

Ethical Considerations in the Collection, Analysis, and Reporting of Spatial Data

Alexandria Zermeño

ABSTRACT

Geoethics includes the application of ethical principles to collection, analysis, and reporting of spatial data (the practice of geoscience). With the increasing ubiquitous use of spatial data, which includes human subject information, there are increasing instances of unethical uses of spatial data that lead to many social implications. Though there are ethical principles outlined for spatial practitioners, methods, tools, as well as standardized guidelines that apply ethics are poorly defined. Here, through a literature review analysis, regarding standards as well as methods along with a survey of practitioners around the world provided a breadth of knowledge regarding how ethics are applied to collection, analysis, and reporting of spatial data. The results show that there is a need for standardized guidelines, as well as formalized practices to train practitioners and reviewers on ethical uses of spatial data, in addition to the growing need to initiate research on these methods as technology advances and our world continues to change. This kind of research and work will encourage many to come together in common purpose to stand for human rights and advance interdisciplinary contributions, partnerships, and combined efforts to make the world a better place.

KEYWORDS

geoethics, GIS standards, GIS guidelines, practitioner methods, unethical practices

INTRODUCTION

“Ethics is about how we ought to live together. The creation of and access to [geospatial data] means we live together differently than we did before. That’s potentially a very good thing, but for it to be good, we must do the hard work of deciding who we are in relation to our data.

(“Locus Charter – EthicalGEO” n.d.)

EthicalGEO, an initiative started by the American Geographical Society, defines Geoethics through Micheal Rozier’s quote. Deciding who we are in relation to our data, implies that there are victims to data creation and access, like “GPS...visit sequences reveal people’s identity” (De Montjoye, et al. Zang and Bolot 2011) (Wang and McArthur, 2018, p. 976). Another example includes, “the technology industry and its products and services are now actually circumventing city- and state-level protections for vulnerable communities” (“Who’s Behind ICE?” 2018). An example is found in a study conducted in 2006, which reverse geocoded mortality locations from published maps by researchers studying mortality associated with Hurricane Katrina in New Orleans. The researchers were able to take points from a map published in a newspaper and find the homes of these victims, when a first respondent found their body, and when the victim was picked up. This example shows how easy a breach of confidentiality can happen when researchers publish results of analysis without keeping in mind ethical considerations (Curtis et al., 2006). A more recent example is a study done in 2020 by researchers using GPS tracking to understand the care-seeking behavior of mothers in rural India. It was clearly stated in their paper, “The ability to use GPS to trace the movements of people raises important ethical issues,” which they saw more when trying to get informed consent from participants and called GPS tracking a “‘double-edged’ sword” (Apte et al., n.d.). What Rozier is making clear, is that we can be complacent in being victims to unethical use, creation, and access to spatial data or we can do the hard work in defining and taking steps to further the field of Geoethics so we as citizens, industry, and academics can live as we ought to.

In order to overcome these implications of unethical use of spatial data, we need to define standards and practices. Just as a doctor for years goes through training, and learning privacy standards like The Health Insurance Portability and Accountability Act of 1996 (HIPAA) to protect patient information; these are kinds of standards GeoEthics also ought to have to keep practitioners

in the field of spatial data accountable, especially for spatial data that pertains to human subjects. For example, in a review of software for space-time disease surveillance which uses human-health and census data, it is mentioned that though there is extensive literature on disease surveillance, “software implementations are far from standardized”; and “Well-studied and understood methods are required to ensure appropriate use and transparent and reproducible results” (Robertson and Nelson 2010). Additionally, Abeler, discussing contact tracing and data protection within the COVID-19 pandemic, mentioned, “Trying to find a data-minimizing solution does not just protect fundamental rights. Such solutions will often increase the effectiveness and efficiency of the respective data-processing system. Only if people trust a system—because it does not spy on them—will the system find broad support in the population” (Abeler et al. 2020). The pandemic, though affecting many worldwide, fortunately exposed the insufficient amount of standards and methods of geospatial practitioners and reviewers. By exposing the previous gaps, there is now potential to advance systems to make them more effective and advance respect between research and human subjects, especially their human rights.

To create such training for practitioners (like HIPPA), one must understand *how* to apply ethical considerations to the collection, analysis, and reporting of spatial data. In mentioning “*how*”, this is like the method or standard to make sure an ethical principle is carried out into practice. To answer *how* we can apply these considerations, I will find examples of some of the laws, guidelines, and standards that have been applied to the collection, analysis, and reporting of spatial data. Additionally, I will look for methods, tools, and approaches that are applied to the ethical collection, analysis, and reporting of spatial data. This research will find if the methods and standards are applied in the field and whether or not they come from a universal standardized training. I predict that I will find applications and methods practitioners have used and that the responses will not be universal. The varying responses to applications of GeoEthics is in recognition of the purpose of this research; to collect a breath of knowledge, because the *how* in GeoEthics, has not been widely defined and acknowledged yet.

BACKGROUND

Practitioner Perspective

There are two kinds of perspectives and arguments regarding use of spatial data information. As seen in an article regarding privacy, the standpoints that are explained include a “technological standpoint” and an “ethical standpoint” (Keßler and McKenzie 2018). The technical standpoint includes practitioners of spatial data who view the ethical considerations as burdensome due to various time, energy, and organization; and even harder when there are discrepancies that are created by “discipline specific norms” (Hartter et al. 2013). Pessimistic perspectives toward ethics are also evident in technology “as if these were incompatible alternatives rather than all ingredients playing complementary roles in a desirable understanding of technology governance” (Bietti 2021) .

The second standpoint, regarding an ethical standpoint, is a standpoint that overlooks the burden and complexity. Where the major focus is not in convenience, but in acknowledgement that, “the potential for location information to be used as a tool of oppression cannot be overstated,” (Keßler and McKenzie 2018). In order to advance forward within the field of Geographic Information Science, these two differing standpoints of both ethics and geography must work together. By the ethical and technological community working together, it creates the field of Geoethics.

The Capetown Statement by the International Association for the Promotion of Geoethics (IAPG) defines geoethics as follows: “Geoethics consists of research and reflection on the values which underpin appropriate behaviors and practices, wherever human activities interact with the earth system. Geoethics deals with the ethical, social and cultural implications of geosciences knowledge, education, research, practice and communication, and with the social role and responsibility of geoscientists in conducting their activities” (Ryan and Bank 2017). To simplify this definition, Geoethics in this paper is defined as the application of ethical principles to collection, analysis, and reporting of spatial data (geoscience).

Where the two different standpoints regarding use of spatial data come together, both expertise in technology and ethics work together to create ethical use. An example of ethics and technology not working together, is found in a study conducted in 2006. This study reverse geocoded mortality locations from published maps by researchers studying mortality associated with Hurricane Katrina in New Orleans. The researchers were able to take points from a map published in a newspaper and find the homes of these victims, when a first respondent found their body, and when the victim was picked up. This example shows how easy a breach of

confidentiality can happen when researchers publish results of analysis without keeping in mind ethical considerations (Curtis et al., 2006).

Who is the Locus Charter?

In mentioning the word “Ethics”, what specifically are these ethical principles that a spatial practitioner must have in mind? Based on the Belmont Principles, ethics in research on human subjects is founded on beneficence, justice and respect for persons. To further specify these principles, the Locus Charter which is supported and administered by the American Geographical Society built core ethical principles for users of geospatial data. These principles are interdisciplinary in background, based on input from government, academic, and industry GIS practitioners. (“Locus Charter” 2021) (Figure 1).

