Chapter 32
Smart Technologies for Sustainable Mobility

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ABSTRACT

The emergence of easy mapping tools, widespread cellular network, declining costs of smartphones and increasing internet use by public agencies provide new opportunities towards the betterment of public transport management. Applying decision support systems such as Geographic Information Systems (GIS) and Information and Communication Technologies (ICT) to public transportation tailors transit services to urban dwellers' needs, reducing eco-footprint while making them more accessible. This chapter aims to explore how GIS and ICT can be used for more eco-friendly public transport and improved sense of community. The chapter posits the positive impact of mobile phones and social media towards sustainable mobility. Multi-modal journey planners, mobile bus ticketing, demand responsive transit systems, eco-taxis, electric car and bicycle sharing are explained with examples from the world. The chapter concludes with a discussion of challenges and future options for using smartphones, social networking and the position of disadvantaged groups in sustainable mobility.

INTRODUCTION

Decision support systems (DSS) are knowledge-based information systems designed to capture, handle and analyze information that in the decision making processes of professionals. DSS refer to applications that are designed to support, not replace, decision making. The classifications of DSS are based on ultimate technologies that determine the characteristics of the decision-making:

- *Spatial DSS:* Spatial decision support is the computational assistance for making better decisions about problems that involve geographic components. Spatial decision support may be employed to facilitate the development, evaluation or selection of proper policies, plans, scenarios, interventions, or solution strategies of a settlement. The spatial DSS process solves large, disparate data sets that include numerical

DOI: 10.4018/978-1-4666-9619-8.ch032

data, maps, images, texts, and other forms; multi-dimensional and heterogeneous geo-data or generates decision alternatives (The Redlands Institute website),

- *Communications-driven DSS* use network and communications technologies to facilitate collaboration and communication.

Data-driven DSS, document-driven DSS, knowledge-driven DSS and model-driven DSS are the other types of DSS (Bresfelean & Ghisoiu, 2010) which are not considered in this chapter.

Some of the attributes and benefits of spatial and communication-driven DSS can be given as follows (Bresfelean & Ghisoiu, 2010, Marques da Costa et al. 2013):

- Easy access (to real-time data),
- Rich communication (of results and new ideas in a practical form),
- Facilitated analysis (of data through use of computational intelligence),
- Time-saving and cost-saving strategic advantage,
- Greater consistency and accuracy,
- Smarter response (to changes and failures),
- Worker empowerment,
- Greater user satisfaction,
- Organizational enhancement,
- Increased innovation and productivity.

Smart technologies provide tools such as DSS for transport planning which enables data summarization and comparison, new location options, evaluation of measures and scenario development possibilities at local levels. GIS enhances spatial DSS; ICT tools and social networking utilizes communications-driven DSS. GIS as a part of spatial DSS is designed to support decision research process making for solving complex spatial problems. Spatial DSS integrates database management systems with analytical models, graphical display and tabular reporting capabilities, and the expert knowledge of decision makers (Densham, 1991). GIS can collect, store, and retrieve information based on its spatial location, identify locations within a targeted environment which meet queries, facilitate selecting analytical models and give alternatives on the selected environment (Crossland et al. 1995).

"From computers to data to information to communication to democracy" (Saco, 2002, p.xiii). New GIS and ICT platforms have evolved rapidly and transformed vastly during the last 30 years. Some of the concepts used to define the transformation in the Digital Age put forward by Castells (2009), can be considered beyond the scope of this chapter since they relate to media and business processes, and the cultural change in the globalized world. However, the popularization of the internet and the wireless systems have caused changes in today's communication platform. The internet was invented in 1969, but its commercialization expanded in the 1990s. Since then, users grew from 40 million in 1995 to 1.4 billion in 2008 (Castells, 2009). After the convergence of internet and wireless systems in 2000s, the meaning of 'being connected' has shifted (Pinzon, 2013); as Castells points "the key feature of wireless communication is not mobility but perpetual connectivity" (2009, p.69).

Recent developments in geo-information technologies on wireless platforms to link spatial and relational data provide new and smart insights into patterns of urban life, such as traffic flows within cities, urban mobility and proximity of social relations. Mobile phones allow for large scale monitoring of people's movements and physical proximities over time, giving the possibility of understanding cognitive relationships and social ties. Popular social network sites (SNS), like *Swarm, Facebook check-in* and *Quora*, extend this real-time and location-based geo-information across highly connected networks of users. More than 235 million mobile users in the U.S. and Europe consumed mobile media in 2011, a 30% increase