USER MANUAL

PARTICIPATORY MAPPING

PUBLIC PARTICIPATION GEOGRAPHIC INFORMATION SYSTEMS (PPGIS)



Participatory mapping, often referred to as Public Participation Geographic Information Systems (PPGIS) or Participatory GIS (PGIS), enables stakeholders to express spatial preferences and identify meaningful locations directly on digital maps. Rather than relying solely on data from literature reviews or process-based modelling, participatory mapping captures place-based, local knowledge and lived experiences.

In practice, stakeholders are invited to map areas they value, use, or consider important, thereby revealing how ecosystem services are distributed and perceived across space. This approach is well-suited to identifying a broad range of ecosystem services, including both direct and indirect benefits. It is especially effective for provisioning and cultural ecosystem services, which are often grounded in personal experience and everyday use of specific locations.

Participatory mapping is a powerful tool for engaging the general public and diverse stakeholder groups. In the context of MPA management, it helps to better understand how people use marine protected areas, which locations they associate with specific benefits, and where potential conflicts or synergies with management measures may arise. While it has been widely applied in ecosystem service valuation, its usefulness extends beyond this context, supporting inclusive, spatially explicit decision-making processes.

Participatory mapping is typically used in the context of:

- Stakeholder engagement
- Mapping ecosystem services across space
- Visualising spatial patterns in stakeholder preferences and values
- Identifying areas of conflict or overlap between user groups
- Exploring spatial trade-offs between different ecosystem services
- Documenting place-based and local ecological knowledge
- Supporting zoning processes and spatial planning in MPAs
- Designing spatially targeted communication and management strategies
- Supporting participatory decision-making

WHEN SHOULD AN MPA MANAGER (NOT) USE PARTICIPATORY MAPPING?

USE PARTICIPATORY MAPPING

- \+ Need spatially explicit understanding
- \+ Identify where ecosystem services are provided or used
- \+ Visualise stakeholder preferences across space
- \+ Map conflicts or overlaps between user groups
- \+ Capture place-based and local (ecological) knowledge

AVOID PARTICIPATORY MAPPING

- − Time constraints
- − No spatial component in the research question
- − Highly technical biophysical assessment required

For more thorough insights into when and how to use this tool, please see below.

WHEN TO USE?

1

NEED SPATIALLY EXPLICIT UNDERSTANDING

Participatory mapping is particularly useful when the research or management question has a clear spatial component. Many ecosystem services vary across space, and management decisions often need to know where certain values or uses are located. By allowing participants to mark places directly on a map, this method makes it possible to visualise how ecosystem services, activities, or perceptions are distributed across a landscape or seascape. This spatial dimension can support more informed planning and management decisions.

2

IDENTIFY WHERE ECOSYSTEM SERVICES ARE PROVIDED OR USED

Participatory mapping is well-suited for identifying the locations where ecosystem services are generated or experienced by people. Stakeholders can indicate fishing areas, recreation sites, scenic viewpoints, or culturally important locations. This helps managers understand how people interact with ecosystems and which areas contribute to different types of benefits. Such information can complement ecological assessments by adding a human perspective on where ecosystem services are perceived or used.

3

VISUALISE STAKEHOLDER PREFERENCES ACROSS SPACE

Participatory mapping allows researchers and managers to translate stakeholder perspectives into actual spatial maps. Participants are invited to mark locations they consider important, valuable, or meaningful directly on a map. When these inputs are combined and analysed, they produce visual representations of where certain values or ecosystem services are perceived to occur. Such visual outputs can be directly used in spatial planning, communication, and management discussions.

WHEN TO USE?

MAP CONFLICTS OR OVERLAPS BETWEEN USER GROUPS

Participatory mapping can also reveal how different stakeholder groups value or use the same areas in different ways. For example, fishers, tourism operators, and conservation organisations may associate different benefits or priorities with the same locations. By comparing maps produced by different groups, it becomes possible to identify where values diverge, where activities overlap, and where potential conflicts may arise. At the same time, these comparisons can highlight areas where interests align or where compatible uses may be possible, making participatory mapping a useful tool for understanding trade-offs and supporting dialogue between stakeholder groups.

