

1 UNDERSTANDING COMPLETE STREETS:
2 HOW DO PROFESSIONALS DEFINE A COMPLETE STREET PROJECT?
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1 ABSTRACT

2 The Complete Streets movement has become popular throughout North America. Although
3 the concepts and overall objectives of a Complete Street are becoming increasingly
4 recognized in the field of transportation planning, some ambiguity exists when defining such
5 projects based on the existing built infrastructure (e.g., bicycle lanes, road diet). This research
6 presents data gathered from transportation planning experts working at municipalities and
7 regional municipalities across the Greater Golden Horseshoe Region in Ontario, Canada.
8 Using a focus group discussion as the basis of our analysis, we attempt to understand how a
9 Complete Street can be defined at the project level as well as what factors may influence this
10 definition. The findings show that the definition of a Complete Street can be largely
11 dependent on contextual sensitivities including surrounding land use, roadway typologies,
12 age and maturity of a road, and the quality of roadway infrastructure implemented with right-
13 of-way (ROW) upgrades. The planning process is also important. Considerations relating to a
14 ROW's *feel, function and form* as well as the *age, mode and mobility* of the road users can be
15 taken into account to define a Complete Street. These findings will improve the knowledge
16 and awareness among transportation planners within (and beyond) the region regarding how
17 a Complete Street project's built form can change in response to various urban land use
18 contexts, as well as planning priorities and processes.

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1 INTRODUCTION

2 The purposes, designs, and uses of our city streets and public right-of-ways (ROW) have
3 evolved over time in response to the demand of the predominant users (1). Each street's
4 unique characteristics have been a result of the local integration of social, political, technical,
5 and artistic forces that have ultimately shaped a city's transportation network and
6 surrounding built form (2). As rates of automobile ownership drastically increased after
7 World War II, entire networks of roadway infrastructures were re-engineered to
8 accommodate for the private motor vehicle (1). The term *mobility* came to be understood as
9 the movement of motor vehicles and the priorities of ROWs were focused on increasing
10 capacity and safety of this mobility type (3). Today we are in the midst of another paradigm
11 shift as the turn of the twenty-first century has seen an emergence of prioritizing and
12 accommodating for other travel modes. Communities across North America have started to
13 re-evaluate how transportation networks have been designed, with many looking towards the
14 concept of Complete Streets for guidance in ROW (re)development.

15 A Complete Street's guiding principle is meant to transform ROWs into spaces that
16 are "safe for drivers, bicyclists, transit vehicles and users, and pedestrians of all ages and
17 abilities" (4). Complete Streets are meant to accommodate the needs and expectations of the
18 travellers who wish to use, pass through, or visit the surrounding neighborhoods or regions
19 through its built infrastructural components (5). Although urban planning practice is rapidly
20 adapting to integrate conceptual elements into streets that have not traditionally been
21 accounted for in the past, there appears to be a lack of clarity around the operational
22 understanding of the components that make a street *complete*. This existence of ambiguity at
23 the project-level could potentially alter the implementation processes of such ROW
24 improvement projects.

25 Complete Streets is primarily a policy-focused approach that has played an apparently
26 important role in recent success of the movement away from motor vehicle centric- ROW
27 designs. However, the implementation of street (re)designs is typically carried out on a
28 project-by-project basis. In this context, an improved understanding of what a Complete
29 Street looks like at the project level could further advance this movement. This paper focuses
30 on the lack of clarity regarding the operational definition of a Complete Street project, using
31 the Greater Golden Horseshoe (GGH) Region in Canada as a case study. In particular, the
32 paper explores two research questions: (a) how is a Complete Street defined by transportation
33 planning professionals at the project level? and (b) what are the factors that influence this
34 definition?

35 36 BACKGROUND

37 The Complete Streets movement began in North America by a federal coalition, America
38 Bikes, who had advocated for a directive in federal law for bicycle facilities to be a routine
39 part of the planning process in all future street projects (7). This advocacy group led to the
40 formation of the National Complete Streets Coalition (NCSC). Since its North American
41 beginnings in 2003, the Complete Streets movement has swept the United States with 712
42 communities, municipalities, and states (at the time of writing) with their own Complete
43 Streets policies (8). The movement continues to spread where we see a number of Canadian
44 municipalities implementing similar policies and others recognizing the importance of
45 Complete Street ideals (9).

