FHWA GUIDEBOOK FOR

MEASURING MULTIMODAL NETWORK CONNECTIVITY



FEBRUARY 2018

1.	REPORT NO.	2. GOVERNMENT	3	3.	RECIPIENT'S C	CATALOG NO.	
	FHWA-HEP-18-032	ACCESSION NO. N/A			N/A		
4.	TITLE AND SUBTITLE		5	5.	REPORT DATE February 2018		
	Guidebook for Measuring Multimodal Network Connectivity		у		February 2018		
			e	5.	PERFORMING	ORGANIZATION CODE	
					N/A		
7.	AUTHORS	8	3.				
	Hannah Twaddell (ICF); Elio);					
	Jennifer Dill (PSU); Kelly Cli Kimberly Voros (Alta); Hug						
9.	PERFORMING ORGANIZATION NAME AND ADDRESS		1	10.	WORK UNIT N	O. (TRAIS)	
	ICF, 9300 Lee Highway, Fairfax, VA 22031				N/A		
	Portland State University (1	February 2018 6. PERFORMING ORGANIZATION CONTACT N/A 8. PERFORMING ORGANIZATION REPORT NUMBER N/A 10. WORK UNIT NO. (TRAIS) N/A 11. CONTRACT OR GRANT NO. DTFH61-II-D-00033 6801-1-6084 13. TYPE OF REPORT AND PERIOD COVERED Research Result and Conclusion 14. SPONSORING AGENCY CODE FHWA/HEPH-10	R GRANT NO.		
	PO Box 751, Portland, OR			DTFH61-II-D-00033		33	
	Alta Planning + Design (Alt			6801-1-6084			
	711 SE Grand Ave, Portland, OR 97214						
9.	SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		1	3.			
	Office of Planning, Environment, and Realty Federal Highway Administration 1200 New Jersey Avenue, SE, Washington DC 20590				Research Result	and Conclusion	
			1	4.	SPONSORING	AGENCY CODE	
					FHWA/HEPH-10		
15.	SUPPLEMENTARY NOTES						
	N/A						
16.	ABSTRACT						
	application of analysis me a five-step analysis proces	thods and measures to support t s and numerous methods and m	ransportation easures to su	tion planning and programming decisions. It describes support a variety of planning decisions. It includes			
17.	KEY WORDS	1	8.	DISTRIBUTION	I STATEMENT		
	Network, connectivity, me bicycle, pedestrian, multin			to the public thro	This document is available ough the National Technical <i>r</i> ice, Springfield, VA 22161		
19.	SECURITY CLASSIF.	20. SECURITY CLASSIF.	21. NO. C	DF I	PAGES	22. PRICE	
	(OF THIS REPORT)	(OF THIS PAGE)	76			\$0	
	Unclassified	Unclassified					

DISCLAIMER

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The U.S. Government assumes no liability for the use of information contained in this document.

The U.S. Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear in this report only because they are considered essential to the objective of this document.

The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official policy of the U.S. Department of Transportation. This report does not constitute a standard, specification, or regulation.

This report discusses general research associated with performance measures and elements of a performance management framework. This report was not intended to address the specific requirements associated with the FHWA rule that established national measures for system performance and other associated requirements, including specific target setting, data collection/reporting, and other general reporting requirements. That final rule ["National Performance Management Measures; Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program": Docket No. FHWA-2013-0054, RIN 2125-AF54, Federal Register - Vol. 82, No. 11, Pg. 5970 - January 18, 2017] can be found at: https://www.gpo.gov/fdsys/pkg/ FR-2017-01-18/pdf/2017-00681.pdf. Within this final rule a measure to track the percentage of travel occurring in non-single occupancy vehicles (non-SOV) was established to reflect multimodal transportation use. The FHWA acknowledged in the rulemaking that the approaches to effectively track multimodal performance will improve with time, and, for this reason, noted that the required non-SOV measure will serve as a starting point. The FHWA further discussed its intent to revisit this measure in the future, as research projects underway to evaluate multimodal performance reach their completion. This report is an example of a research project that will help inform transportation decision makers in how they can effectively measure and improve multimodal performance. Complimentary efforts that are underway both within and outside of FHWA will be used as well to evaluate how and when required multimodal performance measures can be improved.

ACKNOWLEDGEMENTS

All photographs by Nathan McNeil, Portland State University, unless otherwise noted.



TABLE OF

CONTENTS

СНАР	TER 1: INTRODUCTION	50		
3	About this Guidebook			
3	What is Multimodal Network Connectivity?	52		
4	How Can Multimodal Network Connectivity Analyses Support Transportation Decisions?	54		
5	Who Can Use this Guide?	56		
•••••	TER 2: IECTIVITY ANALYSIS PROCESS	58		
10	Step 1: Identify the Planning Context	60		
14	Step 2: Define the Analysis Method(s) and Measures	62		
19	Step 3: Assemble the Data			

- 26 Step 4: Compute the Metrics
- 28 Step 5: Package the Results

CHAPTER 3:

FACT SHEETS ON CONNECTIVITY ANALYSIS METHODS AND MEASURES

- 38 Connectivity Analysis Method: Network Completeness
- 40 Connectivity Analysis Method: Network Density
- 42 Connectivity Analysis Method: Route Directness
- 44 Connectivity Analysis Method: Access to Destinations
- 46 Connectivity Analysis Method: Network Quality
- 48 Spotlight on National Practice— The PeopleForBikes Initiative to Measure Bicycle Network Connectivity Nationwide

- Connectivity Measure: Bicycle Level of Service (BLOS)
- Connectivity Measure:
 Bicycle Level of Traffic Stress (Bicycle LTS)
- 4 Connectivity Measure: Bicycle Low Stress Connectivity
- 6 Connectivity Measure: Bicycle Route Quality Index (RQI)
- 58 Connectivity Measure:Pedestrian Index of the Environment (PIE)
- 60 Connectivity Measure: Pedestrian Level of Service (PLOS)
- 62 Connectivity Measure: Pedestrian Level of Traffic Stress (Pedestrian LTS)

CHAPTER 4: LESSONS LEARNED

- 66 Step 1: Identifying the Planning Context
- 66 Step 2: Defining the Analysis Method
- 66 Step 3: Assembling Data
- 67 Step 4: Computing Metrics
- 67 Step 5: Packaging Results
- 68 BIBLIOGRAPHY

69 APPENDIX: CASE STUDIES

01 INTRODUCTION

- 3 About This Guidebook
- 3 What Is Multimodal Network Connectivity?
- 4 How Can Multimodal Network Connectivity Analyses Support Transportation Decisions?
- 5 Who Can Use This Guide?