4

CAPTURE PLACE-BASED AND LOCAL (ECOLOGICAL) KNOWLEDGE

Stakeholders often possess detailed knowledge about local environments that is not captured in scientific datasets. Fishers, recreational users, tourism operators, and local residents may know where certain species occur, which areas are particularly productive, or how conditions have changed over time. Participatory mapping provides a structured way to document this place-based and local ecological knowledge and integrate it into spatial analyses and management discussions.

5

WHEN NOT TO USE?

1

TIME CONSTRAINTS

Participatory mapping requires time for preparation, respondent recruitment, facilitation, and data processing. Maps must often be digitised, cleaned, and analysed before they can be used in planning processes. When rapid results are needed or when resources are limited, simpler consultation methods such as short surveys or structured interviews may be more practical.

2

NO SPATIAL COMPONENT IN THE RESEARCH QUESTION

This method is only useful when the issue being studied has a clear spatial dimension. If the research question focuses primarily on attitudes, governance arrangements, or economic outcomes without a geographic component, participatory mapping may add little value. In such cases, qualitative interviews, surveys, or document analysis may be more appropriate.

3

HIGHLY TECHNICAL BIOPHYSICAL ASSESSMENT REQUIRED

Participatory mapping relies on stakeholder knowledge and perceptions rather than detailed ecological measurements. When the research requires precise biophysical data – such as species abundance, habitat quality, or environmental processes – scientific monitoring or modelling approaches are usually more suitable. Participatory mapping can still complement these methods by providing social information, but it cannot replace technical ecological assessments.



STEP-BY-STEP GUIDE

APPLICATION EXAMPLE

HOW WAS PARTICIPATORY MAPPING USED IN BLUE4ALL?

RESEARCH QUESTION

What social and cultural values do people associate with the Danish Wadden Sea, and where are these values spatially located?

To capture these values, a participatory geographic information systems (PPGIS) approach is used through an online survey. First, 240 respondents were asked to weigh different value types by distributing 100 points across a maximum of five values (e.g., aesthetic value, bird diversity value, cultural value, etc.). Second, respondents are asked to map up to five locations within the area that they consider particularly important for these values. In addition, the survey includes questions on respondents' demographics, their experiences with the area, and several open-ended questions to gain further insights into how the Northern Danish Wadden Sea is perceived and valued.

The survey results show that aesthetic, therapeutic, and recreational values received the highest weights from respondents and were most frequently identified as important. The spatial mapping further revealed differences between locals and non-locals in how these values are distributed across the Northern Danish Wadden Sea. While non-locals tend to concentrate their value points in a few well-known locations, locals attribute value to a broader range of places across the area. Across all value types, several clear spatial hotspots emerge where many respondents placed points. These hotspots often overlap for different values, indicating that certain locations in the Northern Danish Wadden Sea are perceived as important for multiple social and cultural values simultaneously.

This example demonstrates how participatory mapping can reveal which social and cultural values people consider most important and where these values are located in the landscape. By combining value weighting with spatial mapping, the method helps identify hotspots and patterns in how different groups perceive and use the area.

PHASE 1 – PREPARATION

STEP 1.
Clearly define your objective

Before designing the survey, clearly define the purpose of the participatory mapping exercise. Ask yourself:

- What information do I want to map, and why? Decide which social or cultural values you want participants to identify and how these values relate to your research or management objectives.
- How will the spatial information be used? Consider whether the results will be used to identify hotspots of valued places, compare stakeholder groups, and/or support spatial planning decisions.
- Which decision or research step will the mapping support? Participatory mapping is most effective when linked to a clear analytical goal, such as identifying priority areas, understanding spatial patterns in perceptions, or comparing how different groups value a landscape.

STEP 2.
Decide if participatory mapping is the appropriate method.

Participatory mapping is one of several tools for understanding stakeholder perspectives on landscapes or ecosystems. The choice of method depends on the objectives defined in Step 1.

Participatory mapping is particularly suitable when spatial information about values, experiences, or uses of an area is required. It allows researchers to capture both what people value and where these values are located.

Participatory mapping can also serve an exploratory purpose by revealing spatial patterns that are not captured by ecological or economic data. In many projects, it is most useful when combined with other methods such as interviews or ecological assessments.

