

Does “Where We Live” Reflect “What We Do”?

An Overview of Empirical Evidence on Place-People Correspondence with Regards to Sustainability Performance

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Abstract

Despite effort to uncover the link between people’s behaviors and places regarding their sustainability performance, the findings remain ambiguous. This paper presents an overview of the empirical evidence on this issue and provides a framework to help design of studies on the performance of residential choice considering the three pillars of sustainability. We identified the papers through a search in multidisciplinary databases from 1994–2017 and experts’ recommendations. We analyzed them considering these questions: 1) what aspects of places and people’s behaviors are evaluated? 2) To which pillar of sustainability do they refer? 3) How are places and people related; and, 4) why are they linked the way they are? The conclusion underlines the need to embrace the complexity of residential choice and the associated daily mobility as well as for policymakers to define actions to be taken for unsustainable places to be improved and more sustainable behaviors to be adopted.

Keywords: residential choice, daily mobility, sustainability performance, sustainability indicators

1. Background: Ongoing Efforts and Gaps

With regard to residential choice, it is assumed that people who choose to live in locations defined as more sustainable will show or adopt more sustainable behaviors at the neighborhood scale (Boarnet, Forsyth, Day, & Oakes, 2011; Van Acker & Witlox, 2010). Because of this expected determinant role of residential neighborhoods on behavior, it is important for policy-makers, planners, and practitioners to better understand the interaction between “where people live” and “what people do”. To investigate the level of congruity between the two, sustainability must be embraced in all its complexity, that is, its environmental, social and economic imperatives. One difficulty in making sense of existing scientific evidence is that the findings commonly stem from the consideration of only one imperative, or two at the most. Another difficulty is that the bulk of the scientific literature investigates the sustainability of either the places where people live or the associated behaviors. This paper presents one of the first attempts to examine scientific evidences linking the two at the heart of the critical overview, integrating the environmental, social and economic (ESE) pillars of sustainability. The considered behaviors are those related to daily mobility and activities outside the domicile. The content of the literature reviewed was analyzed according to how it answered the following questions: 1) What aspects of places and people’s behaviors are considered to evaluate sustainability?; 2) To which pillar of sustainability do these characteristics of places or behaviors refer?; 3) How or by which mechanisms are places and people are related?; and finally, 4) why are places and behaviors linked the way they are? From the collected evidence, a conceptual framework was developed to analyze “people-place” correspondence as a transactional unit of analysis, to help elucidate which features make both place and people reach their full potential with regards to sustainability performance. The conclusion underlines the need for researchers to embrace the complexity of residential choice and the associated daily mobility in future research as well as for policymakers to define actions to be taken for unsustainable places to be improved and more sustainable behaviors to be adopted.

2. Research Methodology

2.1 Search Strategy

A literature search using keywords Residential choice AND Lifestyle OR Behavior AND Residential neighborhood OR Built environment OR Urban forms AND Sustainability, was performed on databases (e.g. Web of science and SpringerLink). In addition to the web search, 22 references were provided from two experts. A total of 140 papers published after 1992¹ were thus first identified on the basis of their titles. Since this review aims at understanding the mechanisms linking people’s behaviors to their places of residence with regard to sustainability, we considered the two following exclusion criteria after reading the abstracts: 1) abstracts focusing exclusively on either places or behaviors were excluded; 2) papers focusing on scenario situations instead of real life situations were also excluded. Of the 140 initial papers, we were left with 40 articles which were read entirely; after which nearly half of them were further excluded because of the similarity between their contents.

2.2 Corpus Description

Of the twenty-two articles retained for the critical overview (Table 1), six were written by geographers, five by civil engineers, one by environmental psychologist; one by economist; one by sociologist; one by computer scientist. The seven others were led by interdisciplinary teams among which transport and urban planners and only one including architects. The majority of the research was conducted in Western countries, with about 40 percent, in European countries (3 in the UK, 2 in Belgium, 1 in Austria, 1 in Denmark, 1 in Finland and 1 in Germany). The rest were conducted in North America (4 in the US, 1 in Canada); Australia (3); China (3); Korea (1), and finally, Iran (1). Two main types of strategies are used for evaluating the sustainability of residential choice and the level of congruity between people’s place and behaviors. The first type favors the objective measurement of the built environment and socio-economic factors (fifteen studies focus strictly on these dimensions). The second favors subjective variables associated with psychological factors (eight studies target solely these dimensions). Finally, ten studies mix both approaches, incorporating objective and subjective variables. Most studies used cross-sectional survey designs (14 quantitative, 1 qualitative and 2 mixed), the others proceeded through cohort observation with quantitative research design: quasi-longitudinal (n=2), prospective (n=1) and retrospective (n=2). The sample sizes are highly variable (from n=26 to n=75331) among studies. The primary criterion for sample selection is to have respondents residing in different types of places (e.g. suburban vs. urban neighborhoods; transit-oriented development vs. “regular” neighborhood). For cohort studies, another considered criterion that respondents have experienced relocation.