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1 **The Complete Streets Movement**

2 Streets provide vital links throughout the urban realm creating essential connections between
3 homes, work, schools, and businesses. They are also critical in providing the network that
4 links public spaces and places of gathering for individual neighborhoods, communities and
5 cities as a whole. Today, many urban arterials in the United States (and comparatively in
6 Canada as well) severely lack the infrastructure needed to accommodate for social
7 interactions and modes of active transportation (10). In 2009, 40% of United States citizens
8 (over the age of 50), reported inadequate sidewalks in their communities, 55% reported an
9 absence or lack of bicycle lanes, and 48% felt uncomfortable while waiting at the local bus
10 stops (10). The results from this federal survey implies that urban road design over the last
11 70 years have largely neglected to provide for non-driver users. Now with an expansive
12 automobile-centric roadway system, North American planners and engineers have begun to
13 look at ways to redefine the existing transportation system by moving away from the once
14 desired “fast and cheap mobility” (which has traditionally prioritized motor vehicles in both
15 ROW access and surrounding land development), (11) and focus on creating safer streets and
16 effective means of accessibility for all users. In other words, the Complete Streets movement
17 was created to challenge the automobile-focused paradigm and bring recognition and
18 importance to other transportation choices that go beyond the private vehicle (12).

19

20 **The Design of a Complete Street**

21 Planning for a street and its physical factors come under tremendous influences given the
22 contexts of surrounding densities, land-use mix, pedestrian-vehicular interaction and overall
23 ROW configuration (14). Although streets have been identified by many (15, 17, 17, 18, etc.)
24 as critical components of a city’s make-up and its most “vital organs” (18), very little has
25 actually been done to analyze the physical form and configuration of successful streets (14).

26 Researchers and organizations across North America have catalogued Complete
27 Street examples within various communities to identify physical components that have made
28 these specific streets *complete*. Commonly observed physical components of Complete
29 Streets include improvement to bicycle infrastructure (e.g., bicycle lanes, cycle tracks),
30 pedestrian enhancements (e.g., streetscaping, increased sidewalk widths), traffic calming
31 measures (e.g., decrease in traffic lanes, increase in on-street parking, decrease in speed
32 limits), and improved accessibility measures (e.g., textured sidewalk shoulders, gripping
33 domes, lower and sloped curbs) (6, 12).

34 These features, along with other common elements of a Complete Street (such as
35 improvements in public transit, interactive on-street commercial and retail space, etc.)
36 speculatively offer a wide array of benefits for the immediate users, the surrounding
37 communities, as well as for the entire regions. Complete Streets are intended to safely
38 accommodate users through multi-modal ROWs designed to serve diverse functions
39 including mobility, accessibility, recreation, business, and community activities (13). The
40 hypothesized benefits of a Complete Street include (a) improved transportation options and
41 accessibility, (b) improved personal and community health due to increased use of alternative
42 transportation modes, (c) reduced congestion, pollution, and injury due to a reduction in
43 automobile travel, and (d) smart growth development (13). While these potential benefits for
44 Complete Streets are numerous, evidence that directly links a Complete Street to these
45 hypothesized benefits are only beginning to emerge.

1 Smith et al. (5) recently recognized that Complete Streets must be customized to the
2 surrounding characteristics of the community that the ROW serves (5). However, while the
3 physical infrastructure of a rural Complete Street will differ in comparison to an urban one
4 (due to differences of surrounding land use and intended function of the ROW), the broad
5 conceptual principles should provide the two streets with a “common denominator” and
6 overall goal of prioritizing safety over convenience for everyone who uses the ROW (5).
7 Despite these common goals and objectives, there is an apparent ambiguity of how these
8 projects physically look at the ground/ street level. This research paper begins to provide
9 insights on the project-level definitions of Complete Street, as understood by professionals
10 engaged in Complete Streets planning at the municipality or regional municipality level.
11

12 **METHODS**

13 This investigation focuses on the Greater Golden Horseshoe (GGH) Region in Southern
14 Ontario, Canada. The GGH is the most populous region in the country (8.6 million people in
15 2011 (20)) In 2006, the Ontario Ministry of Municipal Affairs and Housing released the
16 Growth Plan for the GGH. This 25-year plan has been created to implement policies that
17 ensure a number of sustainable planning objectives. The Growth Plan identified 25 urban
18 growth centres within the GGH. These growth centres are major municipalities within the
19 region and are subject to strategic planning interventions and investments to accommodate a
20 significant projected growth in population, density, and employment over the next few
21 decades (21). With regards to transportation, this Plan aims to “reduce traffic gridlock by
22 improving access to a greater range of transportation options” (21). Due to the supportive
23 planning principles and processes that enable multi-modal transportation (including
24 Complete Streets), the GGH was deemed as a suitable region for this research.
25

