

A photograph showing three people (two women and one man) gathered around a table outdoors, looking at various maps and documents. They are under a white canopy tent. The scene is overlaid with a semi-transparent green filter. The title text is centered over the image.

A Guide to using Community Mapping and Participatory-GIS

John Forrester and Steve Cinderby

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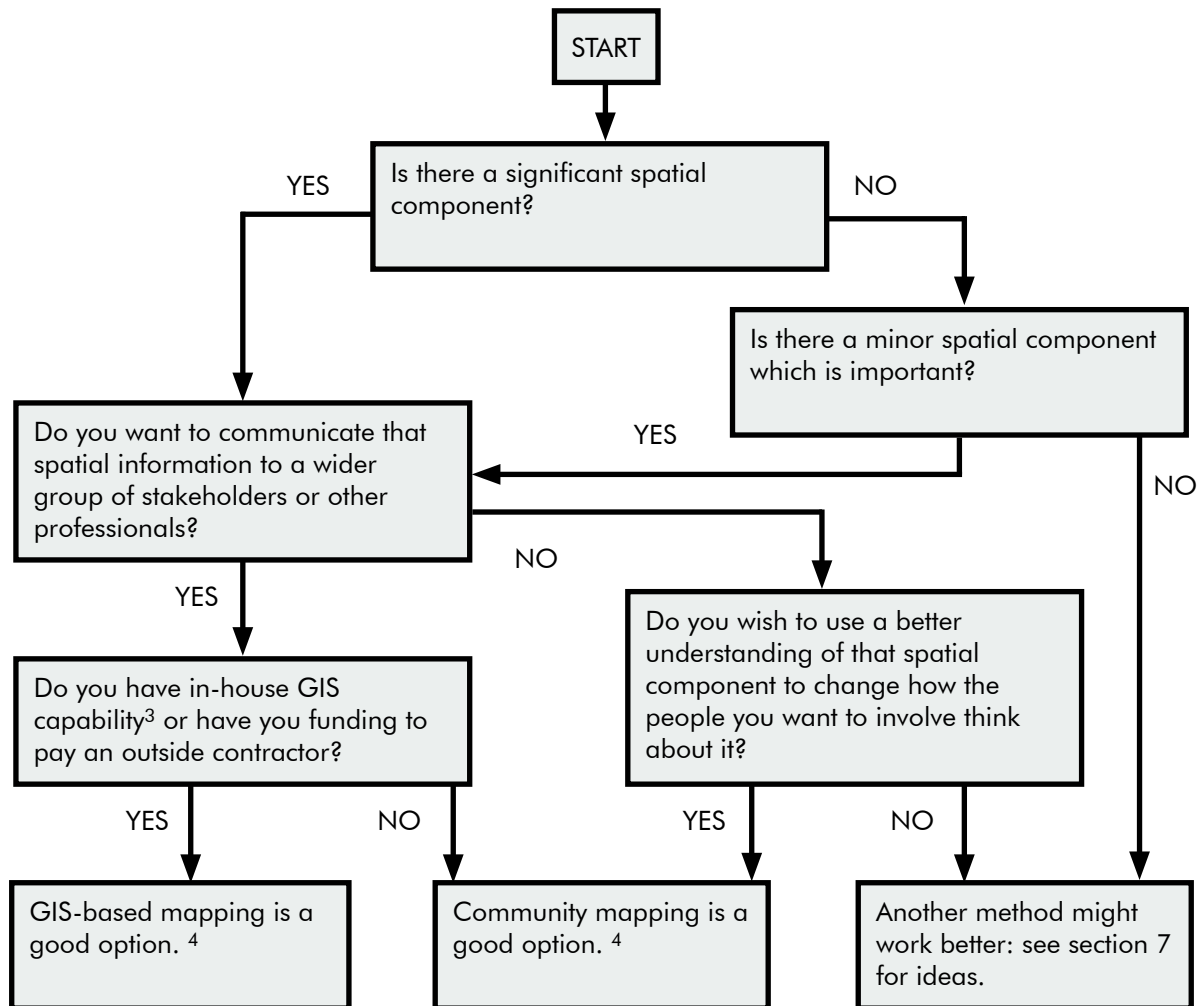
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IS THIS GUIDE FOR YOU?