Table 1. Empirical studies on place-people correspondence with a view of sustainability

#	Author/Year	Sample/country/design	Place performance/Unit	People performance	Accord between place and people’s performance	Congruity	Incongruity	No association
1	Aditjandra, Cao & Mulley (2012)	219 households / UK/ Quasi-longitudinal quantitative	ABCD typology (Marshall, 2005)/LSOA*	Car driving	[+]	•Accessibility to public transport (PT) [decreased] driving	Not applicable (NA)	NA
2	Barr & Prillwitz (2012)	1561 individuals/City of Exeter, Devon, UK/Cross-sectional qualitative and quantitative	•High-density, Medium-density suburban, Low-density outer-urban, and Commuter settlement •Rural centre/NA	Travel mode along with travel purpose	[+, -, o]	•Urbanization** [decreased] car use •Urbanization [increased] PT-use and walking	•Urbanization [increased] car use •Urbanization [decreased] cycling and walking	•Urbanization [had no effect on] car use, PT-use, and walking
3	Boussauw & Wiltoz (2011)	7273 individuals/Flanders, Belgium/Cross-sectional quantitative	Accessibility, residential and job density, diversity, min. commuting distance, proximity of facilities/1, 4, and 8 km buffers	Daily kilometrage per person	[+, o]	•Residential density [decreased] travel distance •Population density, diversity and proximity [decreased] travel distance (within a radius of 1 km)	NA	•Accessibility to street net and job density [had no effect on] travel distance

¹ We considered the papers published after 1992 because Action for sustainable development was the key proposal of the first UN Conference on Environment and Development, held in Rio de Janeiro in June 1992, in response to concerns about global environmental problems (United Nations, 1992). Agenda 21 was enacted and, since then, major groups participated in the SD process in a constant manner. Lifestyle, formalized as the patterns of production and consumption, was addressed in Principal 8 of the Rio Declaration for the first time (UN-Rio Declaration, 1992).

#	Author/Year	Sample/country/design	Place performance/Unit	People performance	Accord between place and people's performance	Congruity	Incongruity	No association
4	Buys & Miller (2011)	26 residents from high-density dwellings in inner-city/Brisbane, Australia/Cross-sectional qualitative	Inner urban higher density precincts (≥30 dwellings/hectare) located within 6 km of CBD/precinct	Travel mode along with travel purpose	[+, -]	•CBD [increased] PT-use for CBD work destinations and Walking for some non-work purposes	•CBD [increased] Car-use for non-CBD work and non-work destinations	NA
5	De Vos et al. (2012)	1657 university students and staff members/ Flanders, Belgium/Cross-sectional quantitative	Urban and suburban/NA	Travel mode	[+, -]	•Urbanization [Increased] AT-use and PT-use -Urbanization [decreased] car use	-Urbanization [decreased] AT-use and PT-use -Urbanization [increased] car use	NA
6	Delmelle, Haslauer & Prinz (2013)	8700 individuals/Vienna, Austria/Cross-sectional quantitative	Population density, centrality, transportation factors, and dwelling types/NA	Social satisfaction	[+, -]	•PT services and Population density [increased] social satisfaction	•Residing in apartment complex [decreased] social satisfaction	NA
7	Etmnani-Ghasrodashti & Ardeshiri (2016)	900 head of households/Shiraz, Iran/Cross-sectional quantitative	Density, Design, Diversity, Accessibility/one-quarter mile buffer	Home-based work and non-work (HBW and HBN) trips	[+,-, 0]	•Densities, diversity and accessibility to sub-center [Increased] PT-use and AT-use for HBW trips •Internal connectivity [decreased] car trips •Residential density, accessibility to commercial, service, sub-center and CBD and diversity [increased] PT-use and AT-use for HBN trips	•Design measurements (high street density and internal connectivity) [Increased] car use	•Distance to bus stop [had no effect on] HBW and HBN trips
8	Fan, Khattak & Rodriguez (2012)	2886 households/Triangle area in North Carolina (Orange, Wake, and Durham), US/Cross-sectional quantitative	Building density, retail accessibility, and street connectivity/0.25 miles buffer	Observed, required and excess travel, travel mode, travel purpose, and travel time	[+]	•Connectivity and accessibility to retail stores [decreased] travel distances •Density, mixity, and street connectivity [decreased] required and excess travel	NA	NA
9	Farber & Lio (2013)	NA/42 metropolitan area, US/Cross-sectional quantitative	Sprawl indicators (Ewing, Pendall, & Chen,2003): decentralization, big city, fragmentation, low mixing, long travel/Regional scale	Social Interaction Potential (SIP)	[+]	•Decentralization and fragmentation [increases] mean commuting time •Decentralization and fragmentation [decreases] SIP	NA	NA
10	Figuroa, Nielsen & Siren (2014)	75331 young (18–64 yrs) and older (65–84 yrs) adults (national dataset)/Denmark/cross-sectional quantitative	5 D's of Ewing & Cervero, 2010: density, destination accessibility, design, diversity & distance to transit/NA	On a daily basis: travel distances, non-work travel distances, and car travel distances (driver or passenger)	[+, -, 0]	•Population density and accessibility [decreased] car travel distance •Population density [decreased] all travel distance and travel distance for non-work travel distance (stronger for older adults) •Mixity [decreased] non-work travel distance •PT service [decreased] car travel distance	•Accessibility to retails job [increased] car travel distance for non-work purpose	•Density [had no effect on] car travel distance (for older adults)
11	Jarass & Heinrichsa (2014)	317 individuals/Berlin, Germany/Cross-sectional quantitative	New inner city development*** (with low density) and inner city development/NA	Travels frequency, travel length, and travel mode	[+, -]	•Inner city [increased] PT-use -Inner city [decreased] car use	•New inner city [increased] Distance •New inner city [decreased] non-motorized mode	NA