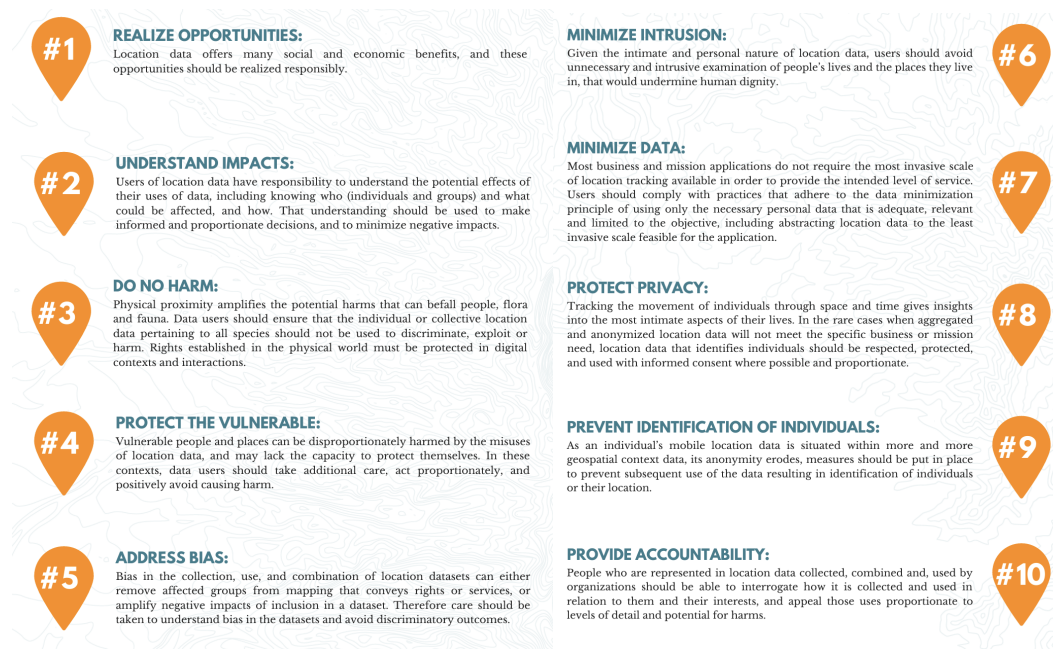


Figure 1. Locus Charter (“Locus Charter” 2021).

The How: Application of Ethical Considerations

Although strongly established ethical principles were outlined within the Locus Charter,

there is still a knowledge gap in application of these ethical principles. The Academic Network of the Americas (ANA) of The Regional Committee of United Nations on Global Geospatial Information Management for The Americas (UN-GGIM: Americas), carried out a survey which found that 77% of respondents did not have any standards on the ethical use of geospatial data in their respective government agencies. A lack of standards is of concern because identifying information such as zip code, date of birth, and gender can be collected by someone who is uneducated in applying ethical considerations. In that case, there could be a breach of confidentiality by uniquely identifying that person (Sweeney, 1997). The question that needs to be answered is, “the How”, how can a practitioner apply these ethical considerations.

Research Framework

Who is the IRB?

The IRB stands for the “Institutional Review Board” which is a board comprised of committees that evaluate research for ethical practices. The research evaluated by these boards doesn’t include every kind of research background, but research that involves Human Subjects. This kind of review board has become necessary for practitioners of human subject research across the United States, “to assure... that appropriate steps are taken to protect the rights and welfare of humans participating as subjects in the research” (Research 2019). The Collaborative Institutional Training Initiative (CITI Training), that educates many practitioners in the standards of ethics, compliance and safety; describes problems with “past studies that have violated ethical concerns”(Robinson-Bailey n.d.). These violations became lessons and pathways for new standards, trainings, and guidelines to be recognized in following research.

Spatial data is not separate from the ethical concerns if the latitude and longitude have a relationship with human subjects. The definition of a human subject that qualifies for review is defined by either: 1) being living, 2) gathering information (opinions, characteristics, and behaviors) on someone, 3) there is an intervention of before and after results, 4) there is an interaction between a subject and a researcher, 5) biospecimens, or 6) identifiable private information (private information that the researcher can identify in reality whom this information is associated with) (Robinson-Bailey n.d.). This is especially important because acknowledging

this relationship sets up the foundation of why, in order to answer this research question, we looked to the IRB. This is because within the IRB, there is a portion of the review process that does evaluate application of ethical considerations in spatial data human-subject research.

Since within the IRB, it is acknowledged that spatial data that includes identifiable private information involves ethical consideration. Then there must be standards and guidelines for this review, as there are many and very highly developed guidelines for medical human subject research (HIPPA) and other social-behavioral research as well.

Practitioner Training

The use of the word “practitioner” comes about because within Medical Research, those who are responsible and practice evaluating medical data, biospecimens, are called medical practitioners (“Practitioner Definition & Meaning - Merriam-Webster” n.d.). Moreover, those who practice evaluating spatial data involving human subjects will also be called practitioners within the geospatial field.

However, unlike medical practitioners, who may be in school for years before they practice working with human subjects in the field. Those with geospatial data and mapping interest can begin making maps and evaluating human-subject data as soon as one is able to access ArcGIS Online. ArcGIS Online is a public and online platform that can be shared with the world (“ArcGIS Online | Web GIS Mapping Software for Everyone” n.d.). Due to this cloud-based software being highly accessible, there are many different levels of expertise within the practice of geospatial data. Within industry, government, education, and research; “the proliferation of mapping technologies has sparked much attention and debate on the ethical conduct in the use of geographic information systems” (Blatt 2012). This widespread debate and recent attention is because many of these ethical concepts and considerations are not widely standardized.

Because as a student, I have more access to understanding the academic and research expertise, the practitioners that will be of focus with this research are practitioners in research and academia. As they are those who are required to go through ethical research training and have their work reviewed by the IRB, these practitioners became a focus of identifying how ethical considerations are applied.

Creating A Shared Breadth of Knowledge

In order for a spatial practitioner to make informed decisions about the tools and services that they are using, a “higher level of user education in the area of position tracking and location-based services is required”(Keßler and McKenzie 2018). This implies that if one is in a position of being highly educated, there is knowledge about the service they are using. Surveying practitioners of different backgrounds of research academically, will create a breadth of contributed knowledge that can be shared across disciplines.

METHODS

Data Collection: Ethical Guidelines and Laws

To collect information on the ethical guidelines and laws that are used by research reviewers, I conducted a literature review. The literature review process was learned from and advised by Michael Sholinbeck (University of California, Berkeley) and the resources provided for STEER students in the UC Berkeley Public Health Internship. The main resource portal that I used to collect literature was Web of Science. The Web of Science portal was a main resource to gather peer reviewed journals and additional literature reviews. I found this literature regarding guidelines and laws by filtering using Review Articles, sorted by relevance or newest. Then I queried “IRB big data, IRB data review, institutional review geospatial data”. To see more recent literature that was reviewed or written, I also filtered the articles to be within a time from publication from 2000-2022.

In order to select the relevant articles for research, I categorized the literature to be reviewed and analyzed into the locus charter matrix. This is a matrix that I individually created for the literature analysis. Within the “Locus Charter” there are 10 different principles related to ethics, and when analyzing the literature within its relevance to these principles it became clear that there are 7 primary principles that are more feasible to analyze due to clarity of the principle (clarity, meaning ability to measure and compare the principle to ethical execution within the guideline or standard).

The second source of collection of ethical guidelines and laws came from looking at recommended citations and similar works. When I read this research, I commonly found that the authors who did write about ethical guidelines and laws also wrote additional literature or collaborated with other authors. This was an especially helpful way to find additional literature and research. The final source of collection also came from the “Locus Charter Knowledge Repository.” This repository includes current and historical research, articles, and guidelines regarding ethics and geospatial data by the American Geographical Society. A survey was also created to collect additional and more specific information from IRB research reviewers on how research regarding geospatial data including human subjects is reviewed for ethical applications. However, since this survey was not deployed properly before this paper there was only 1 result collected.

Data Analysis: Ethical Guidelines and Laws

To analyze and organize the knowledge of ethical guidelines and laws, again the literature was separated into major categories regarding each principle found within the “Locus Charter” (which out of 10 there were 7 principles that were primarily focused on). From the major category made from the concept within each principle, there was a separation into knowledge gaps and additional research advancements.

To find results within the research that made known knowledge gaps and additional research advancements, I looked within the results and discussion sections of the literature. Some key words or phrases that I found which pointed us to a major knowledge gap include “recommendations, improve, solutions” which are key phrases and criteria we used to analyze the literature. In order to find indication of ethical guidelines that have made research advancements, some key criteria include “standards or guidelines”. Within the literature tables, I labeled these as “Advice” (research advancements) and gaps (knowledge gaps), and further literature is organized to note whether in reference to collection, analysis, or reporting of spatial data.

Data Collection - Practitioners

To collect information on the ethical methods and tools regarding considerations of collection, analysis, use, and reporting of spatial data for practitioners. I used a more detailed literature review and deployed a survey for practitioners. The literature analysis follows the same process as the collection method for guidelines and laws, however additional keywords that were used to find literature regarding methods used by practitioners include “geomasking, confidentiality, and privacy” to name a few. Additionally, because we were looking for methods and tools for applying ethical principles, I focused on looking within the methods section of geographic research to collect data on the tools and methods applied, as well as looking to referenced papers as well.