There are a few factors to consider before deciding whether or not to use community mapping (including any form of GIS or Geographic Information System). The following decision tree may help you

to quickly decide whether or not you want to use this method of gathering – and storing – information about your issue.



3 If you are uncertain whether or not you have the in-house capability, or whether or not available free-to-use packages (such as Google Earth) will meet your requirements, then you **should** use this guide.

4 If you came down the right-hand route where the spatial component is minor but important then you should consider using another method alongside the mapping.

WHAT IS COMMUNITY MAPPING?

Mapping is any method where people are encouraged to use a map or maps in order to communicate their knowledge and ideas more clearly. So using a copy of an ordnance survey map (e.g. *Landranger* series 1:50,000 or larger scale such as the *Explorer* 1:25,000 series) to allow someone to point out issues, or to allow them to record the locations of things that they are telling you about, is participatory mapping.

Participatory mapping that is carried out with members of a community, and which can be used to represent the views of some or all of the members of that community can be referred to as community mapping. Community mapping is usually carried out with groups of community stakeholders together rather than with individuals. Community mapping is one form of participatory mapping.

The decision tree above took you through a few questions to help you think about what sort of data you want to collect. Also, importantly, it should make you

think about how you want to use it. This Guide should help you decide which level of detail and which level of technology suits your needs; ranging from using paper maps with marker pens through to digital databases (a GIS).

WHEN DOES COMMUNITY MAPPING BECOME P-GIS?

The key difference between community mapping and participatory GIS is in what happens to the data after it is gathered. What we refer to here in this booklet as P-GIS is the practice of gathering data using traditional methods such as interviews, questions, focus groups, all using some form of paper maps to allow participants to record spatial details. This information is then digitised so that it can be analysed and interrogated using the power of the computer GIS software, and also so that any outputs can then be communicated using computer-drawn map outputs⁵.

5 This contrasts, then, with other uses of GIS such as the practice of allowing community members to manipulate 'official' data using a GIS; a practice usually called ppGIS (public participation GIS).

An example of community mapping is where you want to explore the views of a community, for example, on what flood management measures might be best in a given area. You organise

a public meeting where interested parties sit or stand around tables with maps of the catchment. You are using the maps to provoke ideas, help different stakeholders clarify their points, and focus

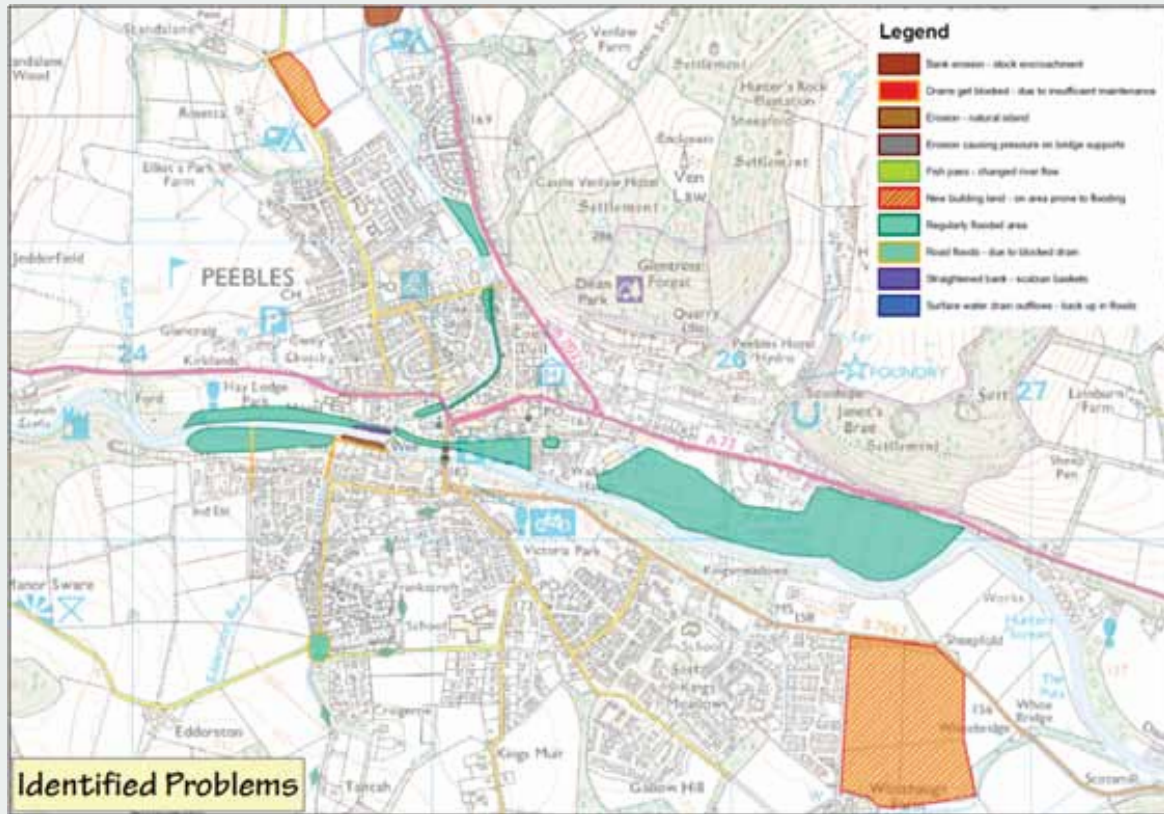
on practical realities in your catchment. People may draw on the maps to illustrate their point. You might keep these maps as a resource to use later.