#	Author/Year	Sample/country/design	Place performance/Unit	People performance	Accord between place and people's performance	Congruity	Incongruity	No association
12	Kamruzzaman et al. (2013)	3957: 510 TOD residents and 3447 non-TOD residents/Brisbane, Australia/Longitudinal quantitative	TOD versus non-TOD: net residential density, land use diversity, intersection density, cul-de-sac density, and PT accessibility/600 m buffer	Travel mode and Travel time	[+, o]	<ul style="list-style-type: none"> •PT accessibility [increased] propensity of walking in TOD •Cul-de-sac [decreased] PT-use and AT-use in non-TOD •Density [increased] AT and switch to walking in TOD and non-TOD •Intersection density[increased] walking in non-TOD 	<ul style="list-style-type: none"> •Intersection density [decreased] switching to AT-use in TOD 	<ul style="list-style-type: none"> •Diversity [had no effect on] mode choice in TOD and non-TOD •PT accessibility to [had no effect on] propensity of walking, only in non-TOD •Cul-de-sac density [had no effect on] PT-use and AT- use, in TOD
13	Li, Dodson, & Sipe (2016)	NA/Brisbane (Australia)/Mutli-source data (survey, census and administrative data	Inner urban area, middle suburban area and outer suburban area/SLA (Statistical Local Area)	Household transport and housing costs	[+]	<ul style="list-style-type: none"> •Living in outer suburbs [Increased] proportion of income spend on transport fuel •Living in the inner urban areas (except the CBD) [decreased] proportion of income spend on housing •Moving away from the CBD [Increased] ratio of transport to housing costs 	NA	NA
14	McCunn & Gifford (2014)	84 individuals/Canada/Cross-sectional quantitative	Green Neighborhood Scale (GNS) ****	Sense of place and neighborhood commitment	[+, o]	<ul style="list-style-type: none"> •Greenness [increased] neighborhood commitment 	NA	<ul style="list-style-type: none"> •Greenness [had no effect on] sense of place
15	Nahlik & Chester (2014)	American Housing Survey/Los Angeles, the US/Prospective quantitative	BAU (business-as-usual) versus TOD/ .8 km buffer around Gold Light Rail Transit (LRT) & Orange Bus Rapid Transit (BRT)	Travel mode, Travel length, Energy use, Greenhouse Gas Emissions, Respiratory Impact potential, and Smog formation potential	[+]	<ul style="list-style-type: none"> •Mobility options [increased] shift from car to PT-use and AT-use •Closeness to commerce and center [decreased] car travel distance •TOD[decreased] fuel costs and car emissions 	NA	NA
16	Sung & Lee (2015)	1823 individuals/Seoul, Republic of Korea/Cross-sectional quantitative (telephone survey)	Urban vitality (land use mix, density, block size, building age, accessibility, and border vacuums)/500-meter buffer areas based on the home addresses	Walking (time, duration, and frequency)	[+, -, o]	<ul style="list-style-type: none"> •Land use mix (residential & non-residential), small block sizes, connectivity, proximity to bus stops [increased] walking. •Large-scale, single-use complex [decreased] walking (<i>curse of the border vacuum</i>) 	<ul style="list-style-type: none"> •Distance from downtown [Increased] walking. •Living in Multi-family housing [decreased] walking 	NA
17	Susilo et al. (2012)	659 residents of sustainable neighborhoods/UK/Cross-sectional	densities, connectivity, bike path, surveillance, PT services and permeability/NA	Travel mode, frequency, and length, and activity locations	[+, -, o]	<ul style="list-style-type: none"> •Connections [Increased] cycling 	<ul style="list-style-type: none"> •Density [decreased] cycling 	<ul style="list-style-type: none"> •Mixity [had no influence on] walking

