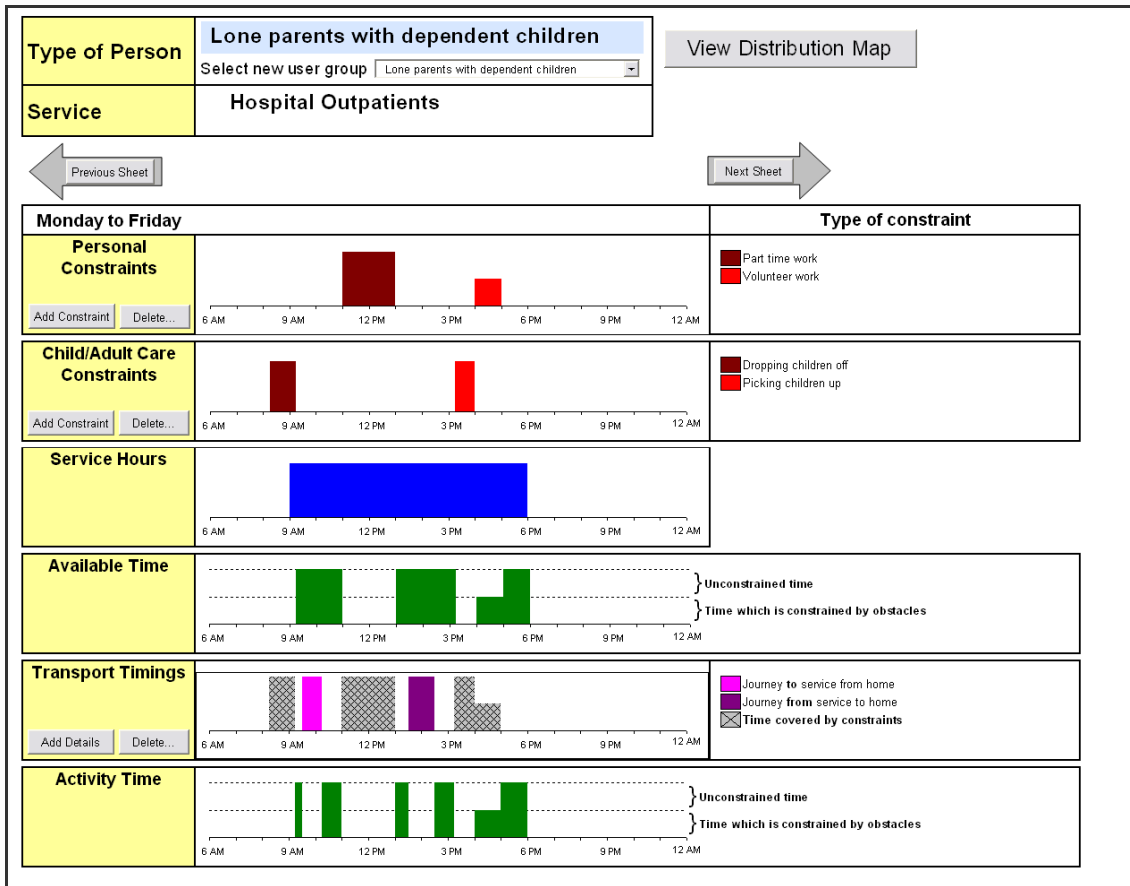
Figure 5: The "User Constraints" sheet

The blue box in the "Type of Person" section allows a text description of the specific client user group to be entered. Up to six client user groups, with their associated constraints, can currently be defined. Clicking on the down arrow below the blue box allows the user to select a different service client group, as shown in Figure 6.
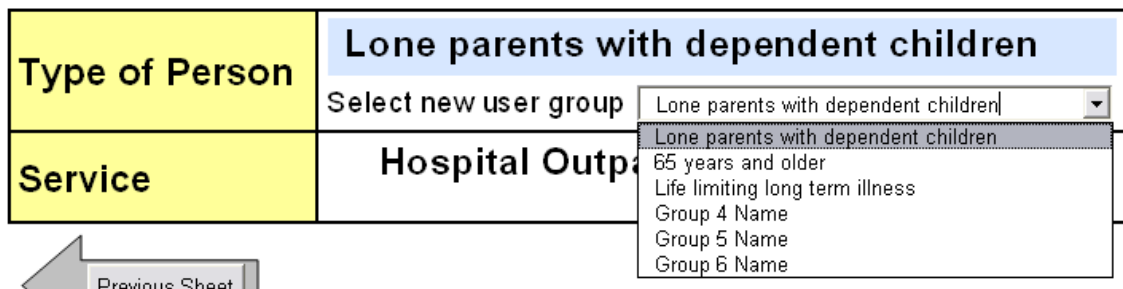
Figure 6: The drop down box for different service client user groups