An example of participatory GIS is where you have (maybe as a result of the community mapping) now decided to implement a scheme. You need to plan what goes where whilst consulting further with stakeholders. You may also wish to carry out

hydrological modelling of possible measures, and gain permissions from landowners and managers. For this you will need detailed high quality maps that show accurately where measures might be. Digitising the outputs of any consultations with stakeholder

groups and individuals can help show points of agreement, thereby focusing effort on resolving – or avoiding – conflict and allow data to be fed into other forms of modelling.



WHAT ARE THE BENEFITS OF GOING ON TO USE A GIS?

Converting paper maps into a digital GIS version can give lots of advantages. You have high quality digitised maps so you can print multiple copies or email it to group members. This allows you to do two important things: first to ask them if you have got it right; second it allows you to communicate that data to some other person or other stakeholder who was not at the initial meeting.

The other key advantage of transferring the paper based information into a digital GIS is that you can re-visualise the information in a clearer way than was drawn on the original map; you can combine or compare different groups maps together; and, finally, it allows you to perform analyses that would otherwise might be impossible or at the very least time-consuming but which might be helpful.

Example of using a GIS map to validate data: at a public meeting you are talking about a particular case of problem water entering a river from “a beck”. A lot of different stakeholders talk about “the beck” at the meeting; one stakeholder draws “the beck” on your map. When the map is digitised and subsequently returned to participants to check, some stakeholders (85%) tell you that the map is correct while others (15%) tell you that it is “wrong”, explaining that they meant another beck. You now know that you are dealing with two becks, and amend your map accordingly to show both.

Example of using a GIS map to communicate data: now that you have your ‘corrected’ map you want to see what might happen if you block or slow the water from either or both becks. Having the digitised data allows you to accurately and succinctly communicate that data to a hydrologist: s/he will know exactly what you are asking. If your hydrologist can then feed back data using a similar map this will also help community stakeholders to understand likely outcomes. Also, the same maps can be used to communicate with planners or contractors if you decide to proceed with the scheme.

Example of using the GIS to further analyse data: in the validation process you know that 85% of stakeholders ‘approve’ one scheme while only 15% approve the other. However, if you also have gathered basic demographic data (i.e. age or employment – see methods section below) you could also answer further questions about which scheme is preferred by different sectors of the community, or you could even target the scheme to benefit more vulnerable sectors by cross-referencing your GIS data with other government data such as on deprivation.

SOME BASICS ON PARTICIPATION

If you haven't practised participatory methods before this section is particularly important. The key to participatory approaches is that they should be geared as much as is possible towards allowing ordinary stakeholders (the participants) to contribute to the design of the strategy or scheme on an equal footing with involved 'experts' whether they be scientific experts or policy experts. This is not to say that any one viewpoint should be put above another: all should be considered and weighed together.

It is important to think about who is going to organise the participatory exercise. Do you, as an agency or other group officer or employee, want to 'lead' the exercise or do you want the community to take responsibility for leading the exercise themselves? Deciding on this will obviously influence your ultimate list of who gets invited. Think about who you want to reach.