#	Author/Year	Sample/country/design	Place performance/Unit	People performance	Accord between place and people's performance	Congruity	Incongruity	No association
18	Valkila & Saari (2013)	30 individuals/Finland/Cross-sectional qualitative and quantitative	Inner city, inner suburb, and outer suburb/NA	Carbon footprints, travel length along with travel mode, and vehicle occupancy	[+, o]	<ul style="list-style-type: none"> •Urbanization, PT accessibility [decreased] car travel distance •Centrality [decreased] travel-related carbon footprint •PT accessibility [decreased] carbon footprint 	NA	•Urbanization [had no influence on] PT-use
19	Yang, Fan & Zheng (2016)	826 households/ Beijing, China/ Cross-sectional quantitative (face-to-face interviews)	Inner city area, inner suburban area, and outer suburban area	Residential and transportation carbon emissions	[+]	•Distance from public facilities and junior/middle school [increased] car purchase and (consequently) carbon emissions	NA	NA
20	Yu, Zhang, Fujiwara (2012)	530 households/ Beijing, China/ Retrospective quantitative	Urbanization degree and access to train / 1.2 km radius buffer	Energy consumption measured by: monetary expenditure	[+, -]	•Recreational facilities and bus lines [decreased] car-related energy consumption	•CBD Residing [Increased] car expenses	NA
21	Zhang & Zhao (2017)	495 people/Beijin, China/Cross-sectional quantitative (face-to-face interviews)	Old central area, Suburban new towns, and Sprawling inner suburbs	Home-based trips within one week, detailing travel modes, origins, destinations and purposes	[+,-, o]	<ul style="list-style-type: none"> •Living in sprawling-suburb communities [Increased] commuting distances, motor vehicle travel and energy use central-area (respectively) •Land-use diversity (within 1 km of a community) and jobs-housing balance (within 5 km of a community)-job proximity [Decreased] travel energy use 	•Retail-housing balance (measured as the % of locally-shopping residents) [Increased] individual travel energy use for non-work trips	•Population density [had no effect on] travel energy use
22	Zhu et al. (2014)	449 households/ Austin, Texas, US/ Retrospective quantitative	Walk Score/NA	Travel time, travel mode, social interactions, and cohesion	[+]	<ul style="list-style-type: none"> •Walk Score [Increased] AT-use, social interaction, and cohesion •Walk Score [decreased] travel time by car 	NA	NA

* LSOA refers to the lowest administration area used in the UK 2001 Census (Aditjandra, Cao, & Mulley, 2012)

** Urbanization: refers to the traditional suburb/urban approach whereas more urbanized structure refers to inner city areas.

***New inner city development refers to new residential neighborhoods within the existing built structure, which has a lower density compared to the inner city structures (Jarass & Heinrichs, 2014).

****18 variables derived from the United States Green Building Council, CMHC, & Kellert, Heerwagen, & Mador, 2008, within a radius of half-mil

Legend: (+) positive relationship, (-) negative relationship, (o) no relationship

3. Results

3.1 Operationalizing the Sustainability Performance of People-Place Interaction

Among our corpus of 22 articles, we identified a diversity of indicators of different nature used to evaluate the sustainability performance of people-place interaction (Table.1). To evaluate the sustainability of places, the indicators used to describe the residential location in terms of its built environment or socioeconomic characteristics (e.g. Boussauw & Witlox, 2011; Delmelle, Haslauer, & Prinz, 2013; Etmiani-Ghasrodashti & Ardeshiri, 2016; Farber & Li, 2013; Figueroa, Nielsen, & Siren, 2014). With regard to evaluating the sustainability of the built environment, most indicators provide quantifiable measures. Boussauw & Witlox (2011), Fan et al. (2011) and Sung & Lee, (2015) considered the contribution of accessibility, population density, and residential density. In other studies, it is a typology of urban developments that is considered, e.g. transit-oriented development (TOD) versus non-TOD (Kamruzzaman et al., 2013) or inner city, inner suburb and outer suburb (e.g. Valkila & Saari, 2013). Concerning the definition of the territorial unit of measurement, the most common approach is to define a buffer around each respondent's home. Fan et al. (2011), Kamruzzaman et al. (2013) and Yu et al. (2012) respectively uses radiuses of 0.4 km, 0.6 km, and 1.2 km; Boussauw & Witlox, (2011), radiuses of 1 km, 4 km, and 8 km. A variation is to define the buffer zone around a rail or rapid bus transit (Nahlik & Chester, 2014). Another avenue is to use a homogeneous dwelling density, e.g. precincts defined as 30 or more dwellings/hectare (Buys & Miller, 2011) or existing administrative boundaries, e.g. census Lower Super Output Area (LSOA) (Aditjandra et al., 2012). The incorporation of subjective indicators to evaluate the sustainability performance of place is also necessary. Indeed, even a homogeneous socioeconomic group living in the same location may differ in terms of individual behaviors (De Vos, Derudder, Van Acker, & Witlox, 2012).

To evaluate the sustainability of people's behaviors, indicators of different natures were used. All but five studies used objective spatiotemporal indicators related to daily mobility. They measure traveled space and time, trip frequency, or specify travel purpose or transport modes. Researchers use these variables in combination e.g. travel mode and travel purpose (Barr & Prillwitz, 2012; Buys & Miller, 2011), travel mode and travel distance (Figueroa et al., 2014), or travel length and travel mode (Valkila & Saari, 2013). Some also manipulate variables through mathematical formulations to carve out their area of interest. For instance, Fan et al. (2011) combine a set of variables to define the indicators required travel, and excess travel. Required travel is "a function of the relative distances among daily activity locations", while excess travel is a function of "the relative distances between the actual residential location and the daily activity locations" (p. 1242). A lower level of required travel means to have smaller geographical areas and less dispersed activity locations; a lower level of excess travel means to have a better coordination between home and activity locations and vice versa, which may encourage or promote sustainability. Buys & Miller (2011) incorporate four variables to qualify daily mobility, bringing forward the concept of convenience. It is defined as the intersection of utilitarian and psycho-social elements and is identified as a determinant factor of transportation choice. It is the outcome of four objective measures: time-efficiency, seamless journey², distance to the destination and purpose of the journey.

