

REFERENCES

- Ahas, R., Silm, S., Ja, O., Saluveer, E., & Tiru, M. (2010). *Using mobile positioning data to model locations meaningful to users of mobile phones*.
- Alexander, L., Jiang, S., Murga, M., & González, M. (2015). *Origin–destination trips by purpose and time of day inferred from mobile phone data*. ScienceDirect.
- Arai, A., & Shibasaki, R. (2013). *Estimation of Human Mobility Patterns and Attributes Analyzing Anonymized Mobile Phone CDR*.
- Beyer, M., & Lanley, D. (2012). *Gartner*. Retrieved from <http://www.gartner.com>
- Buchanan, C. (1976). Transport for society. *Institution of Civil Engineers*.
- Caceres, N., Wideberg, J., & Benitez, F. (2007). *Deriving origin destination data from a mobile phone network*. IET Intelligent Transport Systems.
- Calabrese, F., Lorenzo, G., Liu, L., & Ratti, C. (2011). Estimating Origin-Destination Flows Using Mobile Phone Location Data. *IEEE*.
- Castillo, E., Menendez, J., & Jimenez, P. (2008). *Trip matrix and path flow reconstruction and estimation based on plate scanning and link observations*.
- Csaji, Browet, B., Traag, V., Delvenne, J., Huens, E., Dooren, P., . . . Blondel, V. (2013). Exploring the mobility of mobile phone users. *Physica A.Statistical Mechanics and its Applications*,.
- Dash, M., Koo, K., Decraene, J., & Yap, G. (2014). *CDR-To-MoVis: Developing A Mobility Visualization System From CDR Data*.
- Esko, S. (2013). *Mobile positioning datasets in mobility studies*.
- Farkavcova, Guenther, E., & Greschner, V. (2010). Decision making for transportation systems as a support for sustainable stewardship. *Emerald Insight*.
- Gamage, M. (2016). Is Google Loon right technology for Sri Lanka.
- Groves, R. (2006). *Nonresponse rates and nonresponse bias in household survey*.
- Hariharan, R., & Toyama, K. (2010). Parsing and Modeling Location histories. *Geographic Information Science*.
- Hasan, S., Schneider, C., Ukkusuri, S., & Gonzalez, M. (2013). Spatiotemporal patterns of urban human mobility. *Journal of statistical physica*.
- Iqbal, M., Charisma, F., Choudhury, Wangb, P., & Gonzalez, M. (2013). *Development of origin–destination matrices using mobile phone call data*.

