Appendix A: Literature Matrix

A toolkit to accelerate The adoption of Cycling for Transportation

Findings from a review of the Literature on Behaviour change interventions to increase urban cycling

Behaviour Change Interventions		
Behaviour Change Technique	**Definition and Rationale**	**Cycling Related Example**
Identify and Remove Barriers	Studies have concluded that knowledge and information campaigns do not lead to behaviour change (Abrahamse et al., 2007; McKenzie-Mohr, 2000). Education can affect and shape attitudes, but barriers mediate whether they are expressed through behaviour. Since different individuals and communities face diverse impediments to behavior change; and the impediments are often multiple, little happens until the right combination of intervention types is found. Barriers may be physical, social, financial or psychological. Once barriers are identified a more targeted and context-specific approach to promote the desired behaviour change can be implemented, ensuring best results (McKenzie-Mohr, 2000; Stokes, et al., 2011).	A fear of cycling (particularly amongst females), perceived lack of comfort and convenience, deeply imbedded individual attitudes and perceptions, habit and the interconnectedness of the physical environment, infrastructure and climate
Social Norms	Normative information is a powerful, yet often undetected form of social influence. A growing body of evidence has been developed explaining the importance and potential (positive) impact of normative social influence. Social norms are the set of common beliefs and perceptions of appropriate behaviours operating within a community (Schultz et al., 2007). These norms not only spur, but also guide and direct action and human behaviour in meaningful ways. It is noted that individuals often underestimate the extent to which their actions in a (social) situation are determined by the similar actions of others (Schultz et al., 2007).	Pervasive "streets are for cars" rhetoric, cycling as a "fringe" mode of transport in North-American cities vs. cycling as a mainstream activity in many European, particularly Scandinavian cities
Social Cues & Modeling	The impacts of social cueing and modeling stem from the notion of positive deviance. Modelling is used to actively emulate a new and desired behaviour; which can help a target audience envision a (realistic) change in behaviour (Spreitzer & Sonenshein, 2004). The creation of a positive, social space, built on the principles of encouragement is shown motivate participation (O'Fallon, 2010; Cleary & McClintock, 2000; De Geus et al., 2008).	Workplace cycling ambassadors and "champions," parents and teachers as important models of behaviour and the importance of effective cycle training programs to teach, model and offer supportive learning environment for (particularly) new cyclists
Local Hubs & Community Involvement	The creation of supportive community hubs that encourage civic involvement. This collective approach, most evident in a "face-to-face" environment fosters and supports groups' motivational commitment to their action and resilience in behaviour change (Bandura, 2000). Local hubs and community involvement may include the provision of physical space, funds, resources and/or forums for robust and meaningful civic involvement and leadership in program design, support, implementation and ultimately, participation. Local level involvement in behaviour change initiatives is best and most effectively encouraged with the promotion of an accessible, fun and inclusive group dynamic, highlighting the importance of the group and social conversations and interactions (Sloman et al., 2010; Aldred & Jungnickel, 2012).	Creation of cycling culture, community social networks and the creation of a social space via cycling initiatives
Foot in the Door & Pledges	Cialdini (1993) discusses the concept of "starting small and building." This commitment strategy, also referred to as a "foot-in-the-door technique" has informed various resource conservation as well as cycling studies and interventions. A pledge, often in the form of a public commitment to behaviour change is a common use of this technique. Pledges encourage individuals, organizations and/or communities to make an initial commitment towards action, with the (often hidden) intention to predispose them for later, much larger concessions, leading to behaviour change – which would otherwise not have been possible (McKenzie-Mohr, 2000; Cialdini, 1993).	Employee pledgebank to bike to work (with small initial commitment requirements) and Bike to Work events to provide "first" cycling experience
Visual Images, Prompts & Reminders	Prompts and reminders (often visual imagery) reinforce positive progress and can mitigate the effects of forgetfulness, a common barrier to behaviour change. Prompts and reminders act as reinforcements to encourage the sustenance of a recent behaviour change (McKenzie-Mohr, 2000).	Promotional packs, fun and usable prompts and large-scale cycling events as a promotional strategy to provide a visual prompt and reminder of cycling prevalence and opportunity
Branding	Branding establishes and nurtures a relationship with a customer and/or a target population. Brand recognition and image control are often integral for successful program design and implementation. Program name, logo and key "tagline" are important principles for a successful branding strategy and must be clearly connected to desired initiative (Cooper, 2007).	Make use of clear, concise and consistent program identity, targeted marketing packages and place-based cycling branding strategies
Feedback	The creation of mechanisms to allow participant interaction and the valuable exchange of information. Feedback techniques engage participants by encouraging two-way communication, based on the social psychological notions of reciprocity (Abrahamse et al., 2007).	Bicycle user groups (BUGs) and individualized travel planning programmes
Incentives	Early attention was given to the use of incentives and disincentives as motives effective at promoting environmentally responsible behaviour (De Young, 2000). Appealing to people's noble values is much more effective than offering financial incentives. Alternately, some studies have found that offering financial incentives can even act as a disincentive for altruistic behaviour. On the other hand, gifts can be seen as forming a social contract and people may feel compelled to follow through with the action that has been suggested to do (or not to do). Additionally, there is strong evidence that incentives and information interact, with the combination sometimes being much more effective than the sum of the two interventions (Stern, 1999). For the purposes of this report, external incentives will be highlighted (monetary, prizes, etc.) as opposed to the internal (health, individual gains, etc.), as this topic encompasses a very large body of literature, and ultimately encroaches on an alternative focus area.	Mileage clubs, prizes, discounts, gifts, tax exemptions and small monetary payments

