Methods for Change

Participatory GIS

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Participatory GIS

Participatory GIS (PGIS) is a broad term that refers to a collection of methods intended to collect map-based data from participants using digital platforms. Though there is no universally accepted definition, the term can be applied to any approach that seeks to collect map data from participants using a digital map.

PGIS approaches were created as a way of empowering citizens by incorporating non-expert knowledge into decision making (e.g., for collecting community opinion relating to a planning application) and enhancing democracy within communities. Over time, the methods have broadened in their scope, including their use in advocacy and seeking to provide a voice to marginalised groups.

At a practical level, Participatory GIS can be situated in the broader field of Participatory Mapping, which comprises:

- Participatory GIS (also Public Participatory GIS, PPGIS), in which participants add data onto a digital map interface (e.g., a Google Map), normally via a website (though sometimes using desktop GIS software.

- Sketch Mapping, in which participants use pens to draw data onto a paper base map.

- Mental Mapping, in which participants draw a map on top of a blank sheet of paper.

All these approaches share the same goals (and some approaches can cross or sit between two categories), but they each have their own strengths and weaknesses. It is therefore useful to consider the full range to find the approach that best fits your project. This how-to guide will provide a step-by-step guide to a PGIS platform called Map-Me, which is a good example of a general-purpose and easy to use approach to engaging with PGIS.

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How does Participatory GIS create or contribute to change?

PGIS can create new opportunities to include citizens in the decision-making process. For example, the origins of participatory GIS were in attempts to democratise the planning process, such as gathering views on the location of a new wind farm) or making decisions about strategy for landscape conservation. However, they have subsequently been applied to other questions in which citizens' voices are critical. One example of such an application is the use of PGIS to understand the extent of sectarian territories and paramilitary activity in Northern Ireland to inform government-level decision making about strategies to promote integration (e.g., Huck et al., 2019). Another example is the use of PGIS to collect information from Indigenous Americans in Montana (USA) to understand the impact that logging operations would have on culturally significant locations, so that those locations could be protected.

The key element here is the idea of democratising the GIS mapping and decision-making process, which typically comprises the decision-making body (e.g., a governmental or commercial entity), seeking to engage meaningfully with citizens in order to ensure that they have the ability to engage with and influence the decision-making process. Over time, however, methods such as these have been adopted by communities themselves as empowerment strategies, permitting the organisation and mobilisation of citizens for to ensure that their voices are heard (e.g., when organising to oppose a planning application) or in scientific engagement (e.g., through the creation of citizen science initiatives).

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What ideas or concepts influence this approach?

Participatory GIS developed from a number of different areas and has been influenced by a wide range of concepts and approaches. The method itself was born in the 1990's out of a practical desire to democratise decision making, but it soon attracted extensive critical discussion, which ultimately led to the foundation of Geographical Information Science as a discipline (distinct from Geographical Information Systems, which describes the underlying software).

The key challenge here could be seen as having arisen from the way in which PGIS drew together the computational geographers and commercial companies who were creating these systems and the social scientists who sought to apply them, opening these technologies to critical debate for the first time. For some, the technological innovations that led to the creation and widespread adoption of GIS offered new opportunities for creating 'informed' societies and pursuing rational and efficient planning; whereas for others for others the potential for 'social engineering' and 'knowledge engineering' raised serious questions about freedom, civil society and academic practice (Pickles, 1999). Debates between academics from both perspectives eventually led to arguments for (and the widespread adoption of) a more flexible, open, and theoretical science of geographical information, which heralded the creation of the discipline of geographical information science in the mid 1990s. A detailed overview of the history of this period is given by (Pickles, 1999).

Following the creation of the discipline of Geographical Information Science, these discussions continued to create the subdiscipline of Critical Geographical Information Science, which again was founded on discussions around the use of Participatory GIS (an agenda for this field was proposed by Elwood, 2006). Critical GIS draws much from these early discussions, but focuses on new arguments, such as the 'digital divide' (later 'digital divides'), and their role in restricting accessibility to PGIS - and therefore the resulting decision making. Digital divides are the gap between people who have the necessary access, skills and inclination to use digital technologies (e.g., the internet or mobile devices), and those who do not. Solutions to this include the creation of 'crossover' platforms such as Paper2GIS (Huck et al., 2017; Denwood et al., 2023), which use computer vision technologies to enable participants to use a paper-based map (i.e., a Sketch Mapping interface), which is then automatically digitised into GIS data.