STEP 3.
Identify participants

A well-designed participatory mapping survey should aim to capture a diverse set of perspectives.

a. Selecting participants
Participants may include local residents, visitors, tourists, recreational users, or other stakeholder groups depending on the objectives of the study. Online surveys distributed through mailing lists, social media, or local organisations are commonly used to reach participants. In addition to online surveys, offline data collection can also be used – for example at visitor centres, beaches, or community events – using tablets or paper-based questionnaires. While paper surveys require more work during data entry and spatial digitisation, they allow researchers to reach participants who may not respond to online surveys.

b. Common sampling strategies
Participatory mapping surveys often rely on non-probability sampling methods, most commonly convenience sampling or voluntary response sampling. This means that respondents participate voluntarily after encountering the survey through online distribution channels or direct recruitment. Researchers typically attempt to reach a broad range of respondents by distributing the survey through multiple channels (e.g. local organisations, tourism platforms, or community groups). When surveys are conducted offline, researchers can exercise greater control over sampling by approaching participants at specific locations, allowing them to intentionally include different types of users.



Potential pitfalls

Online participatory mapping surveys may attract respondents who are already highly interested in the topic, leading to self-selection bias. Occasional visitors or people less engaged with environmental issues may be underrepresented. Combining online and offline recruitment can improve diversity and representativeness, though offline surveys are more time-intensive and paper-based responses must be manually digitised before spatial analysis.

STEP 4.
Design the survey

Participatory mapping surveys usually consist of two main components: value elicitation and spatial mapping. The survey can be implemented using online platforms such as Qualtrics, which allows integration of interactive maps and structured questions.

- Value weighting: participants are first asked to indicate which values of the study area they consider most important. Possible value types may include: aesthetic value, biological diversity value, cultural value, recreational value, therapeutic value, and others. This step helps identify which values are perceived as most important overall.
- Spatial mapping: participants are then asked to identify specific locations that are important for these values. Select an appropriate base map and clearly delineate the boundaries within which participants can place their values. Include a limited number of reference features – well-known landmarks, villages, main roads – to support orientation, but be careful not to make these so visually dominant that they inadvertently bias where participants place their responses.
- Additional questions: include demographic questions (age, residence, education), experience with the area (frequency of visits, activities), and optional open-ended questions that allow respondents to explain their choices.

STEP 5.
Ethical preparation

Before conducting surveys, clear ethical procedures should be established. At the start of the survey:

- Explain the purpose of the survey and why the participant was invited
- Describe how the data will be used, including reports or research outputs
- Obtain informed consent before starting the survey questions
- Explain the right to withdraw at any time without consequences
- Clarify anonymity or confidentiality, and how identities will be protected



Data management should also be prepared in advance: ensure GDPR-compliant data handling including secure storage, and define how recordings, transcripts, and notes will be stored and accessed.

PHASE 2 – CONDUCTING THE SURVEY

STEP 6.
Pilot testing

Before wide distribution, pilot the survey with a small group of participants. This helps identify issues such as unclear instructions, difficulties with placing points on the map, or technical problems in the survey platform. Piloting ensures that participants understand the tasks and that the collected spatial data will be usable for analysis.

STEP 7.
Survey distribution

The survey can be conducted online or offline:

- Online: Participants complete the survey on their own devices. Distribution can be through social media, mailing lists, local organisations, or community networks.
- Offline: Participants complete the survey on tablets or paper-based maps. Offline methods allow better control over who participates and can reach groups less likely to respond online. Paper surveys require manual digitisation of spatial points before analysis.



Combining both approaches can improve coverage and participant diversity. Completing a survey of this type typically takes at least 15 minutes, so clear instructions and sufficient time should be allocated to ensure participants can provide thoughtful and accurate responses.

PHASE 3 – DATA PROCESSING

STEP 8.
Data cleaning

Export survey responses from the survey software to Microsoft Excel. Clean the data by removing incomplete or flagged responses and checking for errors in coordinates or value distributions. Paper-based or offline responses must first be digitised. All data should be stored securely to protect participant confidentiality – this may require pseudonymisation – with access limited to authorised persons and files stored in accordance with data protection requirements.



Step 9. Spatial data preparation

Convert mapped points into spatial layers for analysis in QGIS. Tasks include:

- Georeferencing: transforming image pixels into real-world coordinates
- Creating point layers for each value type (e.g. aesthetic, recreational, cultural)
- Integrating geographic context by overlaying points with relevant spatial features such as administrative boundaries, land cover, or biodiversity layers

Example survey structure: mapping social and cultural ecosystem services

Introduction and consent
The survey should begin with a short introduction explaining the purpose of the research, the context of the study area, and the estimated time required to complete the survey. This section should also include a consent statement informing participants that their participation is voluntary and that they may withdraw at any time. Additionally, the introduction should clarify how the collected data will be used (e.g., academic research purposes) and how anonymity and confidentiality will be ensured. Respondents should explicitly confirm their consent before continuing with the survey.