Next, it is critical that everyone – organisers and participants – understand clearly what is actually being discussed. So if you are holding a public meeting to discuss *and decide upon* a broad community strategy to deal with flooding then that could use a participatory approach. But that would be very different from a public meeting where a strategy has already been agreed upon (or even imposed) and the purpose of the meeting is to implement that strategy in the local area.

The latter meeting might nonetheless be participatory in that stakeholders can still contribute their in-depth local knowledge to help make the high-level strategy work at the local level. However, it is always good

practice to let participants know what it is they are participating in and to allow anyone involved to fully understand what they can or cannot influence.

There are also a few other basics to think about. If you want people to be open and talk freely you may want to choose a less intimidating setting in which people feel comfortable talking: so a room in a local hotel may be better than a local council chamber or an echoey church building. You also need to think carefully about how you control the meeting. A strong chair may be intimidating to some, but on the other hand too weak a control may allow one participant to dominate. You may wish to consider employing an impartial facilitator. Also, try to choose a neutral venue where participants do not feel that they need to 'be polite to' their host by deferring to her or his opinions.

Finally, you also need to be clear about who 'owns' the output. If you are carrying out a participatory mapping session with, for example, a local community council, they have the right to be identified as owners of that knowledge and to have a say in how it is used. Whatever the specific case, you should be clear with participants before you start what the outputs from their involvement will be and what purpose(s) to which you intend to put these outputs. It may be that you can agree some mutually beneficial use of the data that you had not foreseen. If possible it is always good to put this in writing and ask people to sign 'consent' forms so that information collected at the meeting can be used as agreed.

METHODS FOR CARRYING OUT COMMUNITY MAPPING

Using a copy of an Ordnance Survey map to allow participants to point out issues or record the locations of things that they are telling you about is basic participatory mapping. In practice, usually the smallest scale map which is used to record information will be the OS Explorer series (1:25,000).

The scale of 'base map' you want to use is determined by the issue of interest; the size of group you want to engage and the method of interaction you want to use; and the spatial scale over which you want to carry out your investigation. The critical consideration when choosing your map scale is that the participants that you invite to comment can identify features and represent their ideas. If you want to get ideas from across a wide area on strategic decisions within a larger catchment you might be able to use a 1:50,000 map. If you are talking to a farmer about his or her land then you will need the 1:25,000 (or higher resolution) as the 1:25,000 is the first scale map to show field boundaries. If you are talking to residents about which properties are at risk then you need to use a map which shows individual properties clearly enough. Air-photographs or satellite imagery (Google Earth) can also be useful resources (particularly in colour) as they often show un-mapped features and can be more easily interpreted by some participants who may be unused to using maps.

It is common practice nowadays to use digital maps which can be printed out if you have access to a 'plotter' or large printer. Any architects' shop or copy and print bureau should be able to print these for you. These maps can be aerial photography or 'cartographic' (i.e. a more traditional map) or they may be a combination of the two, that is a spatially corrected aerial photograph upon which a road network or oth-

er spatial features have been superimposed. A useful feature of digital maps is that you can adjust the scale at which you print them to suit your purposes.

Community mapping works best in groups of approximately eight people or fewer. If you have more participants then not everyone will be able to see or draw on a single map. If you have more than eight participants consider holding more than one meeting or else have parallel mapping sessions with more than one group. The split could be based on expertise, where people are from, or just who is available at specific times. Using any of these approaches will mean that you should also have a joint meeting where the groups come back together to compare, contrast and if necessary refine their maps together as a single group.

COLLECTING INFORMATION ONTO MAPS AT THE MEETING

Once you have appropriate base maps, how do you get participants to record information onto them? Again, it really depends on what you are going to do with the information you are gathering. The simplest and most straightforward means of gathering mapped data is to encourage participants to draw directly onto the base map. The serious drawback with this is that the map cannot be used again. Also, if there are a lot of points (or a lot of participants), or if you want to collect sequential information about two related issues such as perceived problems and suggested solutions you might need to consider alternative options. The easiest solution is to have more than one copy of the map for each activity. Alternatively, use a layer of transparent film (again, try an architects' office supplier) over the base map. By using layers of acetate participants can

undertake mapping in themed phases. For example, problem locations first, followed by solution generation on a second sheet. This means the same areas can be drawn upon twice but will remain clear for subsequent interpretation and analysis.