The methods of collection for the survey is a major part of this research project that was conducted. The first step in creating a survey for geospatial practitioners was to first find a platform that would be the most accessible. The platform the surveys were electronically administered was through Survey 123 (ESRI, Redlands, CA). To learn how to use this survey platform, I went through a training process on the ESRI website that showed me how to code and write the survey into excel to then transfer into Survey 123 (Figure 2).

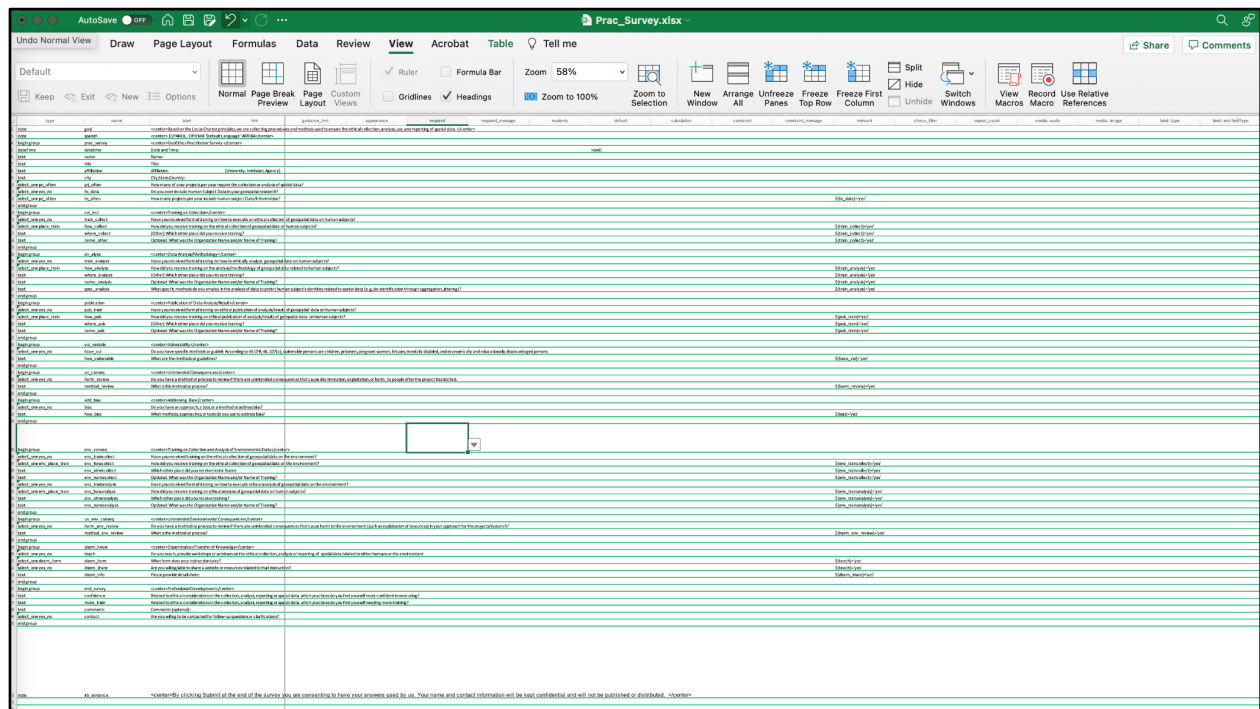


Figure 2. Prac_Survey: Survey 123 Form.

This survey was sent globally through our professional contacts, for example in the United Nations Global Geographic Information Management - Academic Network of the Americas committee, the Pan-American Institute for Geography and History, Researchers in the University of California system and other colleges and universities globally, NASA, NOAA, USEPA, and other government agencies and non-governmental agencies. The survey circulated widely and reached approximately 200 individuals within the time frame from February 1st to February 15th. I received 40 responses to the survey.

This survey was designed to take 10 to 15 minutes each for the respondent to complete. Survey123, (ESRI, Redlands, CA) allows the formatting of a variety of question types: (e.g., yes/no, multiline, branched) to collect responses in an accurate and organized way for analysis. The surveys are formatted into both Spanish and English.

Data Analysis - Practitioners

To analyze and organize the methods and tools practitioners use when collecting, analyzing, and reporting data; I analyzed the surveys and the literature. To analyze the literature, I organized the contents again within the Locus Charter Matrix. The criteria that was used to separate the literature regarding practitioner methods includes “method or tool” for example. Findings that included advancement in ethical consideration were placed in its own row if included key words like, “perform, minimize risk”. The criteria that was used to indicate the need for more research and a knowledge gap was indicated by “lack, uncertainty, need” .

Survey123 provides pre-programmed methods of summary analysis regarding survey data. For quantitative data there were different types of analysis provided: Bar, Pie, Map, or Column. Along with the results, there were counts of the respondents for particular questions (e.g. Yes/No) as well as a percentage of those results out of the total number of responses. For qualitative data, like multiline responses, there was a Word Cloud analysis that was provided. Initially, I had hoped to analyze the multiline responses from the surveys through the Dadoose platform but with the convenience of Survey 123 decided to keep analysis within the Word Cloud Survey 123 provides.

RESULTS

Literature Review

Understand Impacts

The application of this principle shows that there are general guidelines and bodies of knowledge regarding how practitioners and reviews could make sure to uphold this principle however the findings are not universal. (Table 1)

Advice		Gaps	
Reporting	<ul style="list-style-type: none"> Are Maps Necessary in Publications? (unlikely a reader needs the actual geographic space) (Curtis et al., 2006, p. 11) 	Reporting	<ul style="list-style-type: none"> ... findings were corroborated by a 2016 study that reviewed maps published in sexual health journals, and found that 56% of them failed to adequately mask home locations (Haley et al., 2016).” (Swanlund et al., 2020, p. 391) Notably, the vast majority of studies presenting unmasked or insufficiently masked point data were based on U.S. populations. It is likely that our review, which does not extend to products not subject to the rigor of peer-review (e.g., reports, presentations), underestimates the extent to which presented maps compromise individual confidentiality.” (Haley et al., 2016, p. 54) ”peer reviewed manuscripts which display identifiable individual point data or include quasi-identifiers in maps persist. These transgressions violate a fundamental ethical obligation to protect individual confidentiality and may be due in part to a lack of uniform guidelines and rapid advances in technology (Chang et al., 2009)” (Haley et al., 2016, p. 54)
Guideline	<ul style="list-style-type: none"> The International Committee of the Red Cross and Red Crescent published a detailed handbook on data protection in humanitarian action (Kuner and Marelli 2017). This handbook covers everything from basic data protection principles to questions about data sharing and data protection impact assessments (DPIA) in humanitarian contexts.(Zwitter and Gstrein, 2020, p. 4) CITI Training(Ahearn et al., 2013; DiBiase et al., 2007). The GIS&T Body of Knowledge (http://www.aag.org/bok/)(Ahearn et al., 2013; DiBiase et al., 2007). 	Guideline	<ul style="list-style-type: none"> 1. Develop and include a module about utilizing spatial data as a standard component of Human Subjects Training for all professionals in the field, including research and editorial staff. 2. Include modules on confidentiality and stigma considerations in GIS tutorials and in academic coursework.(Ahearn et al., 2013; DiBiase et al., 2007). In India, the Geospatial Information Regulation Bill (GIRB) has been drafted by the Government and is under review, which mandates prior permission to use geospatial data from the government licensing authority [21].” (Apte et al., 2019, p. 3)
Survey	<ul style="list-style-type: none"> Ethics Commission, IRB, Ethics Concept Module 	Collection & Analysis	<ul style="list-style-type: none"> Hence, data collection and utilization needs to follow the principle of proportionality and consider benefits and harms beyond individual interests. (Zwitter and Gstrein, 2020, p. 4) Location data during the current pandemic might be very useful for epidemiological analysis. However, if (ab-)used to re-calibrate political power relations, data can be open for misuse.Hence, any party supplying data and data analysis needs to check whether data and insights can be misused in the context they are presented.” (Zwitter and Gstrein, 2020, p. 5) Collection: Future research should examine the effects of geospatial data availability including the emergence of risks to landowners and impacts on conservation values.” (Rissman et al., 2017, p. 10)

Table 1. Advice and Gaps of Spatial Considerations, Understanding Impacts

Do no Harm

Especially in regard to the environment, there are fields of expertise in order to protect both the environment and human subjects though not universal. However, there is still research that needs to be done regarding private lands and conservation. (Table 2)