Clicking the "View Distribution Map" button takes the user to a distribution map that relates in some way to the currently selected service client user group. For example, Figure 7 shows the map that is displayed when the "View Distribution Map" button is clicked when the client group "Lone parents with dependent children" is selected.
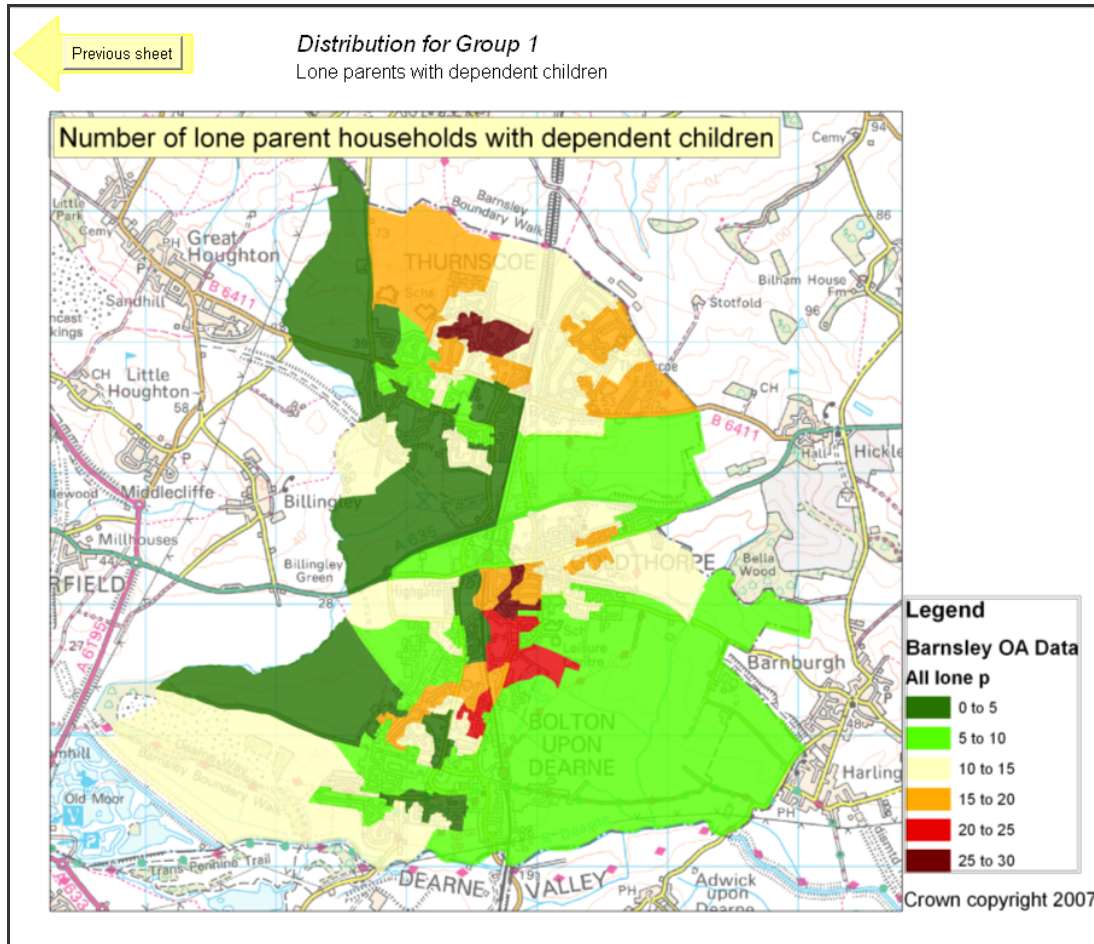
Figure 7: Map showing the distribution of the relevant client group

Adding Constraints

Two types of timing constraints can be added for a particular client user group, one relating to the "Personal Constraints" section and the other to the "Child/Adult Care Constraints" section.

Figure 8 shows the "Add Constraint Details" dialogue box. This box allows the spreadsheet user to add one constraint at a time to either the "Personal Constraints" or the "Child/Adult Care Constraints" sections. Each constraint must be given a start and an end time. It is also necessary to indicate whether the constraint is a complete **barrier**, something that would prevent the service client

group from accessing the service altogether, or a partial **obstacle**, something that makes it difficult (but not impossible) for the service client user to make use of the service. There are eight user definable constraint types for both types of timing constraint, which are distinguished by colour. Discontinuous constraints that only apply at specific times of day can be added by using the "Add Constraint Details" dialogue box more than once. Particular entries can be cancelled by clicking on the appropriate button.
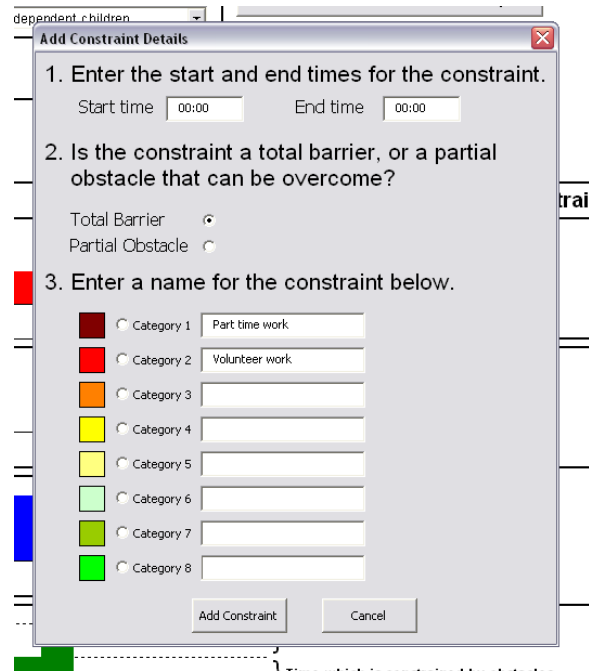
Figure 8: The *Add Constraint Details* dialog box