26 This research used a focus group discussion to explore the current professional
27 understanding of Complete Streets. Key contacts representing all the 25 urban growth centres
28 (as identified in the Growth Plan for the GGH) were contacted to participate in a focus group.
29 Eleven participants attended the focus group, which took place in February, 2014. The
30 participants included six transportation engineers and five transportation planners, each of
31 whom represented a different growth centre in the GGH. Discussions with the group were
32 focused on their thoughts on what a Complete Street project looked like at the street level,
33 and what influences existed (in the planning context) on the creation of these roadway
34 projects within their respective growth centres. Semi-structured conversations were held
35 where each expert gave their opinions, insights and knowledge based on their own
36 professional experiences within the context of their municipality. The focus group discussion
37 was approximately 2 hours in length, and was facilitated by the co-authors of this paper. The
38 discussion was audio-recorded for further thematic analysis. Ethics approval for this research
39 was obtained from the Ryerson University Research Ethics Board.
40

40 **FINDINGS**

41 The participants of the focus group presented a number of concepts and ideas regarding how
42 Complete Streets are conceived and defined by transportation planning professionals, at least
43 in the context of the GGH region, and what planning considerations influence their built
44 forms. Although various thoughts and opinions were presented, two main themes regarding
45 the definition of Complete Streets emerged during the discussion. The first theme centers on
46 the various context dependencies that a ROW is subjected to, and how these influences

1 would significantly alter the way a Complete Street is designed and built. These contextual
2 issues were identified as determinants of how a Complete Street is defined *physically* (e.g.,
3 the existence of bicycle lanes, traffic calming measures, sidewalks on the ROW, etc.), and
4 also how it is defined *functionally* (e.g., the movement of high volume traffic flows versus
5 pedestrian-only ROWs, etc.).

6 The second theme centers on the planning process; some argued that a Complete
7 Street should be defined not by the physical components of the street, but by considering *how*
8 a street was planned, designed and implemented. Since design trade-offs are routine in most
9 street upgrades, (including Complete Street projects), the experts looked at the various
10 considerations that are taken when entering the planning processes for improved ROWs, and
11 began to explore the idea of defining a Complete Street based on what considerations are
12 taken into account before the physical components are actually built.

13 14 **Contexts that Influence Complete Streets**

15 The focus group participants identified that context played an important role when trying to
16 define a Complete Street through its physical components. A number of factors were
17 identified as important when determining which characteristics a *complete* ROW will have,
18 as well as what standards and qualities these elements are able to meet. There were four
19 broad context sensitivities that were identified by the participants as being heavily influential:
20 (a) surrounding land uses, (b) roadway typology, (c) age or the maturity of the road, and (d)
21 the quality of infrastructure. Although the first three contextual issues are dependent on the
22 geographical location within the city, each were identified individually by the practitioners
23 and as such, have been presented in this paper as independent domains of influence.

24 *Surrounding Land Uses*

25 Surrounding land uses may influence the definition of a Complete Street at the project or
26 street level. Streets are the access points to various residential and non-residential
27 destinations, and as such, a street needs to efficiently accommodate for this need for access
28 through their designed components. The focus group indicated that often times, commonly
29 practiced Complete Street elements are not appropriate for a given ROW when considering a
30 street's surrounding land uses. For example, while the downtown commercial areas may
31 require bicycle lanes, active commercial street fronts, transit access, traffic calming
32 measures, and sidewalks on both side of the ROW, not all of these elements may be
33 appropriate or needed for a suburban residential street. Similarly, streets surrounded by
34 industrial land uses often need ROWs that will allow access and ease of travel for large
35 vehicles (unlike downtown or suburban residential streets) and may require wider traffic
36 lanes and turning radii for functional purposes.

37 In other words, while Complete Streets located in all areas of the city would
38 presumably have similar goals (e.g., to increase the safety and comfort of its users, as well as
39 increase levels of walking, cycling and active transportation use), considerations needed to be
40 taken regarding how the street serves the surrounding parcels of land. As one participant put
41 it, "what's the point of putting [in] more sidewalks if you have nowhere to go?" In doing this,
42 Complete Streets will take on different forms through a variety of combined elements that
43 best fits the community it resides in. Due to this significant variation, the definition and *look*
44 of a Complete Street at the street level will vary considerably.

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1 *Roadway Typologies and Street Hierarchy*

2 According to the focus group participants, the position of a street in the overall hierarchy of
3 the street network will also determine what elements should be included into a street design,
4 and ultimately determine how a Complete Street is defined. For example, while a city's
5 major arterials function to efficiently move high volumes of travellers (for longer distances),
6 a collector road is designed to move lower volumes of travellers and typically serve users
7 specific to a given area (22). The practitioners indicated that these road-hierarchy related
8 considerations may produce diverse combinations of Complete Street elements and may also
9 ultimately influence how a Complete Street is defined at the street level.