The social imperatives of sustainability were considered in six studies. The subjective indicators measured alternately the satisfaction with the social composition of the neighborhood or the perception of its social cohesion, the sense place or commitment with the neighborhood, the social interaction with the neighbors, and the satisfaction with current domicile and residential preferences. Some studies refer to two useful concepts. The first one is the residential dissonance³ which refers to the mismatch between actual and preferred residential neighborhoods (De Vos et al., 2012; Kamruzzaman, Baker, Washington, & Turrell, 2013). The second is residential self-selection which refers to the "an individual's inclination to choose a particular neighbourhood according to their travel abilities, needs, and preferences" (Aditjandra et al., 2012; Yu et al., 2012; Kamruzzaman et al., 2013).

Four studies evaluated the sustainability of people's behaviors from an environmental standpoint from three indicators: energy use, carbon footprint and vehicle occupancy (Figueroa et al., 2014; Jarass & Heinrichs, 2014; Valkila & Saari, 2013; Yu et al., 2012). Finally, the economic aspect of behaviors were only considered in one study (Yu et al., 2012). Table 2 summarizes the variables used to measure people's behavior identified in the literature.

² According to Buys & Miller (2011), "Seamless journey is critically related to the concept of unbroken travel and avoidance of using more than a single mode" (p. 296).

³ This concept is defined in Kamruzzaman et al., 2013.

Table 2. Categories of variables used in the 22 reviewed studies to measure people's behaviors

Category of indicators	Indicators	Paper reference Number (see Table 2 1)	Number of studies
SPATIOTEMPORAL			
Transport mode	Car driving	[1, 2, 4, 5,7, 8, 10, 12,	14
	Travel mode	15,16, 17, 18, 21, 22]	
Traveled distance	Daily mileage per person	[3, 8, 10, 15, 17, 18, 21]	7
	Travel distances		
	Observed travel		
	Required travel		
	Excess travel		
Trip frequency	Travels frequency	[10,11, 16, 17]	4
Travel purpose	Travel purpose	[2, 4,7, 10, 21]	5
Travel time	Travel time	[16, 8, 12, 22]	4
SOCIAL	Social satisfaction w/neighborhood	[4, 6, 8, 9, 14, 22]	6
	Social Interaction w/neighbors		
	Sense of place		
	Commitment to the neighborhood		
	Perception of neighborhood cohesion		
	Satisfaction with the current domicile		
	Residential preferences		
ENVIRONMENTAL	Energy use	[10, 15, 18,19, 20]	5
	Carbon footprints		
	Vehicle occupancy		
ECONOMIC	Monetary expenditure on electricity, gas & gasoline	[13, 20]	2

3.2 Which Imperative of Sustainability Is Evaluated in the Studies?

It is well-known and accepted that sustainability encompasses at least three imperatives of environmental, social and economic natures. *Environmental sustainability* deals with the impact of the development process on biodiversity of habitats and the utilization of natural resources (Deakin, Curwell, & Lombardi, 2001). *Social sustainability* refers to the strong of sociocultural life, social involvement, access to services, safety and security and overall human well-being both mentally and physically (Bacon, Douglas, Woodcraft, & Brown, 2012; Deakin et al., 2001; Woodcraft, 2012). Regarding *economic sustainability*, we endorse the definition of Markandya & Pearce (1988) who define it as “the use of resources today should not reduce real incomes in the future” (p. 5) and agree with Moldan, Janoušková, & Hák (2012) that in view of recent economic and financial crises, economic issues should be addressed “on their own merits, with no apparent connection to the environmental aspects” (p. 4).

A first group of variables are unidimensional in that they measure only one dimension of sustainability. For instance, energy use, carbon footprints, or vehicle occupancy relate to environmental sustainability. Social satisfaction, sense of place or neighborhood commitment rather pertains to social sustainability. A second group of variables could be labeled multidimensional in that they relate to more than one dimension of sustainability. For instance, with regard to transport modes, the use of public transit may contribute to environmental sustainability, but have a negative impact on social sustainability by increasing travel time which may reduce time for social interactions with family or neighbors. Similarly, walking may contribute to environmental, social, and economic sustainability by diminishing traffic, pollution, improving health and social relations, and diminishing car-associated monetary expenditures. Finally, a last group of variables allows for a better

understanding of people's behaviors without being necessarily associated to a particular dimension of sustainability (e.g. travel purpose).

3.3 How Congruent Are Place and People's Sustainability Performance?

The reviewed scientific evidence provides mixed findings regarding the correspondence between people and place performances in terms of sustainability (see Table 1 in section 2.2). The relationships identified between places and behaviors are described as matching or congruent (sustainable behaviors in sustainable places or unsustainable behaviors in unsustainable places) in 22 studies, or lacking congruity (unsustainable behavior in a sustainable place and sustainable behavior in an unsustainable place) in 11 studies, or else, as showing no significant relationship in 10 studies. These relationships are illustrated in figure 1.

