


# Chapter 4

## Cloud-Based Big Data Analysis Tools and Techniques Towards Sustainable Smart City Services

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### ABSTRACT

*Cloud computing and big data analytics are the key parts of smart city development that can create reliable, secure, healthier, more informed communities while producing tremendous data to the public and private sectors. Since the various sectors of smart cities generate enormous amounts of streaming data from sensors and other devices, storing and analyzing this huge real-time data typically entail significant computing capacity. Most smart city solutions use a combination of core technologies such as*

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*computing, storage, databases, data warehouses, and advanced technologies such as analytics on big data, real-time streaming data, artificial intelligence, machine learning, and the internet of things (IoT). This chapter presents a theoretical and experimental perspective on the smart city services such as smart healthcare, water management, education, transportation and traffic management, and smart grid that are offered using big data management and cloud-based analytics services.*

## **INTRODUCTION**

Information and Communications Technologies (ICT) are successfully used in smart cities for data communication to increase the quality and efficiency of civil services, reduce resource usage, and include interactive apps and active services with citizens. ICT applications and the widespread use of digital objects such as sensors, actuators, and mobile phones are primarily useful in achieving smart city growth (Yin et al., 2015). Data collection and storage, information processing, networking, and security decision making are all contributing to the infiltration of urban life. Digital infrastructure is primarily needed in smart cities for water and waste management, smart health care, smart governance, power management, transportation and traffic management (Arasteh et al., 2016).

Cloud and big data technologies are shaping the evolving business computing landscape, which holds a lot of promise for a new era of collective applications. Many companies can benefit from the integration of Big Data analytical capabilities with cloud services because it will save them money and time while also simplifying valuable insights that will provide them with a variety of competitive advantages (Wieclaw et al., 2017). Big Data with cloud as a service can ease the implementation of sophisticated analytic features over the bigger and heterogeneous data sources that business organizations need to handle and get benefit of the useful insights derived from it (Quwaider, Al-Alyyoub, & Jararweh, 2016). Data Analytics as a Service (DAaaS) is an advanced platform that provides cloud-based analytical capabilities over a variety of use cases and industries (Güemes, Janeczko, Caminel, & Roberts, 2013). From a practical standpoint, this approach encompasses an analytical solution's end-to-end features, such as data collection, data visualization, reporting, and user interaction. It also extends to innovative concepts, like Analytical Apps and Analytical Appstore (A. M. S. J. F. G. C. S. Osman, 2019).

Nowadays, a vast amount of data is generated and stored in smart city data repositories in both structured and unstructured formats. The collected data have the possibility to be shared and openly accessible by the potential clients in either private or public sector. Fog-to Cloud computing (F2C) is the recent technology for data management for smart city that combines the benefits of centralized and

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