Chapter 13
An Argumentative Review Between Urban Morphology and Energy-Efficient Mobility

Omar M. Galal
https://orcid.org/0000-0002-4165-4663
Arab Academy for Science, Technology and Maritime Transport, Egypt & Technical University of Berlin, Germany

ABSTRACT

Urban settlements are recognized in literature to be a significant energy consumer. Among the primary contributors of such consumption is the transportation system. Recent literature that discusses the relation between energy efficient mobility and urban form has been continually branching and growing. However, as it grew, it becomes more specialized, less self-conscious, and to some extent contradicting. After adopting Conzen's approach to urban morphology, this chapter discusses through an argumentative review the relationship between energy efficient mobility and buildings density, land use, and streets networks. In addition to providing a snapshot to critical studies in the last three decades, two arguments are refuted. First, the residents' behavior resulting from socio-economic factors or individuals' choice has more impact than urban morphology characteristics on energy-efficient mobility. Second, morphological characteristics of urban settlements that lead to energy efficient mobility do not vary with the variation of context.

INTRODUCTION

Throughout the last decades, urban form has been continuously centered in the debates of sustainability and energy efficiency. The fact that buildings produce 43 percent of the world's carbon dioxide emissions and consume 48 percent of the energy produced has raised calls for rethinking the methods by which the built environment is created (Newman and Kenworthy, 2009). Centre to these debates, the

DOI: 10.4018/978-1-5225-9238-9.ch013

compact, dense, mixed-use, pedestrian, and transit-oriented urban form was recognized to be sustainable and energy efficient in the literature (Newman and Kenworthy, 1989; Calthorpe, 1993; Beatley, 2000; Banister, 2011a).

Despite the presence of arguments for less compact urban forms, the adverse consequences of low density and separation of uses have caused a gradual reduction of the impact of such opinions. The inevitable dependence on personal vehicles for travel is perhaps the most negatively significant impact of such urban forms with both economic (infrastructure) and environmental (climate change) implications (Filion 2013). On the other hand, either active modes of commuting (like walking and cycling which are non-motorized) or commuting through means of public transportation (like buses, rapid bus transit, light rail transits and Metros) have been argued by many to be more energy efficient (Newman, 2013; Rogers, 2008; Farr, 2008). The questions remain; what are the characteristics of urban form that empowers Energy Efficient Mobility (EEM)? Is there any relation to begin with or is it a matter of socio-economic factors and individual preferences? Moreover, whether there is a single formula that works everywhere? In other words, what is fixed from context to context, and what is not?

Although it seems that currently the majority of opinions are oriented to more compact urban forms, there are many ambiguities. For example, the intangibility of some of the new vocabulary introduced by a movement like the New Urbanism, such as mixed-use, access, and diversity have been highlighted (Talen, 2003; Elshater, 2012; Elshater, 2015) or even doubts regarding whether they achieve their objectives (Handy, 2005). Indeed, when the concept of mixed-use is stated, it was not specified on which scale and by what manner a sustainable mix should be formed (Evans, Aiesha, Foord, 2009).

Moreover, Boarnet and Crane (2001) have argued that other than traffic calming, no other feature of urban design seems to have a clear and consistent impact on vehicles miles traveled (VMT) reduction. Lo (2016) has further argued that daily sustainability practice is more dependent on personal factors such as the socio-economic features of the residents than contextual factors that are related to urban form. Additionally, studies that relate urban form to sustainable mobility sometimes vary drastically with the variation of the context. As expected as that may be, it still counters all the arguments for the possibility that cities can be formed through a set of standards causing them to become more energy-efficient despite the variation of the context.

Although most previous studies on EEM focused urban form, this chapter focuses on Urban Morphology (UM) as it accounts for the factor of time and the manner of growth, transformation or change occurring in the form of urban settlements. Hence, advocating a specific urban form is advocacy of static conditions of form that may or may not be extremely different from or similar to the urban form of any other settlement in the world. Such advocacy also may imply that there is only a single set of procedures to adopt. On the other hand, in the classical theories of UM exist wisdom that may guide to a diverse range of changes. Consequently, provide a pathway to different future urban forms that are more energy efficient than current ones.

There is a continually growing body of literature investigating the relation between urban morphology/form and energy efficiency in terms of mobility and other disciplines. However, as it grew, it has changed to be more specialized and to some extent less self-conscious. Through an integrative review, this chapter aims to review the relationship between UM and EEM in a more inclusive manner. This chapter first provides a–necessarily low resolution–snapshot for the research on the topic and mostly throughout the last 30 years since the influential study of Newman and Kenworthy (1989). Afterward, this overview is discussed in the light of literature interested in the impact of residents' related features and different climates–as they both vary with the variation of context–on EEM. Hence determine whether