Questions on familiarity with and experiences in the area
The next section should focus on respondents' familiarity with and experiences in the study area. These questions help establish the respondent's relationship with the landscape and provide important context for interpreting later responses.
Typical questions may include: whether the respondent has visited the area; frequency of visits; types of activities undertaken in the area; general impressions or experiences (e.g. using Likert scales).
This section helps distinguish between local users, frequent visitors, and people with limited experience, which can influence how values are perceived.

Section on weighing values
After establishing familiarity with the area, the survey can introduce a value assessment exercise. Respondents are presented with a list of predefined value categories (e.g., aesthetic, recreational, biological, etc.). The list of value categories should be clearly defined, and brief descriptions may be included to ensure consistent interpretation among respondents.
A common approach is to use a point allocation method, where respondents distribute a fixed number of points (e.g., 100 points) across a limited number of value categories (often up to five to make it manageable within time limitations). This method encourages respondents to prioritize values rather than selecting many equally, providing clearer insight into which values are perceived as most important.

Section on mapping values
Following the value prioritization exercise, respondents can be asked to spatially identify locations associated with specific values using an interactive map. For each value selected in the previous section, respondents may mark a limited number of points (e.g., up to five) representing locations they consider particularly important for that value. Clear instructions should be provided regarding how to place, remove, or modify points on the map. It is also useful to provide visual boundaries of the study area and include recognizable landmarks for orientation. Limiting the number of points helps maintain data clarity and spatial relevance.

Section on demographics
The final section should collect basic demographic information such as age group, gender, place of residence, education level, or other relevant background characteristics

PHASE 4 – ANALYSIS

STEP 10.
Statistical analysis

Statistical analysis (e.g. in R) can be used to examine patterns such as:

- Average weight assigned to each value type
- Differences between participant groups (e.g. locals vs. non-locals)
- Correlations between demographics and value preferences
- Correlations between different value types

This identifies which values are considered most important and how they vary across groups.

STEP 11.
Spatial analysis

Spatial analysis is used to identify patterns in how values are distributed across the landscape. This includes:

- Identifying hotspots where many participants placed points
- Analysing overlap and differences between different value types
- Comparing spatial patterns between participant groups (e.g. locals vs. non-locals)
- Cl
- Int



These analyses can be conducted using GIS software (e.g. QGIS, ArcGIS) and/or computational tools (e.g. Python, R), depending on available resources and the researcher's preferences.

SPATIAL ANALYSIS IN PRACTICE

EXAMPLE DANISH WADDEN

For example, in QGIS we can create heatmaps based on points mapped by respondents in the Northern part of the Danish Wadden Sea. Survey participants could self-identify as locals or non-locals, allowing us to compare spatial patterns between these subgroups. Respondents also mapped points corresponding to different value types, such as aesthetic, recreational, or cultural values. Using QGIS, we visualised these points as separate heatmaps, which highlights where different groups perceive higher concentrations of particular landscape values. This approach enables a clear spatial comparison of both respondent groups and value types, providing insights into how different actors experience and value the landscape.

For more advanced spatial analysis, computational tools such as R can be used to statistically identify hotspots and test spatial clustering, enabling a more quantitative understanding of where different groups perceive social and cultural values.



PHASE 5 – INTERPRETATION & REPORTING

STEP 12.
Assess validity

Validity of results

The validity of participatory mapping results depends on careful design, transparent methods, and thoughtful interpretation. Well-conducted surveys provide reliable insights into how people perceive and value places, but poor preparation can lead to biased, incomplete, or unclear results. It is important to remember that these data reflect perceptions and experiences, not objective ecological or social conditions. Results should therefore be interpreted alongside existing environmental datasets, land-use maps, or other social data layers whenever possible.

Key factors supporting validity

Neutral survey design: Questions and instructions should be open and unbiased so that participants can indicate values and map locations freely, without being influenced by the survey design or reference landmarks.
Representative participant selection: Relevant stakeholder groups should be included to ensure a diversity of perspectives. Combining online and offline recruitment helps reduce self-selection bias.
Transparent analysis: The steps used to process and analyse both value and spatial data should be clearly documented so that results can be understood and reproduced.
Reflexivity: Researchers should be aware of their own assumptions and the potential influence of survey design, landmark placement, or facilitation on participant responses.
Cross-check with existing data: Comparing mapped responses with environmental layers (e.g. habitat types, protected areas) or other social datasets can help contextualise findings and validate spatial patterns.