Cycling Initiatives			
Initiative	**Definition and Rationale**	**Source**	**Notable Examples**
Open Streets	Open Streets programs refer to the act of temporary closing city streets to vehicular traffic and encouraging citizens to walk, run, rollerblade or bike and reclaim their streets as public space. Open Streets will serve as the umbrella term for Car-free Days, Sunday Parkways, Pedestrian Days and Ciclovías.	8-80 Cities, 2010	Bogota's Ciclovía, Portland and Chicago's Sunday Parkways, NYC Summer Streets
Safe Routes to School	Safe Routes to School (SRTS) programs include education, encouragement, infrastructure, and enforcement programs aimed at increasing the safety and number of students who walk and bicycle to school .	Pucher et al., 2010	Active and Safe Routes to School, bike bus to school
Cycle to Work Schemes	Schemes or promotional interventions that encourage commuters to cycle to work. Components may include free breakfasts, contests, giveaways, cycling activities and other incentives.	Pucher et al., 2010	Cycle to Work Guarantee, Bike Busters, Challenge for Change
Cycle Training and Education	Bicycle training schemes aimed at teaching existing or potential cyclists bike handling, cycle repair, maintenance skills and education on the safe, lawful use of the roads. Cycle training and education will serve as the umbrella term for skills workshops, training programmes, safety campaigns and cycling manuals.	Pucher et al., 2010	Learn to ride courses, Bikeability training
Cycle Promotion Events	Group, community or city-wide promotional events for all things bike-related. Serves as the umbrella term for recreational events, theme rides and cycling festivals and celebrations.	Pucher et al., 2010	Biker's breakfasts, community events, Bike to Work Week celebrations
Bicycle Share Programs	Bicycle sharing service where bicycles are made available for shared use amongst citizens, for utility purposes, particularly in urban areas.	Beroud, 2012	Bixi, Bicing, Vélib systems
Route Planning Tools	Map-making or trip planning tool for journeys that can be completed by bicycle.		mapmyride.com, Ride the City
Advocacy	Individuals, groups and communities showing a committed and active involvement with cyclists, cycling promotion, cycling infrastructure, and/or cycling related public policy.		Cycle Toronto, Critical Mass groups, bicycle user associations

