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Geospatial technologies and tools for data collection and communication: A Taxonomy

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Currently, a myriad of geospatial technologies, geovisual techniques and data sources are available on the market both for data collection and geovisualization; from drones, LiDAR, multispectral satellite imagery, “big data”, 360-degree cameras, smartphones, smartwatches, web-based mobile maps to virtual reality and augmented reality. These technologies are becoming progressively easy to use due to improved computing power and accessible application programming interfaces. These advances combined with dropping prices in these technologies mean that there are increasing opportunities to collect more data from heterogeneous populations as well as communicating ideas to them. This offers seemingly limitless opportunities for anyone collecting and disseminating geospatial data. When data are aggregated and processed, it becomes information. To communicate this information effectively and efficiently geovisualizations can be utilized. The aim of geovisualization is to interactively reveal spatial patterns that may otherwise go unnoticed. Much excitement surrounds each of these geospatial technologies which offer increased opportunities to communicate geospatial phenomena in a stimulating manner through various geovisualization techniques and interfaces. The challenge is that it also takes very little effort to make geovisualizations that may be visually attractive but do not communicate anything. With so many accessible geospatial technologies available a common and important question persists: **What geospatial technologies and geovisualization techniques are best suited to collect and communicate geospatial data?**

The answer to this question will vary based on the phenomena being examined, the geospatial data available and the communication goals. **Here I present a taxonomy of geospatial technologies and geovisualization techniques, identifying their strengths and weaknesses for data collection and geospatial information communication.** The aim of this taxonomy is to act as a decision support tool, to help researchers make informed decisions about what technologies to incorporate into a research project. With so many different technologies available, what should a researcher consider before they pick which platform to use to communicate important findings? More explicitly, how can specific geospatial technologies help transform scientific data into information and subsequent knowledge?

Included in this taxonomy are data collection tools and cartographic interface tools. This taxonomy is informed by literature from a cross-section of disciplines ranging from cartography, spatial

media, communication, geographic scale, spatial cognition, human-computer interaction, and user experience research. These literatures are presented and woven together to synthesize the strengths and weaknesses of different geospatial technologies for data collection/entry and spatial information communication. Additionally, key considerations are presented in an effort to achieve effective communication; meaning identifying intended use with intended users, to best meet communication goals. To illustrate key points, indicator data from the United Nations Sustainable Development Goals are used. The aim here is to offer recommendations on how to best identify and apply appropriate technology for data collection and geovisualization, in an effort to reduce the number of frivolous, confusing, and ugly maps available online.