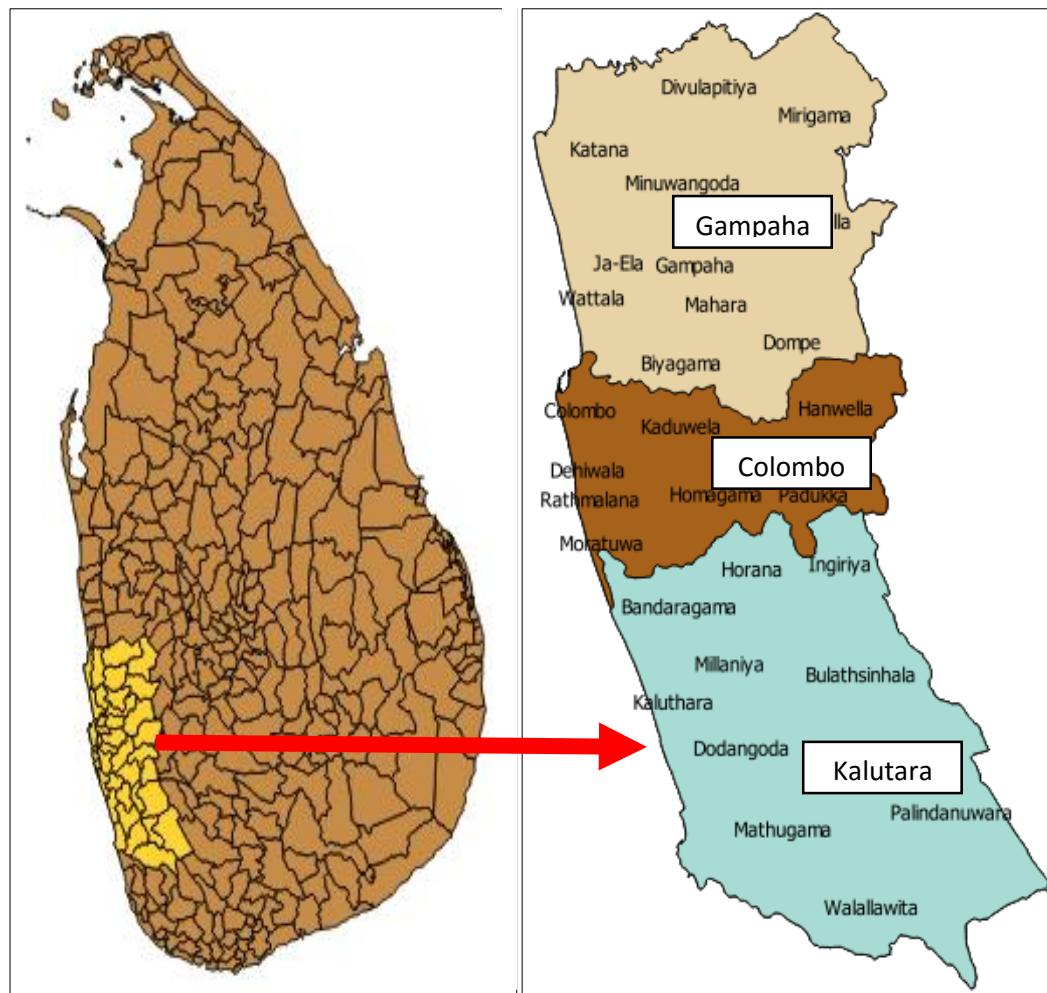
- Isaacman, S., Becker, R., Caceres, R., Kobourov, S., Martonosi, M., Rowland, J., & Varshavsky, A. (2010). *Identifying Important Places in People's Lives from Cellular Network Data*. Springer Berlin Heidelberg.
- Jarv, O., Ahas, R., & Witlox, F. (2013). *Understanding monthly variability in human activity spaces : A twelve-month study using mobile phone call detail records*.
- Jiang, F., Yang, Y., Ferreira, J., Frazzoli, E., & González, M. (2013). A Review of Urban Computing for Mobile Phone Traces: Current Methods, Challenges and opportunities. New York.
- JICA. (2014). *Urban Transport system development project for Colombo MetropolitonRegion and Suburbs*.
- Kaisler, S., Armour, F., Espinosa, J., & Money, W. (2013). Big Data: Issues and Challenges Moving Forward. *Hawaii International Conference on System Sciences*.
- Kevin, Kung, S., Greco, K., Sobolevsky, S., & Ratti, C. (2014). *Exploring Universal Patterns in Human Home-Work Commuting from Mobile Phone Data*.
- Khan, F., Ali, M., & Dev, H. (2015). A Hierarchical Approach for Identifying User Activity Patterns from Mobile Phone Call Detail Record. *IEEE*.
- Kulpa, T., & Szarata, A. (2016). *Analysis of household survey sample size in trip modelling process*. ScienceDirect.
- Leng, Y. (2013). *Urban Computing using Call Detail Records: Mobility Pattern Mining, Next-location Prediction and Location Recommendation*.
- Madhwawa, K., Lokanathan, S., Samarajiva, R., & Maldeniya, D. (2015). *Understanding communities using Mobile Network Big Data*.
- Maldeniya, D., Kumarage, A., & Lokanathan, S. (2015). Where did you come from? Where did you go? Robust policy relevant evidence from mobile network big data.
- Maldeniya, D., Lokanathan, S., & Kumarage, A. (2015). *Origin - destination matrix estimation for Sri Lanka using Mobile Network Big Data*.
- Marcos, R., Vieira, Martinez, E. F., Bakalov, P., Martinez, V., Vassilis, J., & Tsotras. (2010). Querying Spatio -Temporal Patterns in Mobile Phone-Call Data bases.
- McGuckin, N., & Srinivasan, N. (2011). The journey to work in the context of daily travel. *Census Data for Transportation Planning Conference*.
- McNally, G., & Mickael. (2007). *The four step model*.
- Mellegard, E., Moritz, S., & Zahoor, M. (2011). *Origin/Destination-estimation Using Celluar Network Data*. IEEE.