The times of application of the constraints are shown on the timeline alongside the relevant box, as shown in Figure 5. Those constraints that have been defined as complete Barriers are indicated by full height bars, and constraints that are defined as Obstacles are indicated by half height bars on the timeline, as shown in Figure 9.
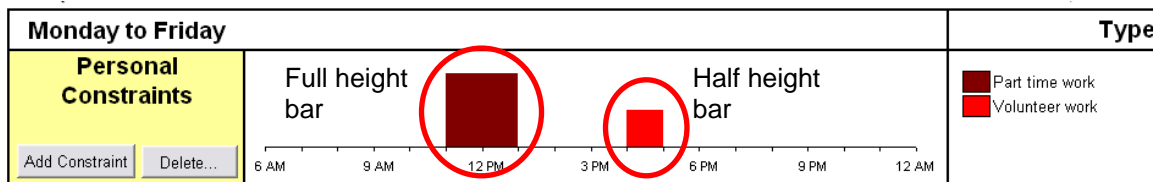
**Figure 9: Full height and half height bars
representing Barriers and Obstacles, respectively**

Once added, individual constraints can then be deleted by using the "Delete Selected" button, as shown in Figure 10. Any constraint category, or combination of constraint categories, can subsequently be deleted by adding a tick mark next to the category name and then clicking the "Delete Selected" button.

7
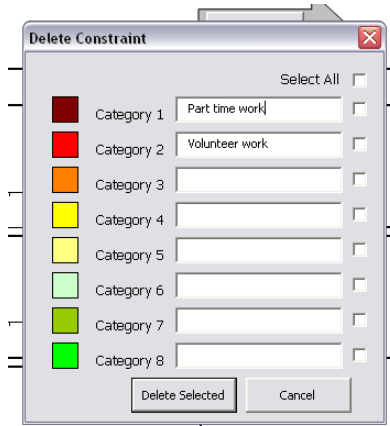
Figure 10: The "Delete Constraint" dialogue box

Note that, once Personal or Child/Adult Care constraints have been added, these are automatically deducted from the Service Hours for the specified service, to show the "Available Time", before any additional transport restrictions are taken into account – as shown in Figure 5.

Adding transport timing constraints

Unless the service is directly provided in clients' homes, time has to be allowed to travel form/to home to access the service. If this journey is made by a private mode of transport, then only the travel time has to be deducted from the "Available Time", but where public transport is being used (bus or train), the timetable imposes additional constraints.

Clicking the "Add Details" button in the "Transport Timings" section allows the spreadsheet user to add details about the timings/travel durations of public transport services to and from the location of the service being accessed. Figure 11 shows the "Add Transport Details" dialogue box. As can be seen, a distinction is made between transport timings from home to access the required service and those for the journey from the service back home.

Figure 11: The *Add Transport Details* dialog box

If the spreadsheet user tries to add a journey that conflicts with a constraint that has already been entered, then the "Potential Conflict" dialogue box appears, as

shown in Figure 12. The spreadsheet user can then decide whether or not to continue adding the journey.
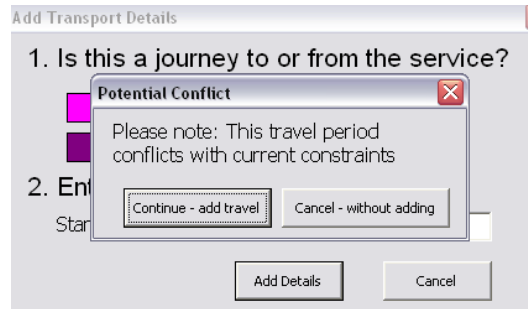
Figure 12: The "Potential Conflict" dialogue box

Once details of transport timings have been added, again the spreadsheet takes into account the other existing kinds of constraints in relation to the service opening hours, and shows the "Activity Time" when the client group could attend the service site without any major inconvenience – as shown in Figure 5.

Clicking the "Delete…" button in the "Transport Timings" section opens the "Delete journeys to or from service" dialogue box, as illustrated in Figure 13. To remove the journeys to or the journeys from the service, the spreadsheet user adds a check mark next to either "Journey to service" or "Journey from service", or both, and then clicks the "Delete Selected" button.