STEP 13.
Translate results into management action

Participatory mapping results should support practical management decisions. Their value lies in helping managers understand how stakeholders perceive and use the landscape, and using this knowledge to design measures that are realistic, place-based, and more likely to be accepted.

- Identify priority areas and hotspots: maps reveal which locations are considered most important by stakeholders, allowing managers to focus attention and resources where they are most needed.
- Understand stakeholder concerns in space: spatial patterns highlight where conflicts, overlaps, or competing uses occur, helping anticipate challenges in implementing measures.
- Design realistic and context-sensitive measures: place-based knowledge informs the design of interventions that fit local practices, preferences, and ecological conditions.
- Improve communication and engagement: visual maps can be used to explain decisions to stakeholders, showing how their values and perspectives were considered.
- Increase legitimacy and support: decisions that reflect stakeholder perceptions and spatially mapped values are likely to be seen as more credible and acceptable, reducing resistance and improving cooperation.

SUMMARY

Advantages and limitations

ADVANTAGES

Strong support for stakeholder dialogue

Participatory mapping engages stakeholders directly and captures where they value different places, linking perceptions to spatial locations and facilitating informed management discussions.

Rich and spatially explicit insights

The method produces detailed information on which values are considered important and where, allowing managers to identify hotspots, overlaps, and potential conflicts.

Context- and place-specific understanding

Mapping reflects local knowledge and experiences that may not be captured in existing ecological datasets, providing complementary insights for spatial planning.

LIMITATIONS

Time intensive

Designing surveys, conducting offline surveys, cleaning spatial data, and analysing results can require substantial effort – particularly when combining online and offline data collection.

Limited to local scale

Results typically reflect the specific study area and the stakeholder groups included; findings may not easily generalise to larger regions or different contexts.

Potential bias

Results may be influenced by participant self-selection, landmark placement, map design, or how points are interpreted. Careful design and transparent reporting are essential to address these risks.

SUMMARY

Common pitfalls and how to avoid them

Pitfall	How to avoid it
Biased sampling	Use multiple recruitment channels, combine online and offline surveys, and include diverse stakeholder groups to reduce self-selection effects.
Poor data quality	Check and clean both value and spatial data carefully; manually digitise offline responses with consistent procedures.
Ambiguous instructions	Provide clear, step-by-step guidance with examples for placing points and weighting values; pilot test the survey to identify confusing elements before full deployment.
Survey fatigue / length	Keep the survey concise and allow sufficient time; clearly communicate that completing it may take at least 15 minutes so participants are prepared.
Landmark bias	Choose reference features carefully and ensure they are not so visually dominant that they draw participants to place values near them regardless of actual experience.

Assumptions

The reliability of participatory mapping results depends on several underlying assumptions. If these are weak or not met, the quality and credibility of results may be reduced. The method assumes:

- Honest and engaged participants: participants provide genuine assessments of which locations and values are important to them.
- Accessible and interpretable map interface: participants can accurately locate and mark points on the provided map, whether online or offline.
- Representative local knowledge: participants have sufficient experience with the study area to provide meaningful spatial insights.
- Neutral survey design: survey instructions, value weighting, and map features do not bias participants toward specific locations or values.

IMPLEMENTATION CHECKLIST



- [ ] Define objectives and confirm that a spatial dimension exists in the research question
- [ ] Select participants, plan for both online and offline recruitment
- [ ] Design survey with value weighting and spatial mapping components
- [ ] Choose base map carefully; limit landmark features to avoid positioning bias
- [ ] Pilot test the survey before full deployment
- [ ] Obtain informed consent and explain data use
- [ ] Conduct survey (online and/or offline)
- [ ] Clean and digitise spatial and value data; ensure GDPR-compliant storage
- [ ] Analyse statistically (e.g. in R) and spatially (e.g. in QGIS)
- [ ] Cross-check with existing environmental and social datasets for validation
- [ ] Report results and visualise spatial patterns for management audiences



For more information on the Blue4All project, please visit our website or follow us on LinkedIn.

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