

## Chapter 19

# Emerging Approaches to Data Management for a New Geospatial Science Research: The Essences and Methodologies of Data Matter Perspective

**Joyce Gosata Maphanyane**  
*University of Botswana, Botswana*

**Read Brown Mthanganyika Mapeo**  
*University of Botswana, Botswana*

**Sethunya Simela**  
*University of Botswana, Botswana*

### ABSTRACT

*Chapter 19 and Chapter 20 are on the emerging approaches to data management for a new geospatial science research. This chapter gives the essences and the methodologies of data matter perspective, and it has two sections; Section A highlights the subject theme; the essences of geospatial science data matter; while Section B expands that into the geospatial science data methodologies. Chapter 20 is the about the data management optimization perspective. It has only one section; Section C, that develops further the essence and methodologies of geospatial data cultivated in these two previous sections. The whole analytical discussion is in the emerging fields and how they had optimized and totally changed the geospatial science data management panorama.*

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## **SECTION A: ESSENCES OF GEOSPATIAL SCIENCE DATA MATTER**

Chapter 20 encompasses the framework on which the geospatial research science hinges upon. It sets a criterion on the essences of the fields and point out the progresses made up until now. These developments are what constitute the emerging approaches to data management. The 3 elements of cartography are analytically discussed. For the scale element, the pixel photon entity and the spatial resolution are discussed. Other resolutions studied here are the mapping, the thematic, and the temporal and model resolutions. Then the spatial and the radiometric resolution pertinent to raster data models were considered too. For projection entities, the geo-referencing systems, and the datum are reviewed. The surveying tools and techniques like the greatest invention of the century in this field, the global positioning system (GPS), are also discussed. Other systems are explained too. These include the world referencing system of 1984 (WRS84), continuously operating reference stations (CORS), the international reference frame (IRF), and the African geodetic reference frame (AFREF). The resultant measurements of these geo-referencing systems reinforce the validity of a GPS use. This leads to GPS increased accuracy, availability, and by default the extension of its sphere of access measurement to cover the entire globe. Lastly, in this section, the visual variables as the third element of cartography are discussed. Symbols, their types and characteristics, and their association and sensitivity with the element of scale dynamism are alluded to as well. Visual variables relevance to geospatial data and its place as an interpretation tool are explained here too.

## **INTRODUCTION**

In the last decade; the world of information communication and technology (ICT) has been optimized greatly with innovations for speed, efficiency, accessibility, connectivity, and relative accuracy in the geospatial research work. These emerging technologies include visualization, data science, and data science methodology, big data, cloud, the Internet, web mapping, artificial intelligence, neural networks, global positioning systems (GPS), national spatial database infrastructure (NSDI) and cellular phones. What has also changed is how coordinates are captured, and world's horizontal and vertical referencing systems are formulated. The world referencing system of 1984 (WRS84), Continuously Operating Reference Stations (CORS), the international reference frame (IRF), the African Geodetic Reference Frame (AFREF) form part of the major innovation which has tremendously increased the precision of the GPS three-dimensional coordinates measurement of any place on Earth. The measurement of the datum that defines the position of the spheroid relative to the centre of the Earth has been refined as well. Technical development on all aspects of ICT; people, organizations, computer hardware and software, communication, and data also play a vital role. This chapter puts all these developments into perspective, and their applications in the geospatial science research highlighted, and their importance ranked accordingly.

## **ESSENCES OF GEOSPATIAL SCIENCE**

The central core of geospatial science is the characteristic and condition of a phenomenon on Earth or its systems in a given surface level, at a particular place and period. In the geospatial science language this just translate into five horizontal number (X, Y, Z, T and A), that is the (X, Y), the horizontal positional

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