Advice		Gaps	
Reporting	<ul style="list-style-type: none"> : "In 2012, researchers at the Carinthia University of Applied Sciences built a GIS Portal for the collection and reporting of high-resolution household energy data in Hermagor, Austria (Paulus, Kosar, Erlacher, & Anders, 2014). To protect confidentiality, the energy demand maps offered by the portal display data aggregated to grid-like statistical units with data suppressed where" (Seidl et al., 2015, p. 253) 	Reporting	
Guideline	<ul style="list-style-type: none"> Dutch Red Cross, Red Cross, Red Crescent societies initiated a group of expertise in the field of innovation and data science for humanitarian action, which issued the "510 Data Responsibility Policy" (Van Der Veen n.d.). This policy introduces key principles such as: ... (3) Do No Harm. (Zwitter and Gstrein, 2020, p. 4) 	Guideline	
Survey	<ul style="list-style-type: none"> https://spatialreserves.wordpress.com Geotechcenter.org Society for Conservation GIS UNESP UnB Random sampling 	Collection & Analysis	<ul style="list-style-type: none"> For instance, lands closed to public recreation can be clearly marked. In some cases, certain sensitive lands may be available in GIS form without permission to publish, or as centroids rather than polygons, but may not be available online. Although this limits transparency and analysis and creates an "epistemic asymmetry" between conservation organizations and the public (Oksanen and Kumpula 2013), it may be appropriate for a small proportion of properties with sensitive conservation or cultural values. As geospatial technologies advance, there is some uncertainty about how data may become used in the future. (Rissman et al., 2017, p. 10)

Table 2. Advice and Gaps of Spatial Considerations, Do no Harm.

Protect the Vulnerable

In order to protect the vulnerable, many guidelines and standards come from guidelines in City Trainings. However, the applications regarding collection, analysis, and reporting are very limited and need advancement to find the best practices. (Table 3)

Advice		Gaps	
Reporting		Reporting	<ul style="list-style-type: none"> Availability of this information in the public domain may increase the risk of identification for the participants. While this is especially pertinent for vulnerable populations, such as people living with HIV, protecting spatial confidentiality and participant identity should be a consideration for GST research in general.” (Apte et al., 2019, p. 4)
Guideline	<ul style="list-style-type: none"> Dutch Red Cross, Red Cross, Red Crescent societies initiated a group of expertise in the field of innovation and data science for humanitarian action, which issued the “510 Data Responsibility Policy” (Van Der Veen n.d.). These guidelines cover largely the same aspects as the OCHA guidelines. These concern particularly the fair data processing of vulnerable data subjects, data minimization as well as data retention and deletion.(Zwitter and Gstrein, 2020, p. 4) 	Guideline	
Survey	<ul style="list-style-type: none"> Signal Code Study Participants sign Forms NIH Global Health Network Geomasking, Deidentifying, Aggregation, Anonymization CITI Training IRB Protocol 	Collection & Analysis	<ul style="list-style-type: none"> Hence, data collection and utilization needs to follow the principle of proportionality and consider benefits and harms beyond individual interests. (Zwitter and Gstrein, 2020, p. 4)

Table 3. Advice and Gaps of Spatial Considerations, Protect the Vulnerable.

Address Bias

To address bias there are some guidelines and methods, however the standards for practitioners are not specific to address the measure of bias and the methods regarding bias still remain a concern for practitioners on their dependability. (Table 4)

Advice		Gaps	
Collection & Analysis	<ul style="list-style-type: none"> “In order to minimize this risk during the care-seeking study, strict implementation of data safety system was observed. This included provision of secured server space, data anonymization, data encryption, restricted access to collection and storage of care-seeking study movement data generated by smart phones” (Apte et al., 2019, p. 5) 	Reporting	
Guideline	<ul style="list-style-type: none"> Dutch Red Cross, Red Cross, Red Crescent societies initiated a group of expertise in the field of innovation and data science for humanitarian action, which issued the “510 Data Responsibility Policy” (Van Der Veen n.d.). This policy introduces key principles such as: ... (2) Legality and Legitimacy, 4) 	Guideline	
Survey	<ul style="list-style-type: none"> Statistical Analysis Outliers Testing for Bias 	Collection & Analysis	<ul style="list-style-type: none"> Further key areas of concern are (Karunakara 2013; Qadir et al. 2016; Gstrein and Zwitter n.d.; Ali et al. 2016): (1) the potential use of Big Data for unethical ends; (2) the potential to mislead through reliance on unrepresentative and biased data; (3) the various privacy and security challenges associated with data (including the danger data being tampered with), (4) and the erosion of humanitarian principles by the exploitative use of data through corporate agents.” (Zwitter and Gstrein, 2020, p. 5)

Table 4. Advice and Gaps of Spatial Considerations, Address Bias.

Minimize Data

There are many and more specific practices for the minimization of data, however there are not guidelines and standards universally that were found in this research. There still needs to be research regarding the minimization of data in low- and middle-income countries. (Table 5)

Advice		Gaps	
Collection & Analysis	<ul style="list-style-type: none"> “...data should not be collected.. unless it is necessary to provide the service, or as we argue below, to audit data processing systems for bias. Once collected, it certainly should not be used to discriminate.” (Null et al., 2021, p. 8) “The harm caused by data breaches, hacks, or unauthorized access of data within an organization is simply too great to justify collecting more data than is necessary to provide a product or service. Organizations have the responsibility to secure and protect the data they process. Minimizing the amount of data they collect is one of the best, most human rights-respecting ways to prevent privacy violations and harms.” (Null et al., 2021, p. 9)(Zwitter and Gstrein, 2020, p. 4) “Organizations should frequently audit their systems to ensure they are limiting the data they collect to that which is necessary to provide their service, and thus limit the harm they could potentially cause. Indeed, if they do not, they may run afoul of their nation’s laws.” (Null et al., 2021, p. 9) Regulators that do not ban behavioral advertising should at minimum require limits to the data collected for this purpose: An organization that collects data for advertising purposes—which should already be minimized to follow general data minimization principles—should be required to delete, not merely de-identify, that information, as well as any information they inferred from that data, after 30 days.(Null et al., 2021, p. 9) 	Reporting	
Guideline		Guideline	
Survey		Collection & Analysis	<ul style="list-style-type: none"> While there is an emerging body of literature exploring the ethical considerations of location tracking, few studies address these through the lens of scientific research and fewer still do so in the context of low- and middle-income countries [2,4-6,14].” (Apte et al., 2019, p. 2)

Table 5. Advice and Gaps of Spatial Considerations, Minimize Data.

Protect Privacy

There are many methods and tools for the protection of privacy however there needs to be more research done on which methods are the most effective and practical for researchers. It is also made known that there is lacking education of available practices and universal guidelines. (Table 6)

Advice		Gaps	
<p>Analysis</p> <ul style="list-style-type: none"> MaskMy.XYZ that makes geographic masking easy to perform. It executes donut geomasking, a well known geographic mask, on thousands of points in seconds, and visualizes the original and masked point patterns in an integrated web map for visual comparison. MaskMy.XYZ also features metrics for both privacy protection and information loss, and allows users to rapidly and iteratively adjust masking parameters based on these metrics. The user interface was designed to prioritize usability, and clear documentation has been included to educate users about geographic masks, which is otherwise only found in niche literatures. By developing this application, we hope that geographic masks will be more widely adopted such that privacy is better protected in research.” (Swanlund et al., 2020, p. 390) 		<p>Reporting</p> <ul style="list-style-type: none"> “The limited scope for anonymisation of movement data is a big challenge in global health research for sharing of data. Accidental self-disclosure leading to breaches of locational privacy is a possibility: if participants are given access to GST-enabled smartphones with which they are unfamiliar, their incidental use of the devices may result in inadvertently revealing information about themselves.” (Apte et al., 2019, p. 4) 	
		<p>Guideline</p> <ul style="list-style-type: none"> “Among these reforms, we identify the urgency for new ethical guidelines and new ethical assessment tools to safeguard society from novel risks brought by big data research.” (Ferretti et al., 2021, p. 10) 	
<p>Reporting</p> <ul style="list-style-type: none"> “Improperly configured public surveys containing survey layers with the ‘update’ and ‘query’ capabilities enabled allows unauthorized individuals to change, delete, export, or add incorrect or misleading data to your survey layers via the ArcGIS Rest API. These activities may result in significant adverse effects to data security and survey respondent privacy. With this configuration, there is NO assurance of the origin, authenticity, and integrity of survey responses. NEVER configure your survey layers with these settings when collecting critical or sensitive information, otherwise your organization’s reputation may be impacted and/or subjected to regulatory penalties such as under GDPR or CCPA. Take the time to validate your survey configuration now” (RandallWilliams, 2020, p. 7) 		<p>Collection & Analysis</p> <ul style="list-style-type: none"> “A next step for research on Vorono (VM)i masking is an evaluation of its reversal potential. While VM outperforms the other methods for privacy tested in this study, an obfuscation method is only valuable if it cannot be reversed and deciphered. The advantage for privacy in RP and WRP is that randomization makes the resulting pattern challenging to reverse engineer and infer actual identities. The pattern in VM is not random, and is instead dependent on the spatial structure of residences within a study area. If a VM could be decrypted based on, for example, alignment with Voronoi polygons, there is a greater risk to privacy with this method. This potential vulnerability remains untested at this time, and more research is needed in reverse engineering of masking techniques.” (Seidl et al., 2015, p. 262) it is critically important that we raise awareness and educate investigators who may not otherwise be familiar with past work (Gutmann et al., 2008; National Research Council (U.S.). Panel on Confidentiality Issues Arising from the Integration of Remotely Sensed and Self-Identifying Data., 2007; VanWey et al., 2005)” (Haley et al., 2016, p. 51) 	
<p>Survey</p>			

Table 6. Advice and Gaps of Spatial Considerations, Protect Privacy.