- Meyer, M., & Miller, E. (2000). *Urban Transport Planning*. McGraw-Hill.
- Miyauchi, Gabriel, K., & Yuhei. (2015). *Commuting and Productivity: Quantifying Urban Economic Activity using Cell Phone Data*.
- Papacostas, C. (1987). *Fundamentals of Transportation Engineering*.
- Parry, K., & Hazelton, M. (2012). *Estimation of origin–destination matrices from link counts and sporadic routing data*.
- Planning Tank*. (2017). Retrieved from <http://planningtank.com>
- Powell, & Victor. (2014). *Principal Component Analysis*. Retrieved from <http://setosa.io/ev/principal-component-analysis/>
- Saini, T., Barot, K., Sinha, A., Gogineni, R., Krishnan, R., & Venkata. (2015). *Estimating Origin-Destination Matrix using Telecom Network Data*.
- Samarajeewa, R. (2005). *Mobilizing information and communications technologies for effective disaster warning*.
- Samarajeewa, R., Madhwawa, K., Lokanathan, S., & Maldeniya, D. (2015). *Using mobile network big data for land use classifications*.
- Schneider, Belik, C., Couronne, T., Smoreda, Z., & Gonzalez, M. (2013). Unravelling daily human mobility motifs. *Journal of The Royal Society Interface*,.
- Sri Lanka - Telecoms, M. a.-S. (2016). Retrieved from <http://www.budde.com.au>
- Tiru, M. (2014). *Overview of the sources and challenges of mobile positioning data for statistics*.
- Wang, M., Schrock, S., Broek, N., & Mulinazzi, T. (2013). *Estimating Dynamic Origin-Destination Data and Travel Demand Using Cell Phone Network Data*. International Journal of Intelligent Transportation Sy 1 stems.
- Wright, P., & Ashford, N. (1989). *Transportation Engineering*.
- Yang, P., Zhu, T., Wan, X., & Wang, X. (2014). *Identifying Significant Places Using Multi-day Call Detail Records*. IEEE.
- Zhang, Y. (2014). *User Mobility from the View of Cellular Data Networks*.
- Zhao, Z., Jinhua, Z., & Koutsopoulos, H. (2014). *Individual-Level Trip Detection using Sparse Call Detail Record Data based on Supervised Statistical Learning*.

Appendices

APPENDIX A

Coverage area of the Household Visit Survey



APPENDIX B

Questionnaire- Household survey –gathering trip information (Source: Urban transport system development project for Colombo Metropolitan Region and Suburbs, Person trip survey)

1st. TRIP		(4) What was your Trip Purpose? (Please put ✓)																												
(1) Origin (Please put ✓) <input type="checkbox"/> 1 Home (same as Form 1) <input type="checkbox"/> 2. Work Place (same as Form 2a) <input type="checkbox"/> 3. School (same as Form 2a) <input type="checkbox"/> 4. Other (please specify the address)		Landmark/ Famous Building near by: House No. and Street Name: Village/ Town : GN division : DS division : In case of Colombo Municipality, Please fill in Postal Zone (01-15) District																												
(2) Origin Type Please Select from Table 1 <input type="checkbox"/> Others		(4) What was your Trip Purpose? (Please put ✓) <input type="checkbox"/> 1. To Work <input type="checkbox"/> 12. To School <input type="checkbox"/> 3. Shopping <input type="checkbox"/> 4. Business <input type="checkbox"/> 15. Private Matters <input type="checkbox"/> 6. To Home <input type="checkbox"/> 7. Others (specify _____)																												
(3) Departure Time <input type="checkbox"/> : <input type="checkbox"/> : A.M. <input type="checkbox"/> P.M.		(5) If you transferred to another mode of transport during the trip, state the mode you changed to and the place. <table border="1"> <thead> <tr> <th>Mode of Transport (Table 2)</th> <th>1st. Mode</th> <th>2nd. Mode</th> <th>3rd. Mode</th> <th>4th. Mode</th> <th>5th. Mode</th> </tr> </thead> <tbody> <tr> <td>Waiting Time (i.e. Bus, Railway)</td> <td></td> <td></td> <td>min</td> <td>min</td> <td>min</td> </tr> <tr> <td>Travel Time</td> <td>min</td> <td>min</td> <td>min</td> <td>min</td> <td>min</td> </tr> <tr> <td>Transfer Point (Bus stop/Railway station/ Location name)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					Mode of Transport (Table 2)	1st. Mode	2nd. Mode	3rd. Mode	4th. Mode	5th. Mode	Waiting Time (i.e. Bus, Railway)			min	min	min	Travel Time	min	min	min	min	min	Transfer Point (Bus stop/Railway station/ Location name)					
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Waiting Time (i.e. Bus, Railway)			min	min	min																									
Travel Time	min	min	min	min	min																									
Transfer Point (Bus stop/Railway station/ Location name)																														