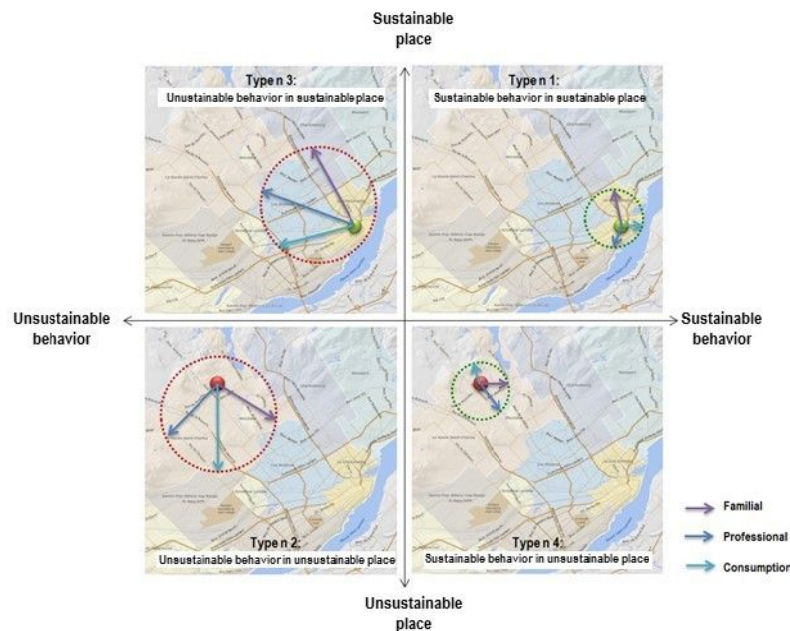


Figure1. Four types of relationship between people and place performance with regard to their residential location

3.4 Why Are the Sustainability Performance of the Place and Behaviors Related in Such Ways?

An overview of the papers revealed several factors influencing the degree of congruence between the sustainability level of people's behavior and of their residential location. Three main sets of factors contribute to shedding light on the relationship between the two: life situation, lifestyle, and convenience. Alternately, they may influence the direction and force of the relationship between place and related behaviors as well as the level of sustainability.

3.4.1 Life Situation

Life situation refers to socioeconomic and demographic characteristics (Aditjandra et al., 2012). Sixteen studies investigated the influence of life situation on place-people correspondence. These variables may change the gravity or direction of the relation between people and place with regard to sustainability. Nine categories of variables were contemplated: age, gender, household-related factors (size, structure, number of children, age of children), income, job-related factors (number of workers, status of job, type of job, retirement), education, mobility resources (car ownership, bike ownership, driver's license), health, home-ownership. *Age* was found to influence the mode of transport. The middle-age group tend to favor car, older adults public transit and younger people walking (e.g. Barr & Prillwitz, 2012; Boussauw & Witlox, 2011; Sung & Lee, 2015). Out of the four papers on social aspects, only Delmelle et al. (2013) found no significant evidence that age was linked to social satisfaction. *Gender* also accounted for some kind of influence. Men used cars more frequently than women, who tended to rely more on public transportation (Barr & Prillwitz, 2012; Etminani-Ghasrodashti & Ardeshiri, 2016; Kamruzzaman et al., 2013; Sung & Lee, 2015). Women also tend to walk more than men (Kamruzzaman

et al., 2013). This being said, even when walking was their primary transport mode, it was affected by the perceived safety (Buys & Miller, 2011). According to Fan et al. (2011), the *presence of children* in households increased daily mobility. Longer travel distances were related to families with children. Indeed, school quality and location were strong influences on residential choice, and reduce households' opportunities to concentrate their daily trips on smaller geographical areas. The *number of children* had no significant effect on excess travel (Fan et al., 2011) although larger households and families with children were found to rely more on car (Aditjandra et al., 2012; Susilo, Williams, Lindsay, & Dair, 2012), which may be used to conciliate parental, familial, or professional obligations. This being said, larger households were also found to use public transportation because of limited access to cars for all members. It is not clear whether *income* influences travel mode choice through increasing car ownership and whether it has a direct effect on mobility (Aditjandra et al., 2012; Fan et al., 2011; Figueroa et al., 2014; Yang, Fan, & Zheng, 2016). As for the impact of *education* and employment, highly educated professional workers tend to depend less on car and walk more compared to other socioeconomic groups (Kamruzzaman et al., 2013; Yu et al., 2012). *Bike ownership* incites biking (Barr & Prillwitz, 2012; Jarass & Heinrichs, 2014) and *car ownership* encourages driving (Aditjandra et al., 2012; Barr & Prillwitz, 2012; Delmelle et al., 2013; Etmnani-Ghasrodashti & Ardeshiri, 2016; Kamruzzaman et al., 2013; Yang et al., 2016). This latter is also the only significant factor pertaining to life situation that influences social satisfaction (Delmelle et al., 2013). Interestingly, the same factor has a negative impact on environmental sustainability.

3.4.2 Lifestyle

Variables related to lifestyle refer to preferences and attitudes (Aditjandra et al., 2012). A total of 10 papers out of 22 investigated the influence of lifestyle factors on the congruity between the level of sustainability of people's behaviors and their places of residence. Barr & Prillwitz (2012) identified four behavioral profiles with regard to transport: "Addicted Car Users", who used the car most frequently and lived in low-density places did not show pro-environmental attitudes. "Aspiring Green Travellers", who still relied on the car, but used other transport modes, especially active transport, and had strong environmental attitudes. "Reluctant Public Transport Users" used public transport as their primary transport mode, but had relatively negative environmental attitudes. Finally, "Committed Green Travellers", whose attitudes matched their behavior. These individuals relied on walking and had strong pro-environmental attitudes. With no surprise people favoring public and active transport drove less, and those who preferred easy access to shopping facilities drove more (Aditjandra et al., 2012; Yang et al., 2016).