Figure 13: The "Delete journeys to or from service" dialogue box

5.   Access Problems by Area

Figure 14 shows the main Access Problems sheet. This sheet allows the user to identify and store potential access issues for a local area, by either selecting from an existing list of problems (here derived from the resident focus groups and the professional workshops), or by adding their own. Again, the Service type is carried forward from the first spreadsheet (Figure 5). The blue box in the "Area" section allows the user to add a text description for the local area; in the Dearne Valley case study areas were individual villages, as shown in the example of Bolton in Figure 14. Access issues can be stored for up to six areas, which can be selected by using the drop down box below the blue box.
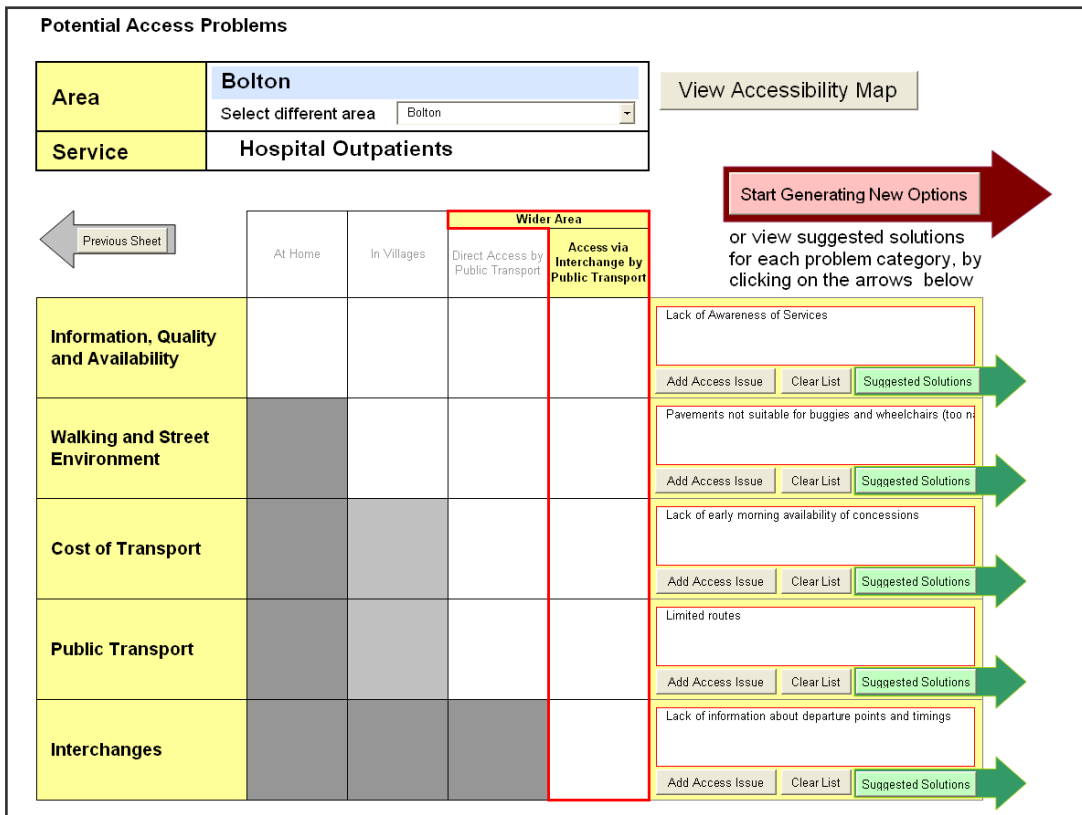
Figure 14: The Access Problems sheet

Clicking the "View Accessibility Map" button will link to an appropriate accessibility map that relates to the currently selected area (see Figure 15).
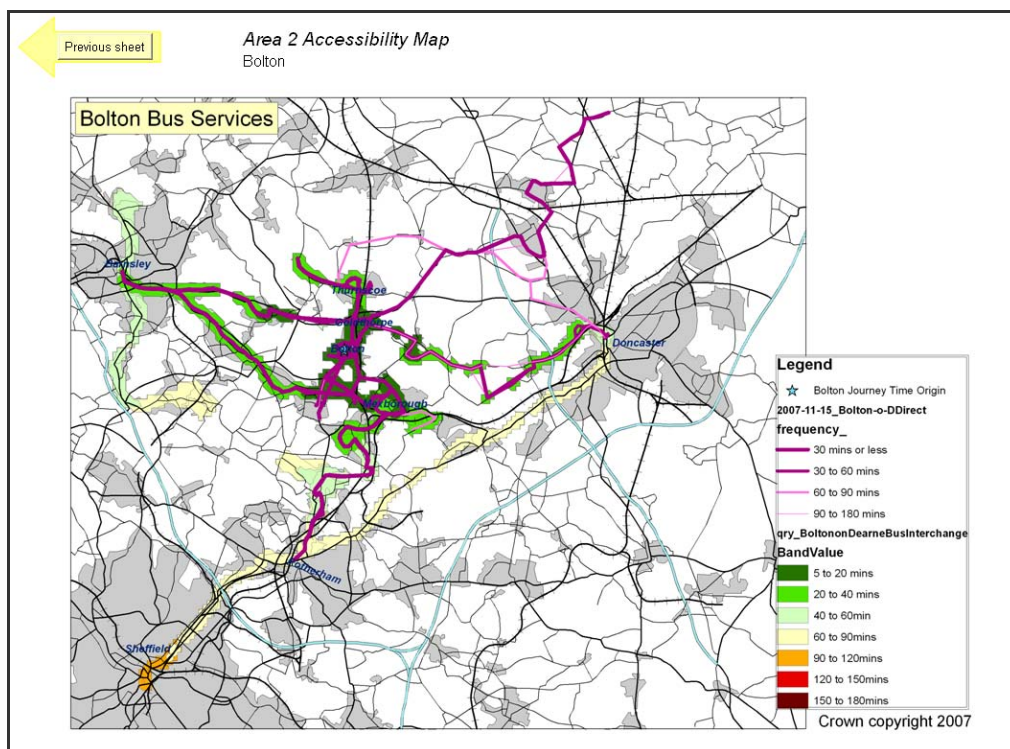
Figure 15: The Bus Accessibility Map for Bolton

Potential accessibility problems are grouped under five broad headings:

1. Information quality and availability
2. Walking and street environment
3. Cost of transport
4. Public transport
5. Interchanges

Only the accessibility categories that are relevant to where the service is provided are highlighted on the "Access Problems" sheet. This has been defined in the "Service Provision" sheet (see Figure 2), where the user has a range of options from 'At Home' to 'In Wider Area'. In Figure 2 the user indicated that Hospital Outpatients has been provided in a location requiring 'Public transport via interchange' and in this situation, all five accessibility problem groupings are potentially relevant.