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Why might I want to use Participatory GIS?

- Participatory GIS enables you to tie data relating to the thoughts, feelings, perceptions and experiences of participants to locations on a map, giving greater insight into the information that you gather, as well as dramatically increasing the analytical potential of the dataset. For example, other methods such as a survey or interview might identify a difference in opinion between individuals that is not well explained by demographic characteristics, but which is explained by a spatial pattern (i.e., people with similar views are clustered in space, but do not necessarily share other characteristics). A simple example of this might be NIMBYism ("Not In My Back Yard": a planning phenomenon in which people who are against a development such as a wind farm because it is located close to their home, whereas they would support it elsewhere), where views on a proposed development (e.g., a wind farm) are more negative the closer to the proposed site the participant lives.

- Participatory GIS offers a bottom-up source of information, which can be used alongside official 'top down' datasets in order to give a fuller understanding of reality. For example, information stored in datasets such as a national census might not reflect reality for local communities. Participatory approaches can therefore provide a complementary dataset that allows those datasets to be compared and evaluated before use.

- Participatory GIS provides a means of democratisation of decision making and can be used to great effect in the gathering of public opinion in support of a wide range of practical and policy decisions. For example, the author of this guide used to use PGIS approaches to allow local residents to influence wind farm installations near to where they live. Participatory GIS can also provide an interesting provocation alongside other forms of data collection. For example, conducting a 'talk aloud' interview (in which participants complete a task, such as completing a PGIS survey, while narrating what they are doing to the researcher) can often lead to a greater level of engagement with the questions, prompting discussions into areas that might otherwise be overlooked.

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Step by step guide to using the Map-Me Participatory GIS platform:

This explanation will demonstrate how to create a Participatory GIS survey using Map-Me ("Mapping Meanings"), which was introduced by Huck et al., (2014) and is a popular platform for PGIS surveys. It is unique in the use of its 'spraycan' interface, which allows participants to 'spray' data onto the map, which enables them to vary their strength of feeling (with density of paint) as well as avoiding the need for them to determine precise bounds around the areas that they identify.

To help you understand this process, it might be useful to see the resulting PGIS survey first – you can access it here. These instructions walk you through how to re-create this survey.

1. **Register:** Go to https://map-me.org and click the **Log in or Register with Map-Me button**. Fill in the boxes under **Register** (example below – you will need to create your own unique username and password) and click the **Register** button.

This will take you to the **Map-Me Manager** page, where your surveys will be listed in future (currently it will just say that you have not created any sites yet). Click **Generate a new site.**

This will take you to the **Map-Me Generator** tool, which is used to create your survey. For now, ignore the question about adding a KML file to the map, and move to the Welcome page section. A KML file is a file exported from Google Earth that allows you to add your own data to the map (normally the boundary of the area within which you wish to collect data). The Welcome page section lets you set a title and add some text for the first page of your site – I have made a simple example below (note that I have left the image blank in this case, but feel free to upload one here)

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2. Questions: The next stage is to fill in any questions that you would like to ask prior to the participant engaging with the map. This normally includes things like consent to take part and basic demographic questions. Simply click "add another question" to keep adding more questions. If you add options to a question, then participants will be given a list to choose from. Otherwise, they will be given a text box to fill in (as in the "What is your postcode" question below):

3. Map appearance: Next you set up what you would like the map to look like. Simply zoom and pan the map and set the layer (Map / Satellite) as you would like it to appear to the user. You can use the search box and **Go to Location** button at the bottom to zoom to a given location:

4. Title: Next, you set up the title of the web site that hosts the survey (what will appear in the tab in your web browser) and the URL – this value will be appended to https://map-me.org/sites/ to produce your web address. In the below case, this will be https://map-me.org/sites/methods4c. You then set the "Blob diameter" (the size of each 'dot' of spray paint) and the 'Spray diameter' the width of the 'spray can' – it is often easiest to leave these at the default value and then you can adjust later if you wish.

5. **Map-based questions:** You can now set up your map-based questions. Each **Topic Question** will appear on a separate map screen. These should be geographical questions (normally starting with "Where…") that people can answer by drawing on the map. In this case I have gone for "*Where do you feel safe in Manchester*" and "*Where do you feel unsafe in Manchester*". As before, simply click **add another topic question** to keep adding more questions to your survey. For each topic question, you can add as many **sub-questions** as you like, again by simply clicking **add another sub-question**. These are text-based questions to add context to the spray patterns (examples in the image below).