Ecuador	Ecuador	Ecuador	Ecuador	Ecuador	Ecuador
Egypt	Egypt	Egypt	Egypt	Egypt	Egypt
El Salvador	El Salvador	El Salvador	El Salvador	El Salvador	El Salvador
Equatorial Guinea	Equatorial Guinea	Equatorial Guinea	Equatorial Guinea	Equatorial Guinea	Equatorial Guinea
Eritrea	Eritrea	Eritrea	Eritrea	Eritrea	Eritrea
Estonia	Estonia	Estonia	Estonia	Estonia	Estonia
Eswatini	Eswatini	Eswatini	Eswatini	Eswatini	Eswatini
Ethiopia	Ethiopia	Ethiopia	Ethiopia	Ethiopia	Ethiopia
Fiji	Fiji	Fiji	Fiji	Fiji	Fiji
Finland	Finland	Finland	Finland	Finland	Finland
France	France	France	France	France	France
Gabon	Gabon	Gabon	Gabon	Gabon	Gabon
Gambia	Gambia	Gambia	Gambia	Gambia	Gambia
Georgia	Georgia	Georgia	Georgia	Georgia	Georgia
Germany	Germany	Germany	Germany	Germany	Germany
Ghana	Ghana	Ghana	Ghana	Ghana	Ghana
Greece	Greece	Greece	Greece	Greece	Greece
Grenada	Grenada	Grenada	Grenada	Grenada	Grenada
Guatemala	Guatemala	Guatemala	Guatemala	Guatemala	Guatemala
Guinea	Guinea	Guinea	Guinea	Guinea	Guinea
Guinea-Bissau	Guinea-Bissau	Guinea-Bissau	Guinea-Bissau	Guinea-Bissau	Guinea-Bissau
Guyana	Guyana	Guyana	Guyana	Guyana	Guyana
Haiti	Haiti	Haiti	Haiti	Haiti	Haiti
Honduras	Honduras	Honduras	Honduras	Honduras	Honduras
Hungary	Hungary	Hungary	Hungary	Hungary	Hungary
Iceland	Iceland	Iceland	Iceland	Iceland	Iceland
India	India	India	India	India	India
Indonesia	Indonesia	Indonesia	Indonesia	Indonesia	Indonesia
Iran	Iran	Iran	Iran	Iran	Iran
Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
Ireland	Ireland	Ireland	Ireland	Ireland	Ireland
Israel	Israel	Israel	Israel	Israel	Israel
Italy	Italy	Italy	Italy	Italy	Italy
Jamaica	Jamaica	Jamaica	Jamaica	Jamaica	Jamaica
Japan	Japan	Japan	Japan	Japan	Japan
Jordan	Jordan	Jordan	Jordan	Jordan	Jordan
Kazakhstan	Kazakhstan	Kazakhstan	Kazakhstan	Kazakhstan	Kazakhstan
Kenya	Kenya	Kenya	Kenya	Kenya	Kenya
Kiribati	Kiribati	Kiribati	Kiribati	Kiribati	Kiribati
Kosovo	Kosovo	Kosovo	Kosovo	Kosovo	Kosovo
Kuwait	Kuwait	Kuwait	Kuwait	Kuwait	Kuwait
Kyrgyzstan	Kyrgyzstan	Kyrgyzstan	Kyrgyzstan	Kyrgyzstan	Kyrgyzstan
Laos	Laos	Laos	Laos	Laos	Laos
Latvia	Latvia	Latvia	Latvia	Latvia	Latvia
Lebanon	Lebanon	Lebanon	Lebanon	Lebanon	Lebanon
Lesotho	Lesotho	Lesotho	Lesotho	Lesotho	Lesotho
Liberia	Liberia	Liberia	Liberia	Liberia	Liberia
Libya	Libya	Libya	Libya	Libya	Libya
Lithuania	Lithuania	Lithuania	Lithuania	Lithuania	Lithuania
Luxembourg	Luxembourg	Luxembourg	Luxembourg	Luxembourg	Luxembourg
Madagascar	Madagascar	Madagascar	Madagascar	Madagascar	Madagascar
Malawi	Malawi	Malawi	Malawi	Malawi	Malawi
Malaysia	Malaysia	Malaysia	Malaysia	Malaysia	Malaysia
Maldives	Maldives	Maldives	Maldives	Maldives	Maldives
Mali	Mali	Mali	Mali	Mali	Mali
Malta	Malta	Malta	Malta	Malta	Malta
Mauritania	Mauritania	Mauritania	Mauritania	Mauritania	Mauritania
Mauritius	Mauritius	Mauritius	Mauritius	Mauritius	Mauritius
Mexico	Mexico	Mexico	Mexico	Mexico	Mexico
Moldova	Moldova	Moldova	Moldova	Moldova	Moldova
Mongolia	Mongolia	Mongolia	Mongolia	Mongolia	Mongolia
Montenegro	Montenegro	Montenegro	Montenegro	Montenegro	Montenegro
Morocco	Morocco	Morocco	Morocco	Morocco	Morocco
Mozambique	Mozambique	Mozambique	Mozambique	Mozambique	Mozambique
Myanmar	Myanmar	Myanmar	Myanmar	Myanmar	Myanmar
Namibia	Namibia	Namibia	Namibia	Namibia	Namibia
Nepal	Nepal	Nepal	Nepal	Nepal	Nepal
Netherlands	Netherlands	Netherlands	Netherlands	Netherlands	Netherlands
New Zealand	New Zealand	New Zealand	New Zealand	New Zealand	New Zealand
Nicaragua	Nicaragua	Nicaragua	Nicaragua	Nicaragua	Nicaragua
Niger	Niger	Niger	Niger	Niger	Niger
Nigeria	Nigeria	Nigeria	Nigeria	Nigeria	Nigeria
North Korea	North Korea	North Korea	North Korea	North Korea	North Korea
North Macedonia	North Macedonia	North Macedonia	North Macedonia	North Macedonia	North Macedonia
Norway	Norway	Norway	Norway	Norway	Norway
Oman	Oman	Oman	Oman	Oman	Oman
Pakistan	Pakistan	Pakistan	Pakistan	Pakistan	Pakistan