Figure 16 shows how making different 'Where' selections on the "Service Provision" sheet affect the accessibility categories that are highlighted (and can be opened) on the "Access Problems" sheet.
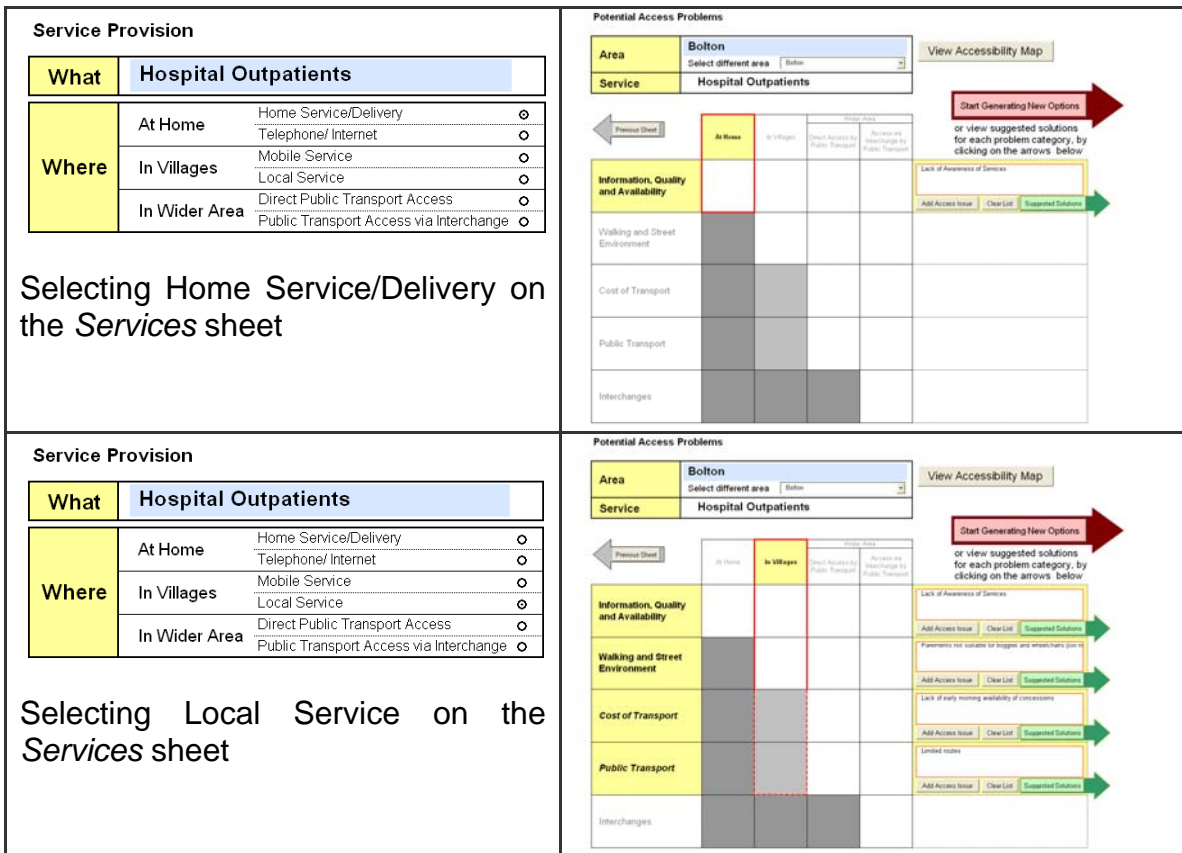
**Figure 16: Effect of selecting different 'Where' options
on the Service Provision sheet**

Clicking the "Add Access Issues" button for one of the (up to five) accessibility problem categories that is highlighted allows the spreadsheet user to review a list of pre-specified potential problems relevant to that category, and to add an access issue to that accessibility category that is relevant to that particular area.

Figure 17 shows the "Enter Access Problems "dialogue box. Each time the user clicks on an entry in the list, it is added to the box on the right hand side. In this way, the spreadsheet user can build up a complete set of problems relevant to people living in that particular area.
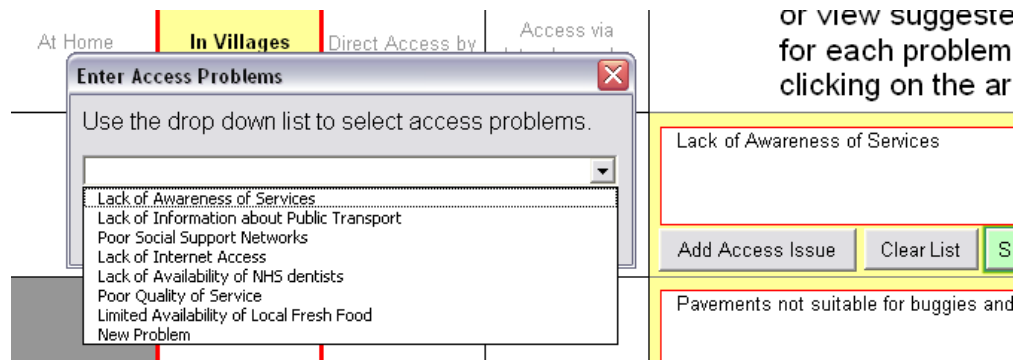
Figure 17: The "Enter Access Problems" dialogue box

Adding new problems
It is possible to edit this list to add additional types of problems under these five broad categories[4]. New problems are added on the "AccProbRef" sheet, as shown in Figure 18.