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11 *The Age of ROWs and their Existing Widths*

12 The age of the city, and specifically the age of the street (including the built form on it) is
13 another context dependent feature that may influence the physical appearance of a Complete
14 Street project. Every ROW has boundaries that are physically defined by the built form that
15 lies directly next to it. Since buildings are rarely moved or taken away, a street ROW is
16 typically restricted by its width as well as the sidewalks provided. The focus group
17 participants pointed out that downtowns of cities often have older and narrower ROWs
18 compared to the newer, and more spread-out suburban areas. Because of this, there are often
19 challenges associated when retrofitting an older street. Due to the limited widths,
20 transportation planners/ designers often have to prioritize transportation modes (based on the
21 intended function through designated roadway hierarchies) in their planning and design
22 processes, as not every use can be included or improved upon. For example, if cycling is a
23 priority then on-street parking may have to be removed due to the lack of space within the
24 ROW. One participant pointed out that "putting a bicycle lane in downtown Toronto is very
25 different" compared to putting one in on a suburban collector road. In downtown Toronto,
26 "the narrow lanes provide very little space and [the designer] would have to take out a lane"
27 out of only few very busy traffic lanes to accommodate for it, which is an extremely
28 challenging task. To contrast with older and narrower ROWs, a street that is newer and
29 wider, and is located in a more low density and/or suburban context, allows more flexibility
30 to accommodate and improve upon design features without having to make as many trade-
31 offs.

32

33 *Quality of Roadway Infrastructure*

34 Depending on the street hierarchy, the quality of transportation infrastructure for various
35 modes of travelling, as well as the level of service may be different. The focus group
36 participants acknowledged that the term Complete Street appears to paint an image of a
37 ROW that serves every travel mode to the highest standard. However depending on the urban
38 context and previously set priorities, one mode may be better accommodated for than another
39 within a ROW. Sometimes design trade-offs must be made when taking function and user
40 priority into account. The focus group identified that a Complete Street can be measured by
41 "the quality of the service that [the street] delivers to the community for that context" and
42 while some elements may be delivered to a high standard, others may be implemented at a
43 lower grade (or sometimes not at all).

44 Taking these various context sensitivities into consideration helps us begin to
45 understand why such ambiguity exists when identifying specific Complete Street projects.
46 Participants however, also discussed the importance of looking beyond the physical features

1 of the ROW and towards identifying these projects in light of the planning and design
2 processes.

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4 **Planning Processes that Influence a Complete Street**

5 Instead of focusing on the physical elements (e.g., the built forms, roadway infrastructure) of
6 a Complete Street project, participants pointed out that the processes and considerations
7 adopted during a street's initial planning and designing phases could be an alternative way
8 when trying to define a Complete Street. In other words, this conceptualization focuses on a
9 definition that is informed by *how* a street is planned/conceived instead of *what* it looks like.

10 The focus group discussion revealed two planning processes and primary
11 considerations relating to a Complete Street project. The first process was to plan for the
12 overall *feel, function and form* of the ROW. The participants indicated that if these three
13 aspects were appropriately thought out and planned for, then the street could be considered
14 *complete*. Similarly, planning for all *ages, modes, and abilities* of users on a street may be a
15 second process that would lead towards building an inclusive ROW, as well as provide
16 another means in defining a Complete Street project. Although these processes do not
17 provide definitive answers of what physical elements define a Complete Street, they do offer
18 alternative ways of conceptualizing and defining these projects using means that go beyond
19 the physical/ built form.

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21 *Feel, Function and Form*

22 Although a Complete Street can relate to a number of *feelings* and perceptions for the users
23 (e.g. inclusive, social, active, vibrant) the focus group participants emphasized that one of the
24 biggest priorities for a Complete Street's planning process should be giving adequate
25 considerations to user safety and comfort.

26 Identifying the street *function* is the second component of the planning process that
27 helps to further influence and define a Complete Street. A primary consideration for street
28 renewal is the overall intended function of the road. As identified previously, this function
29 can be determined through the context dependencies of a road and its hierarchical location
30 within the overall street network. By determining the street's intended function the planner
31 can begin to anticipate the travel mode priorities of the street, following which the design
32 considerations can begin to take shape.

33 The consideration of *form* is the third component to the planning process that might
34 influence a Complete Street's definition. The focus group participants pointed out that
35 practicing systematic planning processes are critical in executing the built form of a street
36 that is conducive the overall level of comfort, safety, and desired function and activity. When
37 planning for a Complete Street, the focus group indicated that attention must be given to
38 these physical elements that may go beyond the generic municipal design guidelines.