Protect Confidentiality

There are many methods and tools for the protection of privacy however there needs to be more research done on which methods are the most effective and practical for researchers. It is also made known that there is lacking education of available practices and universal guidelines. (Table 7)

Advice		Gaps	
<p>Data Collection & Reporting</p>	<ul style="list-style-type: none"> We present a computer program named Datafly that uses computational disclosure techniques to maintain anonymity in medical data by automatically generalizing, substituting and removing information as appropriate without losing many of the details found within the data. Decisions are made at the field and record level at the time of database access, so the approach can be used on the fly in role-based security within an institution, and in batch mode for exporting data from an institution. (Sweeney, 1997, p. 442) 	<p>Reporting</p>	<ul style="list-style-type: none"> “There are examples in the literature where the exact location data for research participants were published in academic journals and newspapers, leading to a breach of spatial confidentiality due to scientists’ or publishers’ negligence [22,23]. To some extent, published maps with masked confidential locations could also be reengineered to reveal the exact location of an individual [22]. (Apte et al., 2019, p. 4) “Our scoping review identified 17 manuscripts related to sexual and reproductive health published and indexed in PubMed between January 1, 2013 and September 1, 2015 presenting insufficiently masked point data or small-population geographic units with quasi-identifiers or did not include details on whether or how data were masked, potentially compromising the confidentiality of study participants. Similar to Kounadi and Leitner, we found that over half of manuscripts including maps with point data presented point data that were either unmasked or did not include details on whether or how data were masked (Kounadi and Leitner, 2014) “Notably, the vast majority of studies presenting unmasked or insufficiently masked point data were based on U.S. populations. It is likely that our review, which does not extend to products not subject to the rigor of peer-review (e.g., reports, presentations), underestimates the extent to which presented maps compromise individual confidentiality.” (Haley et al., 2016, p. 5)
<p>Analysis</p>	<ul style="list-style-type: none"> : MaskMy.XYZ that makes geographic masking easy to perform. It executes donut geomasking, a well known geographic mask, on thousands of points in seconds, and visualizes the original and masked point patterns in an integrated web map for visual comparison. MaskMy.XYZ also features metrics for both privacy protection and information loss, and allows users to rapidly and iteratively adjust masking parameters based on these metrics. The user interface was designed to prioritize usability, and clear documentation has been included to educate users about geographic masks, which is otherwise only found in niche literatures. By developing this application, we hope that geographic masks will be more widely adopted such that privacy is better protected in research.” (Swanlund et al., 2020, p. 390) 	<p>Guideline</p>	
<p>Survey</p>		<p>Collection</p>	<ul style="list-style-type: none"> “While conducting the care-seeking study, we found that the overall awareness regarding the nature of GPS technology was low amongst the rural population. However, concerns over confidentiality were raised by several study participants, some even asking whether the device could record conversations or videos of their activities. There was one refusal to consent based on the issue of confidentiality.” (Apte et al., 2019, p. 4)

Table 7. Advice and Gaps of Spatial Considerations, Protect Confidentiality.

GeoEthics Practitioner Survey



In total there were 40 respondents to the survey, the majority of respondents being current professors in universities within the United States of America. 65% of the respondents work on 5 or more projects that include collection and analysis of spatial data. (Figure 1)

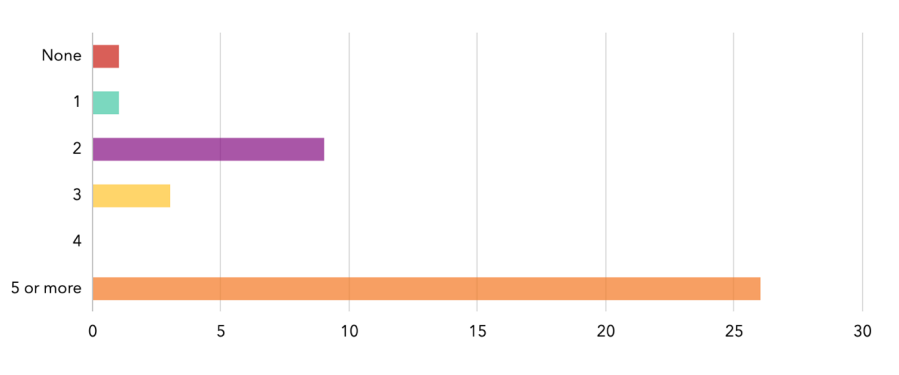


Figure 1. Projects requiring collection or analysis of spatial data.

Out of 39 respondents 47.5% shared that their geospatial research included Human Subject Data; of this half, 17.5% shared that 5 or more of their projects included Human Subject Data.

Training on Collection:

70% of the respondents shared that they have not received formal training on how to execute an ethical collection of geospatial data. Of the 11 respondents who have had training on ethical collection of geospatial data, half of them referenced CITI Training. (Figure 2)

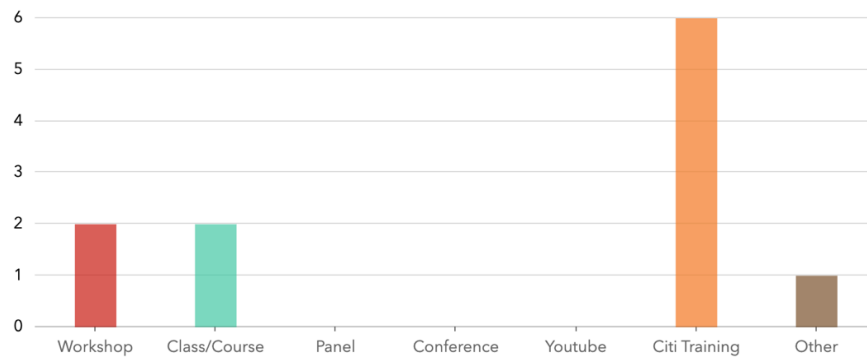


Figure 2. Practitioners who received formal training on ethical collection of geospatial data on Human Subjects.

Data Analysis/Methodology

72.5% of the respondents have not received training on how to ethically analyze geospatial data on human subjects. Of those who have received training (10 respondents), there is a variety of places practitioners look to. One of the respondents shared that their university “provided training/information regarding the collection of any data.” A new source that was shared includes “Harvard Humanitarian Initiative”. (Figure 3)

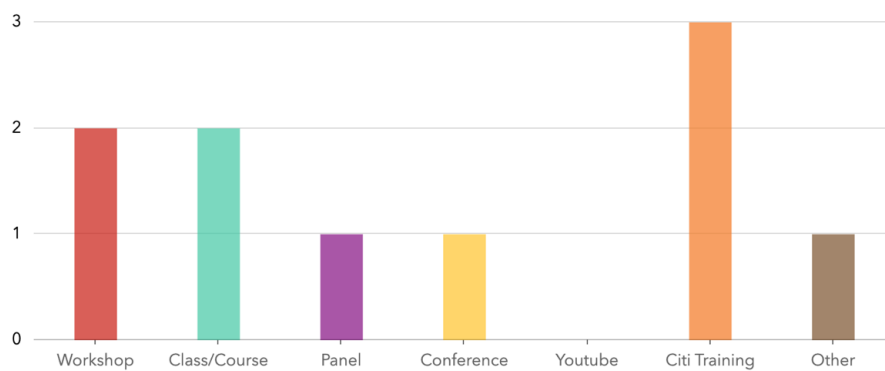


Figure 3. Practitioners who received formal training on ethical analysis of geospatial data on human subjects.