Residential consonance or dissonance refers to the match or mismatch between actual and preferred residential neighborhood. It was studied by De Vos et al. (2012) and Kamruzzaman et al. (2013). Both studies found that the residential consonance or dissonance had a significant influence on travel mode choice, especially on public and active transport. On the other hand, built environment had a stronger impact on car use compared to the other modes of transport. Namely, urban consonants and rural dissonant were more likely to use AT and PT and urban dissonant and rural consonants were more likely to use car, with a lower degree of association compared to the previous group because car use is more influenced by built environment. Consideration for School quality considerations were positively associated with required travel and negatively related to excess travel (Fan et al., 2011). People who considered schools quality in their residential choice had fewer opportunities to concentrate their other daily activities (Fan et al., 2011). According to (Fan et al., 2011), smaller excess travel may result from the fact that this group of people faced more temporal constraints and tried to create more spatially coordination between residences and daily destinations. Consideration for neighborhood security was negatively associated with excess travel and had no influence on required travel, which may be explained by the fact that people with security concerns had limited housing options which may keep them from residing in the neighborhoods that can minimize their daily travel.

As we have observed above, even though the lifestyle factors were important in the determination of sustainable travel behavior, they were not always reflected in people's behaviors. People did not or could not always act on their attitudes and preferences because of their life situation, the built environment where they live, or simply for convenience.

3.4.3 Convenience

Convenience corresponds to the intersection between utilitarian and psychosocial dimensions. It is considered as a determinant factor of transportation choice and developed used by Buys & Miller, (2011). They define it through three key elements: time-efficiency, seamless journey, as well as distance to and purpose of the journey.

Perceived time-efficiency of transport modes⁴ was found to be a major influence for modal choice. The authors identified walking as the most time-efficient option for nearby services, especially recreational facilities, restaurants and smaller shops, although traffic jam, low quality and narrow sidewalk may create the feeling of unsafety and hamper walking. Public transport was considered the most efficient option (quick, easy, less stressful) for travel into the city for the well-served areas with three impediments being waiting time, unreliable services, and unavailability of seats at peak commuting time. The use of private car was the most efficient option (quick) for travel outside of the local area although in inner-city workplaces, parking is costly and commuting in traffic is stressful. The possibility of a seamless journey is another important factor of influence that may prevent the choice of more sustainable modal choices. Combining multiple trips and modes is a time-consuming and uncomfortable experience in the context of poor public transport connections and difficult climate conditions compared to a seamless journey in car. The distance to and purpose of the journey also influence travel mode choice for their relative convenience. For instance, inner-city residents preferred walking to local services and routine destinations and use of public transport for the commute to work. Car is considered more convenient to access suburban areas, leisure activities, as well as visiting family and friends, and for shopping because of the ease of carrying groceries. This being said, the authors found considerable overlap between practical reasons and psychosocial factors in terms of modal choice. Resident definitions of what is a practical or suitable, and thus convenient travel mode was bound up in a range of other considerations or factors, “some of which appear to be attitudinal, symbolic and affective rather than simply functional or utilitarian. For example, one participant explained “although buses were convenient where she lived, she loved her car and just would not consider public transportation” (Buys & Miller, 2011, p. 295).

4. Discussion: Learning Outcomes

This paper reviewed 22 articles (Table 1) investigating the degree of congruity between the sustainability of people’s behavior and those of residential locations. The scientific review (Table 2) inventoried several indicators grouped under economic, environmental, social and spatiotemporal dimensions. Each indicator corresponds to some type of objective or subjective measurement (Table 2). Despite substantial efforts to uncover the link between people’s behaviors and places over the last decade, the findings remain ambiguous. While some research shows a clear relationship between neighborhoods and behaviors, others fail to do so. We identified four types of relationships between place and people (Figure 1). Our knowledge synthesis show that if place-related features influence the level of sustainability of people’s behaviors, individuals’ life situation, lifestyle and convenience are also major influences. In figure 2, we bring all these elements together, reflecting the complexity of measuring place-people level of congruity in terms sustainability issues.

⁴According to Buys & Miller (2011), perceived time-efficiency of transport modes refers to the time-considerations influence the transport choice. “Transport choices were frequently determined by what was perceived—and experienced—as the quickest and easiest option for reaching a destination, while taking into account destination and time of day” (Buys & Miller, 2011, p. 293).