If you use film you will need to make sure that you use pens that write permanently onto plastic and also remember to mark some coordinates onto the transparency so that you can relocate it over the map later. Three or 4 crosses over grid points usually suffice but if you are using aerial photography you may need to choose 3 or 4 point landmarks as locators. Whether you are using transparencies or paper maps we have found that 0.5 mm or 0.6 mm fine point indelible (permanent) markers in packs containing a range of colours are usually the best makers to use.

If you are also collecting large amounts of verbal data (i.e. if you are using a tape recorder or digital voice recorder) then you will also need to make sure that you devise a system to link the information on the map and on the recording. A simple numerical system usually suffices: e.g. "participant one" recorded on the audio tallies with points marked "1" on the map.

If you are holding a meeting at which more than about 8 or 10 persons are likely to attend then you may need more than one copy of the map (and duplicate of pens) if you want everyone to be able to cluster around a map and participate at the same time.

Example of Community Mapping from the Managing Borderlands project:

for a community mapping event to generate flood management options in Peebles we produced two base maps. One covered the town in detail at 1:10K scale and the other the whole catchment at 1:15K and included colour air photographs and the OS 1:25K map layer.

We printed these maps in colour A0 size (84cm by 119cm) and cut matching sheets of acetate

to lay over them. We marked crosshairs corresponding to the edge of the maps and some key landmarks (outside the key area the participants mapping would likely focus on) on the acetates and we labelled these.

Five people representing key local organisations attended the meeting. They first drew where flood issues had occurred in the past on the acetate using whichever map (the town zoom or the whole catchment) was appropriate. We

noted what the polygons and lines represented on the maps to help link back to the audio recordings we were also making.

We used the second acetates to allow participants to highlight where they thought that new flood protection or land use changes would help reduce flooding.

The process took approximately 2 hours including introductions and refreshments.



METHODS FOR CARRYING OUT GIS

MOVING FROM PAPER TO DIGITAL

Once you have collected the community mapped information at the 'focus group', the next stage in the P-GIS process is to convert this into a digital (computer) map form – the process of digitisation. There are two key approaches to digitising a paper map: You can use a large digitising table and trace around the mapped information. The digitising table has the advantage that it should allow you to accurately transfer the paper information into the computer. But obviously you need to have the right equipment.

Alternatively you can photograph your paper maps (or the acetate transparencies) and then the digitise lines, points and areas on the screen into the GIS. On-screen digitising requires you to link the extent of the map in the photograph to the same geographic extent in the GIS software. This is often called 'rubber-sheeting' and requires some points on the photograph to be linked to the same points on the map. The more points you use, the more accurate the position of the photo will be. Once the map photograph has been located geographically the information participants drew onto the map can then be traced on-screen (using a mouse or pen-pad) to get the data into the GIS.

A final approach to transferring your data to a digital format is to use a free online map display package such as Google Earth (GE). GE is NOT a proper GIS, however it is free of charge and can be useful. In GE you can add points (called placemarks) using the map-pin button; areas using the polygon tool; or lines using the path tool. In GE you can add information describing what the feature is by adding information into the 'Description' or change how it appears by

modifying the 'Style, Colour'. You can save what you do to a your 'My Places' directory in Google and then export them (using the "Save_as" command) or share them with other people.

The key drawbacks of the Google Earth approach are that whilst you can re-visualise and electronically share the information it is difficult to print in high resolution and you cannot perform any serious analysis of the information or combine different information.

USING OUTSIDE GIS HELP

Although many people regularly use all kinds of computer software packages, they still may think that GIS needs specialist skills and expertise to gain the most benefits from using them and ensuring that the information generated is correct. For many community mappers this leap to full digital GIS is a barrier. However, it is possible for people to overcome this problem. GIS are widely used in academia (i.e. in universities and many further education colleges); by local authorities (councils) and government agencies (e.g. the Environment Agency); and private businesses. Community mappers should investigate the potential to work with these groups – particularly academia – to overcome the access barrier to GIS software and expertise.