Figure 18: Sheet for adding a new problem

New problems can be added in columns B-F, under the appropriate category of accessibility problem. Once it has been added onto this sheet, the access problem will appear in the relevant drop down list on the "Access Problems" Sheet, and on the relevant sheet for solutions (*Acc1Inf*, *Acc2Walk, Acc3Cost, Acc4PT* or *Acc5Int*).

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[4] Although in doing so, these additions will not then link automatically to a set of pre-specified suggested solutions. These also need to be added (see Section 7).

6.   Generating solutions: 'inside-the-box'

Once all the relevant access problems have been entered for a particular area, the spreadsheet user can choose to view a list of suggested solutions, or to start generating their own novel solutions (see Section 7).

The suggested solutions are linked to the individual problems that are listed for each of five accessibility problem areas. Like the problems themselves, they have been derived from a combination of the suggestions made by local residents in the focus groups and by the professionals in the workshops, as well as from previous knowledge.

Clicking the "Suggested Solutions" button on the "Access Problems" sheet will display the problem-specific solutions, as illustrated in Figure 19 below.

Walking and Street Environment

Problem 2: Cars drive too quickly on residential streets

Introduce physical speed reduction measures: speed humps, chicanes

Use of regulations: 20 mph speed limits, give way at junctions, park on alternate sides of street

Enforcement of speed limits

Return to Access Problems

Start Generating New Options

Problem 4: Unsafe crossing places at bus stops/stations

Provide informal crossing facilities: refuges, speed tables

Provide zebra, pelican or puffin crossings

Resite bus stops to safer locations

Problem 5: Personal security concerns – poor lighting

Improve lighting levels and colour

Remove potential hiding places and improve sight lines

Problem 6: Personal security concerns – groups hanging around

Provide community wardens

Improve leisure facilities for young people

School sessions, to encourage more responsible behaviour

Figure 19: Suggested solutions for four of the specific access issues relating to Walking and Street Environment

13

Here, under the general category of 'Walking and Street Environment', the user has selected four of the six pre-specified problems: number 2 on the list (Cars drive too quickly on residential streets), number 4 (unsafe crossing places at bus stops/stations), number 5 (Personal security concerns – poor lighting) and number 6 (Personal security concerns – groups hanging about). In each case, two or three kinds of solution are suggested for possible implementation in that area.

Once the spreadsheet user has decided which of these solutions to consider for that area, he/she can then return to the Access Problems sheet (Figure 14) to consider the other relevant accessibility problem categories, by clicking on the yellow "Return to Access Problems" button. As previously noted, separate problems and solutions can be identified for up to six areas.

Adding new predefined solutions

Additional solutions are added to the following sheets:
- *'Acc1Inf'* for solutions relating to 'Information, quality and availability'
- *'Acc2Walk'* for solutions relating to 'Walking and street environment'
- *'Acc3Cost'* for solutions relating to 'Cost of transport'
- *'Acc4PT'* for solutions relating to 'Public transport'
- *'Acc5Int'* for solutions relating to 'Interchanges'

Figure 20 shows an example of one of the solution sheets (*Acc1Inf*). Solutions are added in the row that relates to the specific problem.

Information, Quality and Availability				
Problems	Solution 1	Solution 2	Solution 3	Solution 4
Lack of Awareness of Services	Lack of Awareness of Services - Test Solution 1	Lack of Awareness of Services - Test Solution 2	Lack of Awareness of Services - Test Solution 3	Lack of Awareness of Services - Test Solution 4
Lack of Information about Public Transport	Lack of Information about Public Transport - Test Solution 1			
Poor Social Support Networks	Poor Social Support Networks - Test Solution 1	Poor Social Support Networks - Test Solution 2		
Lack of Internet Access	Lack of Internet Access - Test Solution 1	Lack of Internet Access - Test Solution 2	Lack of Internet Access - Test Solution 3	
Lack of Availability of NHS dentists	Lack of Availability of NHS dentists - Test Solution 1	Lack of Availability of NHS dentists - Test Solution 2		
Poor Quality of Service				
Limited Availability of Local Fresh Food	Limited Availability of Local Fresh Food - Test Solution 1			
New Problem				

Figure 20: Solution sheet for Information, quality and availability

N.B. New accessibility problems should not be added onto this sheet, only the solutions.

14

7. Generating solutions: 'outside-the-box'

Spreadsheet users are also encouraged to generate their own solutions, as well as relying on previous ideas and experience. There are two levels at which the user can trigger this process:

(i) On the main "Access Problems" sheet (Figure 14), by clicking on the button "Start Generating New Options"; and

(ii) On the individual Accessibility Problems sheets (see example in Figure 18), again by clicking on the "Start Generating New Options" button.