Publication of Data Analysis/Results:

72.5% of the respondents have not received training on how to ethically publish analysis/results of geospatial data on human subjects. There are a variety of places that respondents receive training, those who seek out training from CITI training are the same as respondents who seek out course instruction. (Figure 4)

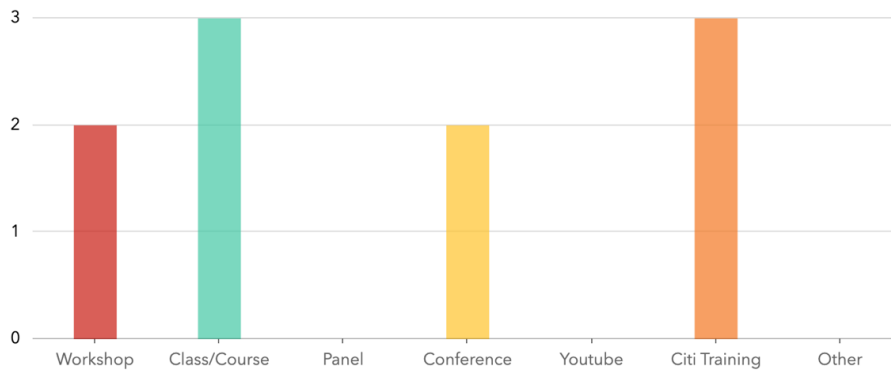


Figure 4. Practitioners who received formal training on ethical publication of analysis/results of geospatial data on Human Subjects.

Training on Collection and Analysis of Environmental Data

77.5% of the respondents have not received training on the ethical collection of Environmental Data. Out of the 8 respondents who have received training, the majority shared that they received training from a course. (Figure 5)

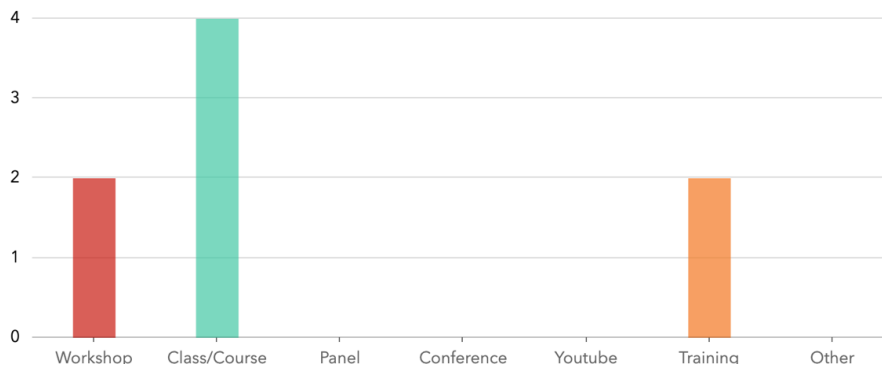


Figure 5. Practitioners who received training on ethical collection of geospatial data on the environment.

Dissemination/Transfer of Knowledge

57.5% of the respondents do not teach or provide workshops and seminars to share their knowledge. 16 respondents shared their knowledge in the form of course instruction. (Figure 6)

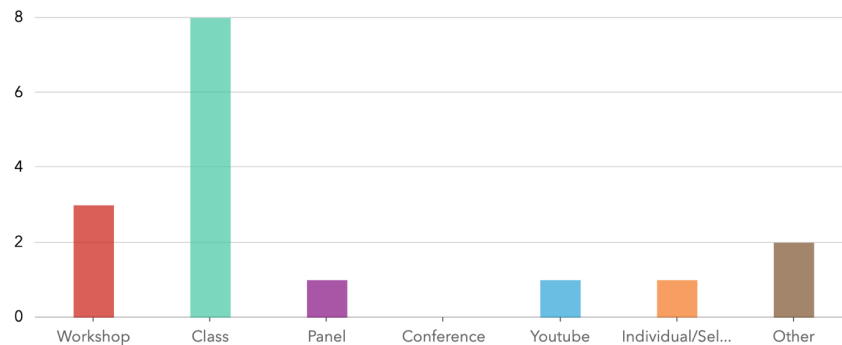


Figure 6. Practitioners who provide workshops or seminars on the ethical collection, analysis, or reporting of spatial data related to either humans or the environment.

DISCUSSION

The purpose of this study was to understand how ethical considerations are applied within collection, analysis, and reporting of spatial data. The literature review and survey analysis provided preliminary insight into the methods and tools as well as guidelines and standards that are being used within the geospatial field to consider ethical principles. However, although there are some applications that contain ineffective and inaccurate practices and for accurate effective practices, there is a lack of education and training for practitioners who are not aware and do not make use of the practices.

Formalization and Standardized Practices

Though I have found many different guidelines, methods, and tools found within the literature. The surveys have made clear that there is lack of training and education on ethical practices. Additionally, because there are still knowledge gaps, consequences seen within the literature of unethical practices (i.e., reidentification of personal information due to lacking use of

masking), the trainings that are of use are not equipping and training practitioners thoroughly. Advocating for standardized practices where research practitioners can receive necessary and updated training techniques is vital to researcher efficacy.

Developing Research Initiatives

In order to create standardized guidelines, and methods to meet those guidelines, it is necessary for there to be a push for GeoEthics Research. Which combines both technical and ethical fields to find high utility, effective, practical, and strong applications for ethical considerations. Due to Geoethics still being a developing field, that is why within the answers of those who were surveyed and within the literature there are many different responses and standards.

Limitations and Future Directions

As this is preliminary research, there are limitations to the generalizability of this research. Beginning with the survey analysis, due to a technical error in sending out the survey for the IRB there was only 1 response. Due to this error, there was much more focus placed on the practitioner results for collection, analysis, and reporting. Also, the main platform that was used within the literature search was Web Of Science. There could have been much more literature and research review that could have been missed.

Into the future, there is great significance in strengthening and collaborating in this research as well. Resending the practitioner survey would be key to collecting precious insight from practitioners on ethical methods and tools. Resending the IRB survey would also grant insight to the efficacy of CITI and IRB Review and also encourage a restructuring of their spatial education, training and review. Lastly, there is also interest and inquiry into the industrial field, to understand whether there is a higher or lower standard of ethical applications in comparison to academia. Answering this question could also encourage much more collaboration within geographical fields.

Broader Implications

If there is no awareness regarding the application of GeoEthics, as we have seen, there are serious implications to government and academic efficacy (Kim et al. 2021). As our world continues to change, and advance, if these methods and guidelines are not defined, we could lose our opportunity in advocating for our human rights. Bringing together technology and the social ethical fields together, can be a first step in not only advancing the field of GeoEthics. This kind of research and work will encourage many to come together in common purpose to stand for human rights and advance interdisciplinary contributions, partnerships, and combined efforts to make the world a better place.

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IRB Soc-Beh-Ed-Exempt Review

REFERENCES

- Abeler, J., M. Bäcker, U. Buermeyer, and H. Zillessen. 2020. COVID-19 Contact Tracing and Data Protection Can Go Together. *JMIR mHealth and uHealth* 8:e19359.
- Abhayaratna, J., E. Daemen, and K. Janowicz. 2021, May 27. The Responsible Use of Spatial Data. <https://www.w3.org/TR/responsible-use-spatial/>.
- AGU_Annual_Ethics_Report_2020.pdf. (n.d.). .
- Apte, A., V. Ingole, P. Lele, A. Marsh, T. Bhattacharjee, S. Hirve, H. Campbell, H. Nair, S.