Palestine	Palestine	Palestine	Palestine	Palestine	Palestine
Panama	Panama	Panama	Panama	Panama	Panama
Papua New Guinea	Papua New Guinea	Papua New Guinea	Papua New Guinea	Papua New Guinea	Papua New Guinea
Paraguay	Paraguay	Paraguay	Paraguay	Paraguay	Paraguay
Peru	Peru	Peru	Peru	Peru	Peru
Philippines	Philippines	Philippines	Philippines	Philippines	Philippines
Poland	Poland	Poland	Poland	Poland	Poland
Portugal	Portugal	Portugal	Portugal	Portugal	Portugal
Qatar	Qatar	Qatar	Qatar	Qatar	Qatar
Romania	Romania	Romania	Romania	Romania	Romania
Russia	Russia	Russia	Russia	Russia	Russia
Rwanda	Rwanda	Rwanda	Rwanda	Rwanda	Rwanda
Saint Kitts and Nevis	Saint Kitts and Nevis	Saint Kitts and Nevis	Saint Kitts and Nevis	Saint Kitts and Nevis	Saint Kitts and Nevis
Saint Lucia	Saint Lucia	Saint Lucia	Saint Lucia	Saint Lucia	Saint Lucia
Saint Vincent and the Grenadines	Saint Vincent and the Grenadines	Saint Vincent and the Grenadines	Saint Vincent and the Grenadines	Saint Vincent and the Grenadines	Saint Vincent and the Grenadines
Samoa	Samoa	Samoa	Samoa	Samoa	Samoa
San Marino	San Marino	San Marino	San Marino	San Marino	San Marino
São Tomé and Príncipe	São Tomé and Príncipe	São Tomé and Príncipe	São Tomé and Príncipe	São Tomé and Príncipe	São Tomé and Príncipe
Saudi Arabia	Saudi Arabia	Saudi Arabia	Saudi Arabia	Saudi Arabia	Saudi Arabia
Senegal	Senegal	Senegal	Senegal	Senegal	Senegal
Serbia	Serbia	Serbia	Serbia	Serbia	Serbia
Seychelles	Seychelles	Seychelles	Seychelles	Seychelles	Seychelles
Sierra Leone	Sierra Leone	Sierra Leone	Sierra Leone	Sierra Leone	Sierra Leone
Singapore	Singapore	Singapore	Singapore	Singapore	Singapore
Slovakia	Slovakia	Slovakia	Slovakia	Slovakia	Slovakia
Slovenia	Slovenia	Slovenia	Slovenia	Slovenia	Slovenia
Solomon Islands	Solomon Islands	Solomon Islands	Solomon Islands	Solomon Islands	Solomon Islands
Somalia	Somalia	Somalia	Somalia	Somalia	Somalia
South Africa	South Africa	South Africa	South Africa	South Africa	South Africa
South Korea	South Korea	South Korea	South Korea	South Korea	South Korea
South Sudan	South Sudan	South Sudan	South Sudan	South Sudan	South Sudan
Spain	Spain	Spain	Spain	Spain	Spain
Sri Lanka	Sri Lanka	Sri Lanka	Sri Lanka	Sri Lanka	Sri Lanka
Sudan	Sudan	Sudan	Sudan	Sudan	Sudan
Suriname	Suriname	Suriname	Suriname	Suriname	Suriname
Sweden	Sweden	Sweden	Sweden	Sweden	Sweden
Switzerland	Switzerland	Switzerland	Switzerland	Switzerland	Switzerland
Syria	Syria	Syria	Syria	Syria	Syria
Tajikistan	Tajikistan	Tajikistan	Tajikistan	Tajikistan	Tajikistan
Tanzania	Tanzania	Tanzania	Tanzania	Tanzania	Tanzania
Thailand	Thailand	Thailand	Thailand	Thailand	Thailand
Timor-Leste	Timor-Leste	Timor-Leste	Timor-Leste	Timor-Leste	Timor-Leste
Togo	Togo	Togo	Togo	Togo	Togo
Tonga	Tonga	Tonga	Tonga	Tonga	Tonga
Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago
Tunisia	Tunisia	Tunisia	Tunisia	Tunisia	Tunisia
Turkey	Turkey	Turkey	Turkey	Turkey	Turkey
Turkmenistan	Turkmenistan	Turkmenistan	Turkmenistan	Turkmenistan	Turkmenistan
Tuvalu	Tuvalu	Tuvalu	Tuvalu	Tuvalu	Tuvalu
Uganda	Uganda	Uganda	Uganda	Uganda	Uganda
Ukraine	Ukraine	Ukraine	Ukraine	Ukraine	Ukraine
United Arab Emirates	United Arab Emirates	United Arab Emirates	United Arab Emirates	United Arab Emirates	United Arab Emirates
United Kingdom	United Kingdom	United Kingdom	United Kingdom	United Kingdom	United Kingdom
United States	United States	United States	United States	United States	United States
Uruguay	Uruguay	Uruguay	Uruguay	Uruguay	Uruguay
Uzbekistan	Uzbekistan	Uzbekistan	Uzbekistan	Uzbekistan	Uzbekistan
Vanuatu	Vanuatu	Vanuatu	Vanuatu	Vanuatu	Vanuatu
Venezuela	Venezuela	Venezuela	Venezuela	Venezuela	Venezuela
Vietnam	Vietnam	Vietnam	Vietnam	Vietnam	Vietnam
Yemen	Yemen	Yemen	Yemen	Yemen	Yemen
Zambia	Zambia	Zambia	Zambia	Zambia	Zambia
Zimbabwe	Zimbabwe	Zimbabwe	Zimbabwe	Zimbabwe	Zimbabwe