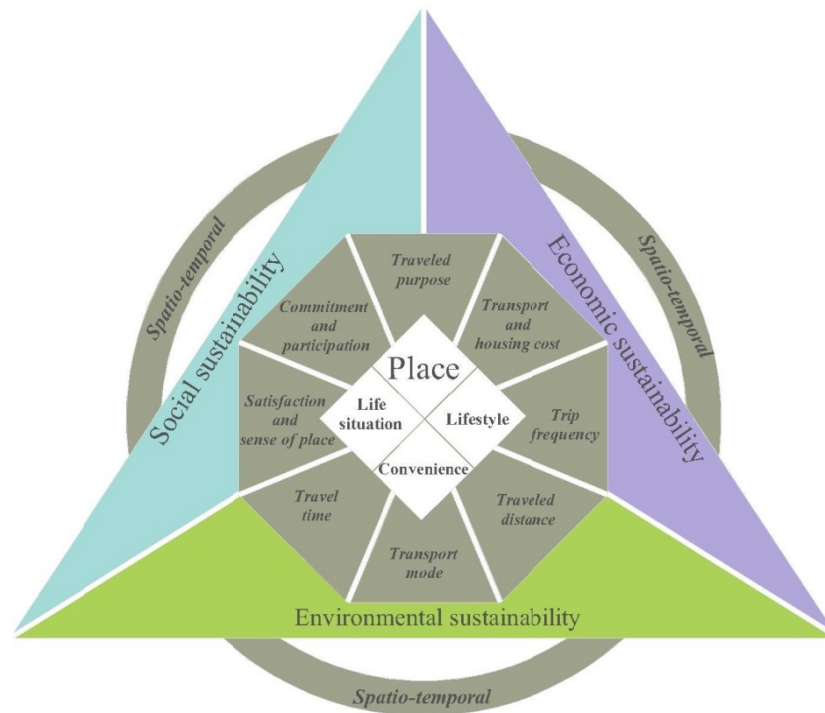


Figure 2. Portraying the performance of people's behavior in terms of sustainability

4.1 Sustainability Is the Results of a Complex Interplay of Factors

The literature review shows that the sustainability of behaviors are influenced to a certain extent by the characteristics of residential location itself, but also by people's life situation, lifestyle and perception of convenience. Thus, sustainability development will be hard to achieve unless these sets of factors are considered as acting together. Indeed, place-related features may not change people's behaviors unless micro-level conditions are provided. Consequently, to promote sustainable behavior nothing should be considered unimportant. Unfortunately, only one paper considered simultaneously life situation, lifestyle, and convenience and five did not even consider one of them. The influence of place on people's behaviors does not simply involve the effect of its material features but is the result of a complex interplay of factors. For example, spending more time commuting for greater environmental sustainability may infringe the time spent with family members or for community involvement, associated with dimensions of social sustainability.

4.2 Sustainability Performance Is Hard to Evaluate

We found no evidence of any particular thresholds used to determine whether places or people's behaviors are sustainable or not. Different geographical boundaries have different spatial structures and planning providing distinct choices of domiciles, as well as destinations and associated daily mobility (Aditjandra et al., 2012) which makes it hardly possible to define universal gauges. This problem is even more acute considering the environmental, economic and social imperatives of sustainability. For example, in context A, the household income is high, and the house price is also high. In context B, the household income is low, and the house price is high. Therefore, the portion of income spent on dwelling is different and incomparable in the two contexts, when it comes to evaluating economic sustainability. Hence, the results may not be transferable from one context to another.

Because of the multidimensionality and cultural specificity of place and behaviors with regards to measuring sustainability, appropriate analytical methods embracing this complexity must be privileged. In such wise, cluster analysis will be a powerful tool since it allows the identification of people's profile segmentation. It was applied in 5 out of 22 reviewed papers: (Barr & Prillwitz, 2012; Farber & Li, 2013; Kamruzzaman et al., 2013; Susilo et al., 2012; Yu et al., 2012). The approach is helpful to inform policies targeted to promote behavioral change, soft policy (Barr & Prillwitz, 2012).

5. Conclusions, Limitations and Future Research

This article provides interesting insights into the complexity of measuring people-places performances in terms of sustainability, as well as interpreting the congruity of performances. As our results show, “where we live” might not necessarily reflect “what we do” and vice-versa. This being said, this critical overview does not purport to represent all disciplinary fields, neither distinguish approaches with regards to place performance or describe the involved dimensions in sufficient detail because of space limitations. Nevertheless, this paper provides a conceptual umbrella embracing elements of the utmost importance, which can be used to orient future studies and feed further discussions. It could be expanded with additional dimensions (e.g. desirability and upstream impact) and developed into a theoretical model to explain degrees of congruity between places and behaviors. This paper also suggests that for the development and implementation of solutions to move forward to a more sustainable society, individual behaviors must be understood and considered as part of the solution. There is also much work to be done to go beyond mobility-associated behaviors and this calls for interdisciplinary approaches to be developed.

A limitation of the overview derives from the fact that this paper focuses only on real life situations and excludes scenario situations, which constitutes a considerable portion of the body of knowledge on place-people correspondence with regards to sustainability performance. Other limitations concern the nature of the paper, which follows a holistic approach to provide a conceptual framework. These limitations were grave, but did not stop us, as was seen, from extracting significant indicators from the body of literature and developing a conceptual framework to help design of studies on the performance of residential choice considering the three pillars of sustainability.

The limitations in this paper suggest particular needs for future research. First, while analysis of real situations provides an understanding of sustainability of an existing system, future research is needed to study scenario situations to explore some other aspects of the use of indicators to gauge the complex systems of place-people interactions. Although a holistic approach is helpful to develop an overall framework for reference, future research is needed to use an analytic approach and to delve into the complex determinants of place and people performance considering the environmental, social and economic (ESE) pillars of sustainability.

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