39 Although resulting projects will vary in size and shape (given the variety of
40 contextual sensitivities (described previously), the participants felt that when the planning
41 process involved in a street (re)design considers the desired *feel, function, and form*, the
42 street may be defined as a Complete Street regardless of the physical form it takes or the built
43 elements that are included.

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1 *Age, Mode, and Ability*

2 The second process that may help define a Complete Street is similar to the first. However,
3 instead of considering the street's *feel, function, and form*, this concept focuses on
4 accommodating for the citizens of different *ages, modes and abilities*. The focus group
5 discussed the "eight to eighty" concept, which emphasizes that if a street is safe and
6 comfortable for an 8 year old or an 80 year old, it will also be suitable for all other users (22).
7 One participant commented that a given downtown commercial ROW should not only feel
8 safe for the "avid cyclist" but should also feel safe for "Mom, Dad, and the kids."

9 In addition to planning for the user's *age*, planning for various travel modes is also
10 important. The participants emphasized that a ROW should take into consideration the
11 primary modes of travel including walking, cycling, public transit (if available) and driving.
12 Finally, planning for different levels of user *mobility and ability* is also an important part of
13 this planning process. Such considerations would include provisions for users dependent on
14 mobility assistant devices, strollers/carriages, or users who may have hearing, visual and/or
15 other impairments. If the planning process relating to a street re(design) consciously takes
16 these aspects into account, the focus group indicated that street may be able to be called a
17 Complete Street.

18

19 **DISCUSSION AND CONCLUSIONS**

20 Defining a street as a Complete Street is difficult. While much of the academic and popular
21 literature agree that a Complete Street should safely accommodate for all users regardless of
22 travel mode, age, or ability, (4,23) a gap remains with regard to defining a Complete Street at
23 the street level. In this study, data from a focus group discussion was used to explore the
24 professional perspectives relating to the definition of Complete Street projects. Participants
25 indicated that defining a Complete Street at the project level is difficult without the
26 consideration of a number of contextual sensitivities that influence the physical/ built form of
27 a ROW. Four broad types of contextual sensitivities were discussed, namely: (a) surrounding
28 land uses, (b) roadway typology and street hierarchies, (c) age or the maturity of the road,
29 and (d) the quality of infrastructure. These contexts along with other external factors (e.g.,
30 political influence, community needs, wants, and diversities, environmental factors, budget
31 constraints) will likely influence the built forms that we see in urban streets. These contextual
32 forces also influence a streetscape in a much more complex manner than what has been
33 presented in this paper. Each street is surrounded and conceivably impacted by a unique
34 combination of surrounding contexts. Further research could examine these context
35 sensitivities more closely, as well as how these factors work in combination with one another
36 to define the characteristics of a street on the ground.

37 The focus group also suggested that a Complete Street could be defined based on *how*
38 a street is created rather than *what* it looks like. In other words, instead of examining what
39 has been physically built (e.g. built forms, roadway infrastructure), the planning and
40 designing processes for ROWs may offer an alternative definition for Complete Street
41 projects based on the elements that have been considered and evaluated. While several
42 Complete Street- related concepts and design principles might be reviewed during the
43 planning process, only some may be implemented due to other restrictive factors. This is an
44 important observation, and emphasizes the importance of the planning process instead of
45 physical outcome in defining a Complete Street. The concept of Complete Streets has
46 received much attention in recent years among both advocacy organizations and local

1 municipalities, and communities across North America have implemented many street
2 (re)design projects that adopt these principles (6, 12). The scopes of these projects, however,
3 vary widely and a gap remains with regard to understanding the conceptual and physical
4 commonalities among these projects at the ground/ street level. Within this context, this
5 paper contributes by delivering insight into the project-level definitions of a Complete Street,
6 as well as the contextual and planning aspects that influence this definition. The results
7 reported are a summarization of the professional thoughts and experiences of transportation
8 planning professionals within the GGH region in Canada. Our findings will help
9 transportation planners within (and beyond) the region by improving their knowledge and
10 awareness regarding how a Complete Street project's built form can change in response to
11 various urban land use contexts and planning priorities and processes.

12 The Complete Streets movement is a relatively new concept in the field of urban
13 transportation planning, particularly in the GGH region and more broadly in North America.
14 Whether looking at the scope of a single project, or examining the over arching concepts,
15 further conceptual research on Complete Streets, such as the one presented here, will
16 contribute to the successful adoption of this concept in urban transportation planning
17 practice, and in the long run, enable desired changes to our transportation systems, travel
18 behavior and population health.

19

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