6. **Completion page:** Finally, once complete the survey will take the user to a 'Thank You' page with the opportunity to upload any comments about the platform. If you used an image on the welcome page, this will also appear on the 'Thank You' page. You can also set a website where the user should be directed after the 'Thank You' page (in this case, I have used my personal web page).

When you are happy, click **Create Website** and it will generate your site and take you to a summary page:

If you are unhappy with anything, you can click on **click here to edit the site** to go back and make changes. If you are happy, you can click the top link in the list of languages to view the site using the English interface: https://map-me. org/sites/en/methods4c

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This will take you through the site that you just created – it is now ready to start collecting data!

If you now click on **home** in the top right-hand corner, you will see that your site is now listed in the Map-Me Manager, complete with links to edit, duplicate and delete it, as well as download links for all of the datasets associated with your site.

For more information, including on data processing, there is an instruction document from 2012 available here.

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Example(s) of Participatory Mapping in social science research:

Belfast Mobility Project

Researcher:
Dr Jonathan Huck, University of Manchester, funded by ESRC.

Participatory GIS was used to great effect as part of the Belfast Mobility Project (https://belfastmobilityproject.org). Here, we sought to understand how the complex and nuanced territorial boundaries between Catholic and Protestant communities in North Belfast (i.e., the boundaries that separate areas in North Belfast that are considered to be 'Catholic' from those considered to be 'Protestant') impacted upon the mobilities of individuals living within those communities. As part of this project, we used a PGIS survey to better understand the location and characteristics of these segregated spaces.

Due to the complexity of these territorial bounds, some of which are sharply defined (e.g., by the presence of a 'peace wall' separating two communities) and others of which are more vaguely defined, we elected to use the Map-Me platform to collect this data. Traditional PGIS systems tend to operate by letting the user draw either points or polygons (shapes) onto a map. Map-Me replaces this typical 'point and polygon' approaches used in GIS with a 'spray can' (or 'airbrush') interface, which removes the requirement for participant to define precise boundaries around the areas that they draw on the map. It also allows them to vary the size of the spray pattern (by zooming the map) and the density of the spray as a representation of their 'strength of feeling' about a particular location.

Each participant undertook the survey as part of a wider one-to-one interview with a researcher, which served to address issues relating to digital divides (see below). This meant we could provide computing equipment and the researcher was on hand to support the participant in getting their message across. It also helped to ensure that the participant was able to represent their thoughts on the map, and did not, for example, submit any data that were added 'by mistake'. The following questions were asked of each participant:

1. Please spray the areas you would consider to be Catholic.

2. Please spray the areas you would consider to be Protestant.

3. Please spray the areas you would consider to be mixed.

4. Please spray any local areas that you would define as public spaces that are shared by both communities.

Maps showing the results of these questions (along with other data collected as part of this project) are given at https://belfastmobilityproject.org/maps.html and the answers to questions 1-3 are also shown in Figure 1 (below).
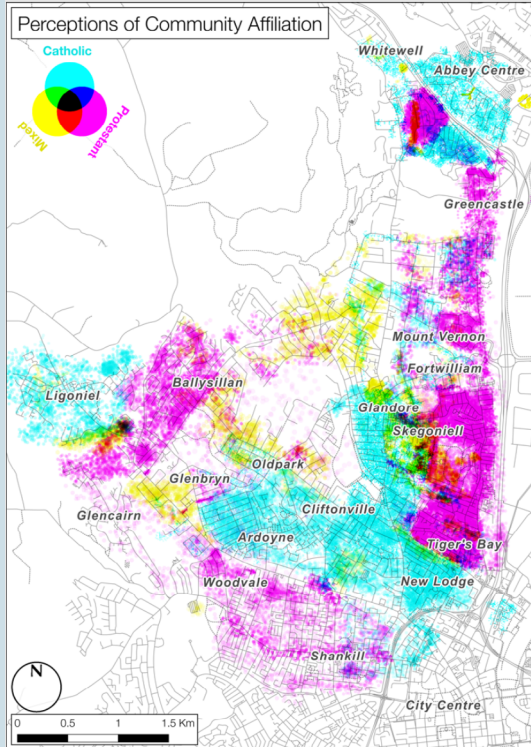
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Figure 1. *Participatory GIS representation of Catholic, Protestant and Mixed spaces in North Belfast, collected from 33 participants using the Map-Me PGIS platform as part of the Belfast Mobility Project. Colour blending has been used to illustrate the interaction between different classes (i.e., disagreement between participants, which results in the colours closer to the centre of the colour wheel, top left), of which there is relatively little evidence here, indicating a strong understanding of territorial boundaries amongst the participants (Reproduced from Huck et al., 2019). An interactive version is available here. Image Credit: Dr Jonny Huck. Road data © OpenStreetMap Contributors.*