The advantages of collaborating are that the necessary skills for using the software should be available. However, there are issues that need to be considered. First, if an outside person will be digitising and analysing the maps they will need assistance and clear guidance to ensure they translate the paper maps accurately and

then produce the digital information in a way that is useful and what you expected. Ideally the partner group should come to the mapping meetings and be part of the process from the start. Secondly, there is the issue that once in a GIS you may be tied to using that software in the future. Whilst GIS can export data into formats for use in free viewers (e.g. Google .kmz files) this is not ideal for future use of the information.

THE DIFFERENCES BETWEEN P-GIS AND OTHER FORMS OF GIS

P-GIS data should be described as 'qualitative data' as it is based on people's knowledge, opinions and perceptions. Also, the location and boundaries of areas that people draw on the community maps may be of varying accuracy levels. In some situations the information can be very precise – for example marking the exact location of a drainage outflow that gets clogged (which may not even be present in official data) – but equally likely (and sometimes on the same map) quite vague – such as where a new riverine planting to slow flood waters should be concentrated.

GIS are not well designed to automatically cope with such uncertainties and fuzziness. To use this data most

effectively requires a dialogue between the participants, meeting facilitator and GIS operator. This dialogue can confirm or improve the robustness of the P-GIS data and highlight the confidence with which the data can be used for further analysis.

GIS does allow quantitative results to be easily generated from spatial data including community map data. This power and ease needs to be tempered with an appreciation of the reliability and robustness of the information used in the assessment. This understanding of the limitations of your data should also include a similar understanding of the limitations of official datasets which might be combined with P-GIS information. For example, flood risk maps are probabilities of how likely an area is to inundation but they are not predictions or exact flood extents. Communities have detailed experiential knowledge of where floods occur but group meetings may not be best place to assess future (technical) risk. A GIS can quickly overlay two sets of information and assess the quantitative areas of overlap with precision. The key to effectively using this information is how to present these findings in a way that does not overplay these numbers but instead is useful for the decision making process and community dialogue.

VALIDATION AND USING P-GIS OUTPUTS

There are several ways you can validate your digitised maps. The first and most obvious way is simply to send the maps (e.g. by e-mail or via the internet) back to the participants for them to approve.

Another way which tests the outputs with a wider constituency is to use some sort of survey method to gauge public opinion of the ideas which have been mapped. Further, if there are conflicting or mutually exclusive choices these will need to be represented on two (or more maps). We have in the past used postal surveys to allow all the community members to 'vote' for one or other option as represented by the different maps. If it is not so critical to have 100% community coverage but you still want to gauge community opinion more widely then a form of community mapping which we refer to as Rapid Appraisal GIS (RAP-GIS) is very useful. This is explained in detail in the box below. The RAP-GIS approach can easily be adapted to local circumstances by either holding a specific event such as an open day – or maybe even renting a vacant shop premises on the high street for a week to allow community members to comment – or by tagging your session on to another event such as a show, as we did.

It really depends on whose comments you want, so think about the best way of finding those people.

One final caveat on using P-GIS maps in policymaking and decision taking contexts is that you must remember the provenance of the information that you are representing. So, for example, you may have mapped wider community opinions at an open day and these include the subjective opinions of a wide range of people with differing expertises and levels of involvement. While they may be represented cartographically in the same way as the specific expertise of land managers or land owners the two are different. Just because you have made them look the same doesn't mean that they are the same.

This Guide is not meant to be comprehensive. But you have made a start. If you decide that community mapping and/or GIS will not help you then you may still want to use some participatory methodology. The following section gives some information that may help you chose. If you do decide to use a mapping approach then the next section will also start you on looking for some more essential reading.

Example of RAP-GIS from the Managing Borderlands project:

The results from P-GIS workshops with key stakeholders to identify possible solutions for local flooding issues were presented at agricultural shows. This allowed wider audiences see them.

Show attendees could see the results presented on a map – but also add comments and make additional suggestions – through a form of community mapping using flags to mark the locations of information.

By collecting information on who the participants were (what they did for a living) and where they lived (by their postcode) and their gender and age it was possible to filter feedback to identify which solutions were most popular or whether they only received buy-in from particular groups. For example farmers highlighted problems with solutions that would result in the land being less economically productive but these were the solutions that other stakeholders found the most appealing.