High-level generation of options

If the user starts at the higher level [case (i)], at the top of the main "Access Problems" sheet, they are first directed to a sheet which sets out a number of general ways in which an accessibility problem might be addressed by a service provider. This is illustrated in Figure 21. Here five broad solution strategies are set out, from Re-defining types of service provision, through to Relating better to other agencies, to address gaps in multi-agency service provision.
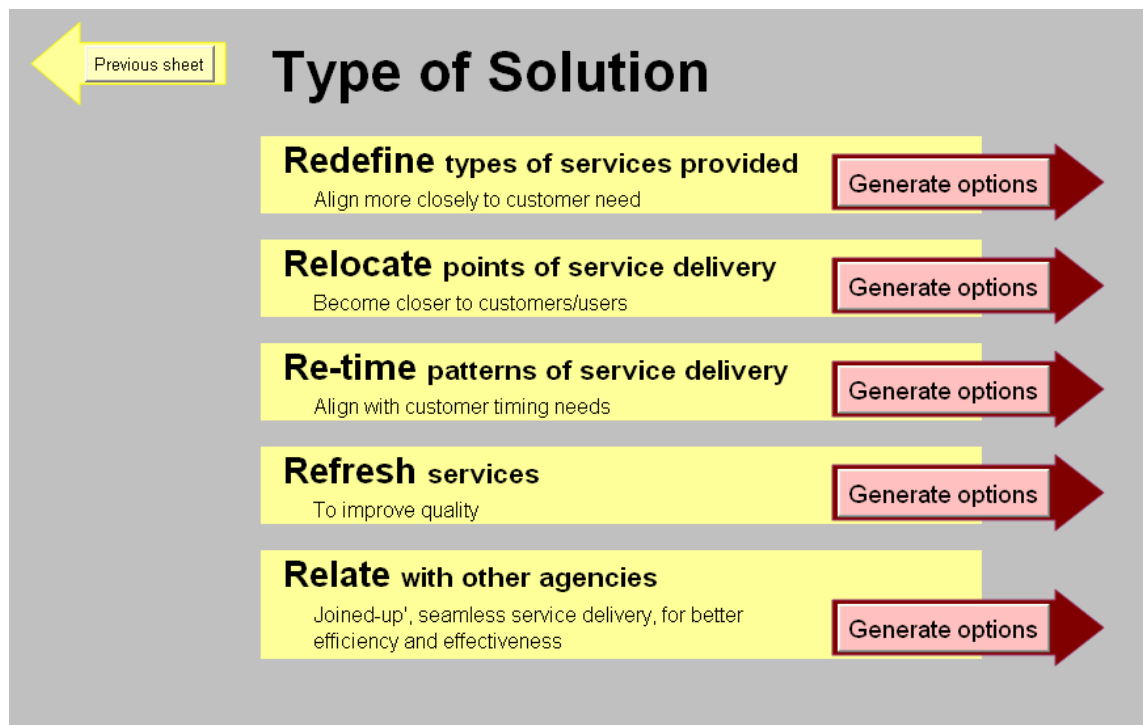
Figure 21: High Level Strategies for Addressing Accessibility Problems

The user can click on any of the "Generate options" buttons and will be directed to a sheet that uses a well established 'out-of-the-box' method to encourage innovative thinking. This involves showing users randomised sets of three pictures, from which they are encouraged to think of how these concepts could provide a new way of viewing – and solving – a particular problem. An example

is shown in Figure 22. See Appendix 1 for a description of how to add to or replace the images that the spreadsheet draws on for the random selection.

**Figure 22: Randomised images used to act as a stimulus
to thinking about service retiming**

In this example the spreadsheet user has clicked on the option generation button next to the 'Re-time patterns of service delivery' section, and has been shown pictures of a mouse trap, a snail and a fingerprint. This could stimulate thoughts, for example, about 'capturing' certain client groups at certain times that suit them, about allowing people more time to access services, or letting client groups 'stamp their own identity' on determining service operating hours.

If the user clicks on 'Generate New Selection' then another randomised triplet of pictures will appear. On the sheet there is room to record up to six ideas, before returning to the previous sheet (Figure 21) and either exploring another strategy (e.g. Refresh services), or returning to the main "Access Problems" spreadsheet (Figure 14) and looking at more specific kinds of problems and solutions.

These Random Images sheets can be exported and saved as a new worksheet by clicking the "Export to a new worksheet button" (shown at the top of Figure 22) and then using the Save As… command in Excel's File menu.

Option Generation at the Accessibility Problem Category Level

The spreadsheet user can also switch to the same type of 'out-of-the-box' option generation process at the more detailed level of dealing with a particular type of accessibility problem [case (ii)].

Here each of the sets of solution screens associated with a category of problems (e.g. Figure 19) has its 'Start Generating New Options' button. On clicking on this button, the spreadsheet user is directed to a similar type of sheet to that shown in Figure 22, but with the appropriately heading and its own set of three randomised pictures.
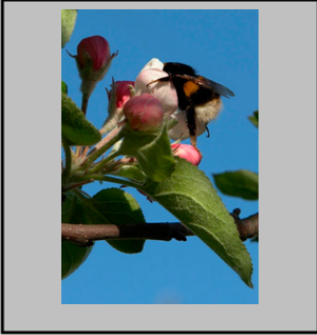
For example, part of the New Options screen for the accessibility problem category 'Information, Quality and Availability' is shown in Figure 23. This time the pictures depict a flower, a skyscraper, and a helicopter. Again, the ideas that are generated by the user can be exported to a new workbook.

8.   Conclusions
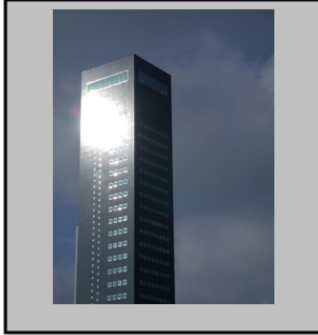
The Accessibility Planning tools that are presently available to practitioners tend to focus mainly on the locational aspects of service provision, and do not consider the many other dimensions of accessibility problems[5], such as temporal constraints, financial constraints or personal security concerns. In addition, existing tools do not directly contribute to the development of suitable solutions – other than by highlighting areas from which residential access is poor. The tool described here makes important contributions in both of these areas.