- Chan, and S. Juvekar. 2019. Ethical considerations in the use of GPS-based movement tracking in health research – lessons from a care-seeking study in rural west India. *Journal of Global Health* 9:010323.
- ArcGIS Online | Web GIS Mapping Software for Everyone. (n.d.). . <https://www.esri.com/en-us/arcgis/products/arcgis-online/overview>.
- Bernman, G., S. de la Rosa, and T. Accone. 2018, February. Ethical Considerations When Using Geospatial Technologies for Evidence Generation. UNICEF-IRC: Innocenti Discussion Papers.
- Bietti, E. 2021. From Ethics Washing to Ethics Bashing: A View on Tech Ethics from Within Moral Philosophy. SSRN Scholarly Paper, Social Science Research Network, Rochester, NY.
- Blatt, A. J. 2012. Ethics and Privacy Issues in the Use of GIS. *Journal of Map & Geography Libraries* 8:80–84.
- Crampton, J. 1995. The Ethics of GIS. *Cartography and Geographic Information Systems* 22:84–89.
- Curtis, A. J., J. W. Mills, and M. Leitner. 2006. Spatial confidentiality and GIS: re-engineering mortality locations from published maps about Hurricane Katrina. *International Journal of Health Geographics* 5:44.
- Curty, R. G., J.-S. Lee, W. Chang, T.-H. Kao, and W. Jeng. 2022. Practicing What is Preached: Exploring Reproducibility Compliance of Papers on Reproducible Research. Pages 255–264 *Information for a Better World: Shaping the Global Future*. Springer, Cham.
- DiBiase, D. 2017. Professional and Practical Ethics of GIS&T. *Geographic Information Science & Technology Body of Knowledge* 2017.
- Dyer, S., and D. Demeritt. 2009. Un-ethical review? Why it is wrong to apply the medical model of research governance to human geography. *Progress in Human Geography* 33:46–64.
- ESRI. 2020. ArcGIS Location Tracking Privacy Best Practices:54.
- EthicalGEO Pod – EthicalGEO. (n.d.). .
- Ferretti, A., M. Ienca, M. Sheehan, A. Blasimme, E. S. Dove, B. Farsides, P. Friesen, J. Kahn, W. Karlen, P. Kleist, S. M. Liao, C. Nebeker, G. Samuel, M. Shabani, M. Rivas Velarde, and E. Vayena. 2021. Ethics review of big data research: What should stay and what should be reformed? *BMC Medical Ethics* 22:51.
- Gabriela García Seco. 2021. Seminario virtual Marzo 22,2021.

- Gaudet, C. H., H. M. Annulis, and J. C. Carr. 2003. Building the Geospatial Workforce 15:10.
- Hartter, J., S. J. Ryan, C. A. MacKenzie, J. N. Parker, and C. A. Strasser. 2013. Spatially Explicit Data: Stewardship and Ethical Challenges in Science. *PLOS Biology* 11:e1001634.
- Herbretreau, V., C. Révillion, and E. Trimaille. 2018. GeoHealth and QuickOSM, two QGIS plugins for health applications. Pages 257–286 in N. Baghdadi, C. Mallet, and M. Zribi, editors. *Earth Systems - Environmental Sciences : QGIS in Remote Sensing Set*. ISTE.
- Jelinek, A. 2020, April 21. Guidelines 04/2020 on the use of location data and contact tracing tools in the context of the COVID-19 outbreak. European Data Protection Board.
- Keßler, C., and G. McKenzie. 2018. A geoprivacy manifesto. *Transactions in GIS* 22:3–19.
- Kim, J., and M.-P. Kwan. 2021a. Travel time errors caused by geomasking might be different between transportation modes and types of urban area. *Transactions in GIS* 25:1910–1926.
- Kim, J., and M.-P. Kwan. 2021b. An Examination of People’s Privacy Concerns, Perceptions of Social Benefits, and Acceptance of COVID-19 Mitigation Measures That Harness Location Information: A Comparative Study of the U.S. and South Korea. *ISPRS International Journal of Geo-Information* 10:25.
- Kim, J., M.-P. Kwan, M. C. Levenstein, and D. B. Richardson. 2021a. How do people perceive the disclosure risk of maps? Examining the perceived disclosure risk of maps and its implications for geoprivacy protection. *Cartography and Geographic Information Science* 48:2–20.
- Kim, J., M.-P. Kwan, M. C. Levenstein, and D. B. Richardson. 2021b. How do people perceive the disclosure risk of maps? Examining the perceived disclosure risk of maps and its implications for geoprivacy protection. *Cartography and Geographic Information Science* 48:2–20.
- Kounadi, O., and B. Resch. 2018. A Geoprivacy by Design Guideline for Research Campaigns That Use Participatory Sensing Data. *Journal of Empirical Research on Human Research Ethics* 13:203–222.
- Kwan, M.-P., I. Casas, and B. Schmitz. 2004. Protection of Geoprivacy and Accuracy of Spatial Information: How Effective Are Geographical Masks? *Cartographica: The International Journal for Geographic Information and Geovisualization* 39:15–28.
- Lavery, D. 2017, December 5. Suppress Low Counts and Still Create Informative Web Maps with Pop-ups.
- Locus Charter – EthicalGEO. (n.d.). .

- Luan, H., and J. Law. 2014. Web GIS-Based Public Health Surveillance Systems: A Systematic Review. *ISPRS International Journal of Geo-Information* 3:481–506.
- Malin, B. 2012. Guidance on De-identification of Protected Health Information:32.
- McKittrick, M., N. Schuurman, and V. Crooks. 2022. Collecting, analyzing, and visualizing location-based social media data: review of methods in GIS-social media analysis. *GeoJournal*.
- Milligan, T. 2018. Valuing Humans and Valuing Places: “Integrity” and the Preferred Terminology for Geoethics. *Geosciences* 8:25.
- Null, E., I. Oribhabor, and W. Escoto. 2021, May 20. Why we need data minimization safeguards now (and how to do it).
- Parker, M. J., C. Fraser, L. Abeler-Dörner, and D. Bonsall. 2020. Ethics of instantaneous contact tracing using mobile phone apps in the control of the COVID-19 pandemic. *Journal of Medical Ethics* 46:427–431.
- Pavlovskaya, M. E. 2002. Mapping Urban Change and Changing GIS: Other views of economic restructuring. *Gender, Place & Culture* 9:281–289.
- Practitioner Definition & Meaning - Merriam-Webster. (n.d.). . <https://www.merriam-webster.com/dictionary/practitioner>.
- RandallWilliams. 2020, May 13. New White Paper: Discovering and Limiting Access to Public Survey123 Results.
- Research, C. for D. E. and. 2019. Institutional Review Boards (IRBs) and Protection of Human Subjects in Clinical Trials. FDA.
- Rights (OCR), O. for C. 2012, September 7. Methods for De-identification of PHI. Text. <https://www.hhs.gov/hipaa/for-professionals/privacy/special-topics/de-identification/index.html>.
- Rissman, A. R., J. Owley, A. W. L’Roe, A. W. Morris, and C. B. Wardropper. 2017. Public access to spatial data on private-land conservation. *Ecology and Society* 22:art24.
- Robertson, C., and T. A. Nelson. 2010a. Review of software for space-time disease surveillance. *International Journal of Health Geographics* 9:16.
- Robertson, C., and T. A. Nelson. 2010b. Review of software for space-time disease surveillance. *International Journal of Health Geographics* 9:16.
- Robinson-Bailey, L. (n.d.). Social-Behavioral-Educational (SBE) Foundations. <https://about.citiprogram.org/course/social-behavioral-educational-sbe-foundations/>.

- Ryan, A. M., and C.-G. Bank. 2017. The Need for Geoethics Awareness from a Canadian Perspective. *Geosciences* 7:120.
- Sheppard, S. R. J., and P. Cizek. 2009. The ethics of Google Earth: Crossing thresholds from spatial data to landscape visualisation. *Journal of Environmental Management* 90:2102–2117.
- Swanlund, D., N. Schuurman, and M. Brussoni. 2020. MaskMy.XYZ: An easy-to-use tool for protecting geoprivacy using geographic masks. *Transactions in GIS* 24:390–401.
- Sweeney, L. 1997. Computational Disclosure Control for Medical Microdata: The Data fly System:12.
- Taylor, L. 2016. The ethics of big data as a public good: which public? Whose good? *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 374:20160126.
- Univ Consortium Geographic Information Science. 2021. GIScience and Professional Ethics.
- Who's Behind ICE? The Tech Companies Fueling Deportation - Immigrant Defense Project. 2018, October 23. .
- Young, M. 2020, April 2. Emergency Event Geospatial Security and Privacy (HIPAA) Guidance.
- Zwitter, A., and O. J. Gstrein. 2020. Big data, privacy and COVID-19 – learning from humanitarian expertise in data protection. *Journal of International Humanitarian Action* 5:4, s41018-020-00072–6.

APPENDIX

GeoEthics Practitioner Survey

Encuesta para participantes de geoética

Name:

Title:

Affiliation (University, Institution, Agency):

City, State, Country:

Nombre:

Título:

Afiliación (Universidad, Institución, Agencia)

Ciudad, Estado, País:

How many of your projects per year require the collection or analysis of spatial data?

¿Cuántos de sus proyectos al año requieren la colección o análisis de datos espaciales?