The results of the wider feedback were fed back into the GIS to add another layer of community mapping into the system. This example highlights some of the attractive elements of the digital storage of data in the PGIS in that information can be extracted by additional factors (such as age of participants) and new information added or combined with that already collected in a more rapid way than could be achieved by other approaches



OTHER (NON-SPATIAL) ENGAGEMENT METHODS YOU COULD USE

- Focus groups; useful for gauging the opinion of specific sectors of the community: e.g. young mothers, teenagers. The focus is on the group membership. The idea is that people with a similar background will develop a group dynamic and discuss issues in more depth.
- Individual interviews; useful for key stakeholders.
- Leaflet drops; useful for covering a wide area such as a whole neighbourhood. Leaflets may, however, be considered junk mail. If you want people to respond to a leaflet you may need to include a reply envelope thereby increasing cost. Response rates are usually not high.
- On-street-intercept interviews; useful for 'random' sampling a community quickly. You can control numbers and demographics.
- Poster sessions; as with on-street-intercepts except that community members self-select as to who engages with the poster. However, a poster session in conjunction with another event can be useful.
- Transect walks; useful to gauge community opinion on a specific location. How you select participants for the walk is important. Can be combined with a focus group-type approach.
- Town meetings (public meetings); useful for sharing information to interested (self-selected) community members but should at all costs be avoided for contentious issues.
- Electronic media; methods such as *Twitter* can be good, especially for a younger age group.

FURTHER READING ON PARTICIPATION, COMMUNITY MAPPING AND GIS

Participation

Water Management at the Interface of Government and Society: The Role of Participatory Catchment Organisations - Implications for Policy Development (5pps). Accessed 13th March 2012. Can be downloaded free from the Scottish Universities Insight Institute website at: [http://www.scottishinsight.ac.uk/Portals/50/Water%20Management%20-%20Policy%20Brief%20\(2012\).pdf](http://www.scottishinsight.ac.uk/Portals/50/Water%20Management%20-%20Policy%20Brief%20(2012).pdf)

The DISTILLATE Guide to Crosssectoral and Intra-organisational Partnership Working for Sustainable Transport Decision Making (25pps). Although produced initially for transport planners, this guide is just as applicable to any local authority issue and is available to download free of charge from the DISTILLATE website at [http://www.distillate.ac.uk/outputs/D1%20guide%20to%20partnership%20working%20\(14-04-08\).pdf](http://www.distillate.ac.uk/outputs/D1%20guide%20to%20partnership%20working%20(14-04-08).pdf)

Overcoming the Challenges of 'Doing Participation' in Environment and Development (53pps). These workshop proceedings are for those who have already decided to pursue a participatory approach to environment and development, but want to dip in to something which will help them better understand the issues involved. Available to download free from the SEI website at: <http://www.sei-international.org/mediamanager/documents/Publications/Sustainable-livelihoods/participation%20workshop%20wp%20100308.pdf>

Community mapping and GIS

Inclusive and Sustainable Infrastructure for Urban Regeneration: Leisure and Tourism Spaces –Facilitating Inclusive Design Using GIS-P (47 pps). This report gives more detail on using P-GIS in different contexts and is available to download free from the SEI website <http://>

www.sei-international.org/mediamanager/documents/Publications/Future/facilitatinginclusivedesignusinggis.pdf

Mapping for Change is an innovative social enterprise that exists to support the development of sustainable communities. We specialise in providing participatory mapping services to communities, voluntary sector organisations, local authorities and developers using a suite of innovative tools for communication. This provides a link to their online mapping activities. http://www.communitymaps.org.uk/version5/includes/CommunityMaps.php?minisite_group

Toolbox & Manual Mapping the vulnerability of communities. This report from Mozambique talks through the steps of using community mapping to assess vulnerability and risk. <http://projects.stefankienberger.at/vulmoz/>

Good Practices in Participatory Mapping. Jon Corbett wrote this very useful guide for the International Fund for Agricultural Development, Rome. www.ifad.org/pub/map/pm_web.pdf

Useful P-GIS links

Participatory Avenues, the Gateway to Community Mapping, PGIS & PPGIS. The online resource for PGIS practitioners. <http://www.iapad.org/>

Public Participation GIS Portal. The corresponding online resources for PPGIS. <http://www.ppgis.net/>