Our analysis illustrated that the results were well supported by other datasets (census data, GPS traces, election campaign materials etc); as well as revealing interesting nuances that are overlooked by 'official' datasets (i.e., those derived from the census), which are based on administrative zones that do not always align well with socially-derived boundaries as understood by communities.

At its worst, this condition can result in the situation identified at Greencastle, where adjacent highly segregated communities are conflated into a single census zone, which is then reported as 'mixed' in official reports.

The question of shared spaces (Question 4) was also revealing, suggesting a clear pattern by which segregation was enforced in most aspects of life except for those driven by consumption. Spaces identified by participants as shared were predominantly places such as shopping centres, chain restaurants and supermarkets.

Traditionally, facilities in this part of Belfast are duplicated for each community (i.e., there would be separate Catholic and Protestant Post Offices, corner shops, leisure centres etc., all in close proximity).

Here, however, these nonplaces appear to be bucking this trend, with both groups seeming to share these spaces, even where they enter and exit via different sides of the building, as we found at Cityside retail park.

These findings would not have been identified without the use of participatory mapping alongside interviews and other data collection techniques and are of great importance to policy makers. For example, a series of maps like that in Figure 1 (below) were used in an exhibition by the Northern Ireland Ministry of Justice. Policy makers involved in desegregation efforts in Northern Ireland continue to use Map-Me to understand patterns of segregation, sharing and perceptions of paramilitary activity. More detail on our case study in North Belfast is given in Huck et al., (2019).

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Where else could Participatory Mapping be used?

Participatory mapping can be used in any situation where there is an opportunity to include more voices and experiences. The 'classic' applications of participatory mapping are around the support of decision making, normally relating to planning (e.g., identifying a suitable location for a new wind farm), but the method has since been extended to a wide range of applications across the social sciences.

Top tips

- Don't just rely on the defaults, use an 'off-the-shelf' platform or copy what others have done. Participatory Mapping has been a bit of a 'boom' area in publication over the past decade, which means that the literature can be very mixed in quality. It is important to think critically about the nature of the data that you are seeking to collect, and how your study might be designed to best support the participants in sharing their geographical thoughts and feelings.

- Give thought to whether you want to collect your data remotely or in person. Facilitated workshops are more work, but typically result in much richer datasets and more representative samples of participants.

- Pilot studies are essential for Participatory Mapping applications, it is often surprising how broadly people can interpret questions and instructions, and the opportunity to catch any ambiguities up-front is invaluable.

- If selecting a digital platform, you need to be sure that you are confident that it can keep your data secure. For web-based platforms, a good basic marker for this is if the web address starts with https:// rather than https:// (which indicates that it is using a secure connection). If you are collecting data on behalf of an organisation, you must also ensure that the platform meets the information governance requirements of that organisation (e.g., some require that data are stored in the same country as the organisation is

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⊕ Further reading

- Denwood, Timna, Huck, Jonny J & Lindley, Sarah. 2021. Effective PPGIS in spatial decision-making: Reflecting participant priorities by illustrating the implications of their choices. Transactions in GIS, 26(2), 867-886.

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- Elwood, S. (2006). Critical issues in participatory GIS: Deconstructions, reconstructions, and new research directions. Transactions in GIS, 10(5), 693-708.

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Huck, J. (2023) 'Participatory GIS' in Rodekirchen, M., Pottinger, L. Briggs, A., Barron, A., Eseonu, T., Hall, S. and Browne, A.L. (eds.) *Methods for Change Volume 2: Impactful social science methodologies for 21st century problems.* Manchester: Aspect and The University of Manchester.

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