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[5] Jones, P. and Wixey, S. 'Measuring accessibility as experienced by different socially disadvantage groups'. End of project summary report to the EPSRC, July 2005.

**Figure 23: Randomised images used to act as a stimulus
to thinking about Information, Quality and Availability**

First, the tool makes explicit a wide range of types of accessibility constraints, in addition to those directly relating to the spatial location of services. It sets out the detailed temporal constraints that can seriously limit a client group's access to services, and also considers various problems associated with information, costs of transport, poor pedestrian access, personal security, and other aspects of public transport services (e.g. limited capacity for buggies and wheelchairs, poor interchange facilities).

Second, it provides the user with detailed sets of known possible solutions, directly linked to the different types of problems that have been identified. It also affords users the opportunity to take part in out-of-the-box thinking, through the use of randomly generated triplets of carefully selected pictures.

Both the lists of problems and proposed solutions have been derived through the detailed involvement of people in the Dearne Valley area of South Yorkshire: local residents in a series of focus groups, and professionals in two interactive workshops. We would like to acknowledge the assistance of all those who contributed in this way to the knowledge embedded in this tool.

18

Appendix 1: Changing the pictures used in the 'outside-the-box' option generation sequences

The pictures for the "Random Images" sheet used for the 'outside-the-box' option generation task (see Figures 22 and 23) are all held in a folder called "Images" which must be in the same directory as the main spreadsheet.

It is possible to replace any or all the images in this folder, or to add additional pictures. All the images in the folder should be sized so that the longest edge measures 800 pixels. The pictures currently used in the spreadsheet were resized with Picasa 2 using the "Export Picture to Folder" command under the File menu, as shown in Figure 24. Picasa 2 is a free image editing tool from Google available at http://picasa.google.com/download/.

The pictures must be renamed as "image(+number).jpg" (for example, image1.jpg, image2.jpg, etc.) before the spreadsheet will recognise them.
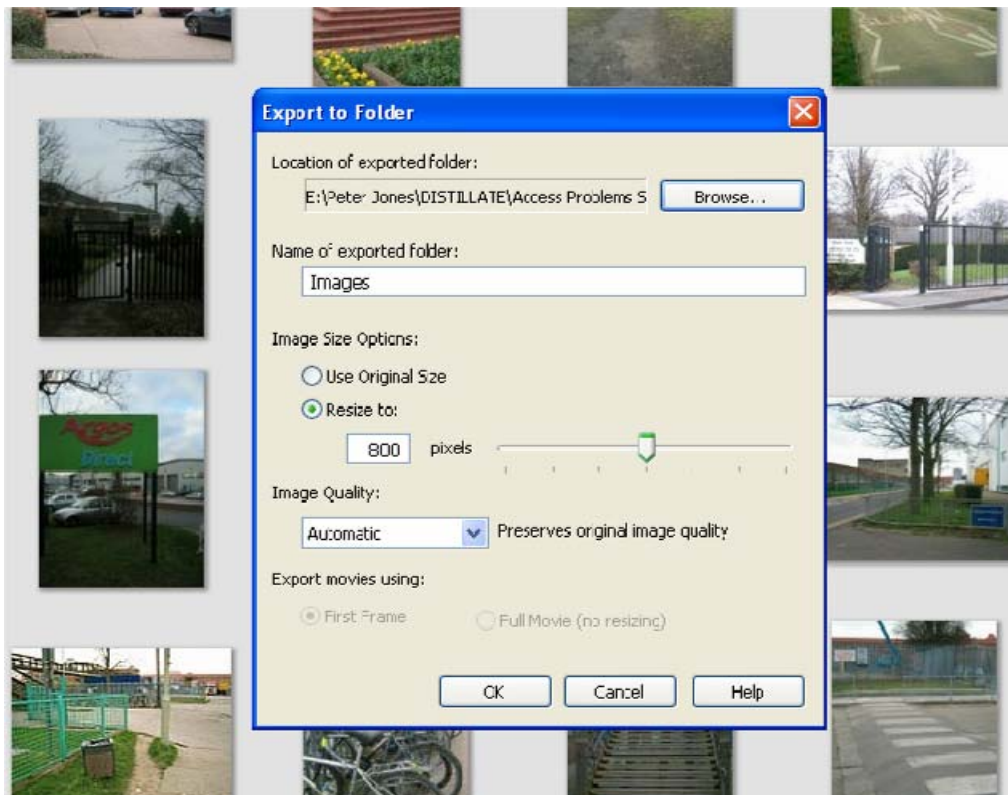
Figure 24: The image resize dialog box in Picasa

Updated image details should be included on the "Image details" sheet, that is reproduced in Figure 25. There are spaces to record the original filename, the author, image source, basic usage details and a more detailed statement about the restrictions on the use of the image. The source, usage and restrictions fields are displayed along with the image.

If the number of images has changed this must be reflected under the "Number of Images" heading in column I of the "Image details" sheet. The spreadsheet generates three random numbers between 1 and the total number of images indicated. If there are more images than indicated, the choice will only be made from the number of images indicated; conversely, if there are fewer images than indicated, the spreadsheet may try and load an image which does not exist and this will crash the option generation code.

Figure 25: The "Image details" sheet