> None

> 1

> 2

> 3

> 4

> 5 or more

- ninguno
- uno
- dos
- tres
- cuatro
- cinco o mas

Do you ever include Human Subject Data in your geospatial research?

¿Incluyen datos de seres humanos en su investigación geoespacial?

> Yes

> No

- Si
- No

How many projects per year include Human Subject Data/Information?

¿Cuántos proyectos al año incluyen datos/información de seres humanos?

- > None
- > 1
- > 2
- > 3
- > 4
- > 5 or more

Training on Collection:

Entrenamiento sobre colección:

Have you received formal training on how to execute an ethical collection of geospatial data on Human Subjects?

¿Ha recibido entrenamiento formal sobre cómo ejecutar una colección ética de datos geoespaciales sobre seres humanos?

- > Yes
- > No

How did you receive training on the ethical collection of geospatial data on Human Subjects?

¿Cómo has recibido entrenamiento sobre la colección ética de datos geoespaciales sobre seres humanos?

- > Workshop
- > Class/Course
- > Panel
- > Conference
- > YouTube
- > Training
- > Other

(Other) Which other place did you receive training?

Optional: What was the Organization Name and/or Name of Training?

- Taller
- Clase/Curso
- Panel

- Conferencia
- YouTube
- Entrenamiento
- Otro

(Otro) ¿En qué otro lugar has recibido entrenamiento?

Opcional: ¿Cuál es el nombre de la organización y/o el nombre del entrenamiento?

Data Analysis/Methodology

Analisis/Metodología de datos

Have you received formal training on how to ethically analyze geospatial data on human subjects?

¿Has recibido entrenamiento formal sobre cómo analizar éticamente datos geoespaciales sobre seres humanos?

> Yes

> No

How did you receive training on the analysis/methodology of geospatial data related to human subjects?

¿Cómo has recibido entrenamiento sobre el análisis/metodología de datos geoespaciales relacionados a seres humanos?

> Workshop

> Class/Course

> Panel

> Conference

> YouTube

> Training

> Other

(Other) Which other place did you receive training?

Optional: What was the Organization Name and/or Name of Training?

Data Analysis/Methodology

Analisis/Metodología de datos

What specific methods do you employ in the analysis of data to protect human subjects' identities related to spatial data (e.g., de-identification through aggregation, jittering)?

¿Cuales métodos específicos has empleado en el análisis de datos para proteger las identidades de los seres humanos relacionados con datos espaciales (eg. desidentificación mediante agregación, nervios)?

Publication of Data Analysis/Results:

Publicación de análisis/resultados de los datos

Have you received formal training on ethical publication of analysis/results of geospatial data on Human Subjects?

¿Has recibido entrenamiento formal sobre la publicación ética del análisis/resultados de datos geoespaciales sobre seres humanos?

> Yes

> No

How did you receive training on ethical publication of analysis/results of geospatial data on Human Subjects?

¿Cómo has recibido entrenamiento sobre la publicación ética del análisis/resultados de datos geoespaciales sobre seres humanos?

> Workshop

> Class/Course

> Panel

> Conference

> YouTube

> Training

> Other

(Other) Which other place did you receive training?

Optional: What was the Organization Name and/or Name of Training?

Vulnerability:

Vulnerabilidad

According to 45 CFR, 46.107(a), vulnerable persons are children, prisoners, pregnant women, fetuses, mentally disabled, and economically and educationally disadvantaged persons.

De acuerdo a 45 CFR, 46.107(a), personas vulnerables son niños, prisioneros, mujeres embarazadas, fetos, discapacidad mental, y personas con desventajas económicas y educativas.

Do you have specific methods to protect the individuals including vulnerable populations in your projects/research approach related to reporting of spatial data?

¿Utilizan métodos específicos para proteger a los individuos incluyendo las poblaciones vulnerables en el enfoque de sus proyectos/investigaciones en relación al reporte de datos espaciales?

> Yes

> No

What are the methods or guidelines?

¿Cuáles son los métodos o guías?

Unintended Consequences:

Consecuencias Involuntarias:

Do you have a method or process to determine if there are unintended consequences that cause discrimination, exploitation, or harm; to people in your approach for the projects/research related to collection/analysis/reporting of spatial data after the project has commenced?

¿Utilizan un método o proceso para determinar si hay consecuencias involuntarias que causen discriminación, explotación, o daño hacia personas en su enfoque para los proyectos/investigaciones relacionados a la colección/análisis/reportes de datos espaciales después de que el proyecto haya comenzado?

> Yes

> No

What is this method or process?

¿Cuál es el método o procedimiento?

Addressing Bias:**Abordar el sesgo**

Do you have an approach, a tool, or a method to address bias?

(e.g., data are de-identified and a biostatistician completes the statistical analysis)

¿Utilizan un enfoque, técnica, o método para abordar el sesgo? (eg datos son desidentificados y un bioestadístico completa el análisis estadístico)

> Yes

> No

What methods, approaches, or tools do you use to address bias?

¿Cuales métodos, enfoques, o técnicas utilizaste para abordar el sesgo?

Training on Collection and Analysis of Environmental Data**Entrenamiento sobre la colección y análisis de datos ambientales**

Have you received training on the ethical collection, analysis or reporting of geospatial data on the environment (for example, non-exploitation of resources)?

¿Has recibido entrenamiento sobre la colección, análisis, o reportaje ético de datos geoespaciales en el medio ambiente (por ejemplo, no explotación de recursos)?

> Yes

> No

How did you receive training on the ethical considerations of geospatial data related to the environment?

¿Cómo has recibido el entrenamiento sobre las consideraciones éticas de datos geoespaciales relacionados al medio ambiente?

> Workshop

> Class/Course

> Panel

> Conference

> YouTube

> Training

> Other

Which other type of training did you receive?

Optional: What was the Organization Name and/or Name of Training?

Publication of Data Analysis/Results:

Publicación de análisis/resultados de los datos

Have you received formal training on ethical publication of the analysis/results of geospatial data on the environment?

¿Has recibido entrenamiento formal sobre la publicación ética del análisis/resultados de los datos geoespaciales en el medio ambiente?

> Yes

> No

How did you receive training on ethical publication of analysis/results of geospatial data on the environment?

¿Cómo has recibido el entrenamiento sobre la publicación ética del análisis/resultados de datos geoespaciales en el medio ambiente?

> Workshop

> Class/Course

> Panel

> Conference

> YouTube

> Individual Training or Self-taught

> Other

(Other) Which other place did you receive training?

Optional: What was the Organization Name and/or Name of Training?

Unintended Environmental Consequences

Consecuencias ambientales involuntarias

Do you have a method or process to review if there are unintended consequences that cause harm to the environment (such as exploitation of resources) in your approach for the projects/research?

¿Utilizan un método o procedimiento para revisar si hay consecuencias involuntarias que causen daño al medio ambiente (por ejemplo la explotación de recursos) en su enfoque de los proyectos/investigación?

> Yes

> No

What is the method or process?

¿Cuál es el método o procedimiento?

Dissemination/Transfer of Knowledge

Diseminación/Traslado de conocimiento

Do you teach, provide workshops or seminars on the ethical collection, analysis or reporting of spatial data related to either humans or the environment

¿Enseñas, impartes talleres, o seminarios sobre la colección ética, análisis, o reporte de datos espaciales relacionados a seres humanos o al medio ambiente?

> Yes

> No

What form does your instruction take?

¿Qué forma toma su instrucción?

> Workshop

> Class/Course

> Panel

> Conference

> YouTube

> Individual Training or Self-taught

> Other

- Taller
- Panel
- Conferencia
- Entrenamiento individual o autodidacta

- Otro

Are you willing/able to share a website or resources related to that instruction?

¿Estás dispuesto/capaz de compartir un enlace o recursos relacionados a esa instrucción?

> Yes

> No

Please provide details here:

Favor de proveer detalles aquí:

Professional Development:

Desarrollo profesional

Related to ethical considerations in the collection, analysis, reporting or spatial data which practices do you find yourself most confident in executing?

¿Relacionado a las consideraciones éticas en la colección, análisis, reporte, o datos espaciales, en que practicas te sientes más seguro al ejecutar?

Related to ethical considerations in the collection, analysis, reporting or spatial data which practices do you find yourself needing more training?

¿Relacionado a las consideraciones éticas en la colección, análisis, reporte, o datos espaciales, en que practicas necesitas más formación?

Comments (optional):

Comentarios(opcionales):

Are you willing to be contacted for follow-up questions or clarifications?

¿Estás dispuesto/a a ser contactado/a para preguntas o clarificaciones de seguimiento?

> Yes

> No