	Physical infrastructure (as control)	Social infrastructure (includes social and private entrepreneurial initiatives)						Civic infrastructure (includes civil society initiatives, local government components and other related)					Additional?
	Infrastructure/built environment	Open streets	Safe routes to --/ Challenge for change (group initiatives)	Theme rides	Cycle training; education	Community access (what is this?)	Celebrations, Festivals/Events	Route planning tools	Advocacy	Funding for civil society involvement	Participatory instances (planning, organizing, other)	Bike share	
Identify & remove barriers													
Pledges													
Social Norms													
Modelling													
Local hubs													
Human Factors													
Reciprocity													
Foot in the door													
Prompts													
Visual images													
Branding													
Reminder													
Feedback													
Incentives													
Other?													
Social capital													

	Physical infrastructure (as control)	Social infrastructure (includes social and private entrepreneurial initiatives)						Civic infrastructure (includes civil society initiatives, local government components and other related)					Additional ?
	Infrastructure/ built environment	**Open streets**	**Safe routes to --/ Challenge for change**	**Theme rides**	**Cycle training; education**	**Community access (what is?)**	**Celebrations / Events**	**Route planning tools**	**Advocacy**	**Funding for civil society**	**Participation (planning, organizing, other)**	**Bike share**	
Identify & remove barriers	X	X	X		X			X	X	X	X	X	
Pledges			X		X				X				
Social Norms	X	X	X	X			X		X	X	X	X	
Modelling		X	X	X	X		X		X	X	X	X	
Local hubs		X	X	X	X		X		X	X	X	X	
Human Factors	X		X		X		X	X	X	X	X		
Reciprocity			X		X		X			X			
Foot in the door		X	X	X			X			X		X	
Prompts		X	X		X		X			X	X	X	
Visual images	X	X	X	X	X		X	X	X	X	X	X	
Branding		X	X	X			X	X	X	X	X	X	
Reminder	X	X	X	X	X		X		X	X	X	X	
Feedback			X		X				X	X	X		
Incentives	X	X	X		X			X	X	X	X	X	

This initial evaluation of the matrix seeks to "translate" between what is typically covered by the cycling literature to date, as it intersects (or fails to intersect) with the behaviour change theory that forms the basis of our research. Note that physical infrastructure is included because it is the focus of so much of the literature. Preparing a simplified version of this matrix, then, with the total number of articles that focus primarily on a specific topic will document and provide a basic test of our hypothesis that there is a gap in the literature, because of this focus. Note that while much of the literature (whether academic or practitioner in source) does address the different components of behaviour change, but <u>most does not test or evaluate the effectiveness of these methods</u>, another gap where our work (in this initial and future studies) could make a very significant contribution.

Source: prepared by Lake Sagaris, based on initial round of team and partner discussions, and starting bibliography. Note, many of these initiatives are described or announced in practitioner-sourced materials, but may only be listed, or not even mentioned, in the academic literature to date, although there is some crossover at events (research hubs, conferences and symposia).