APPENDIX C

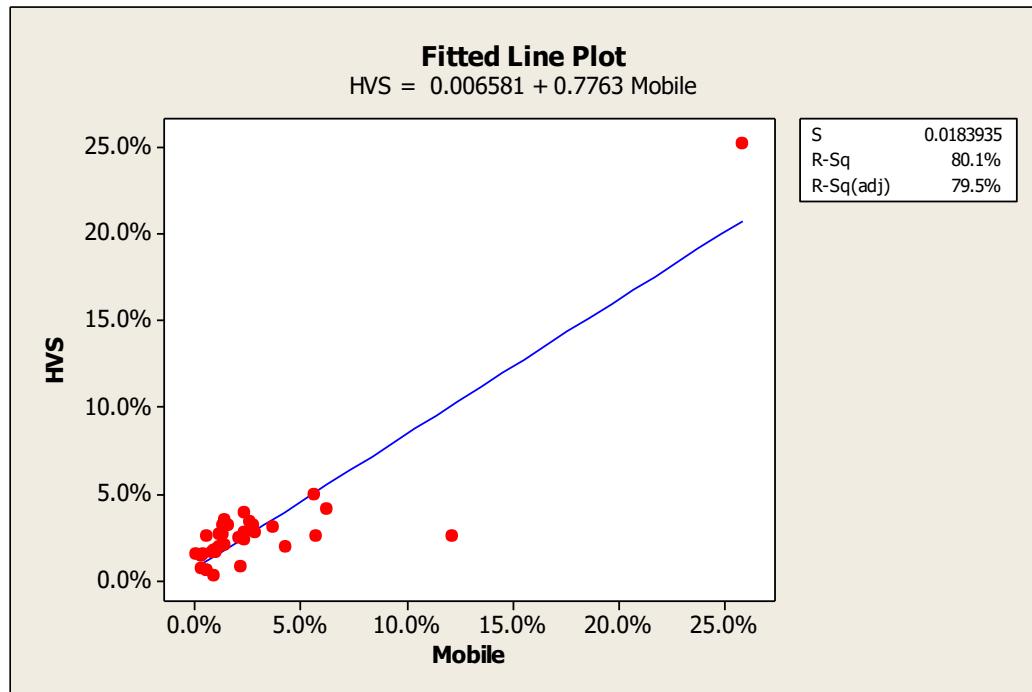
Work - home distribution at DSD level

DSD	Home			Work	
	HVS	Mobile (10 PM- 4AM)	Mobile (7PM- 4AM)	HVS	Mobile
Agalawatta	0.30%	0.90%	1.10%	0.30%	0.90%
Attanagalla	3.20%	4.30%	4.20%	2.40%	2.30%
Bandaragama	1.70%	3.00%	2.80%	0.80%	2.10%
Beruwala	2.30%	1.60%	1.60%	1.90%	1.20%
Biyagama	3.60%	3.70%	3.60%	3.40%	2.60%
Bulathsinhala	0.80%	1.20%	1.10%	0.60%	0.50%
Colombo	7.80%	7.50%	7.20%	25.1%	25.80%
Dehiwala Mt.Lavinia	2.00%	4.00%	2.50%	1.90%	4.30%
Divulapitiya	2.40%	2.10%	1.90%	1.60%	1.00%
Dodangoda	0.90%	0.70%	0.70%	0.60%	0.50%
Dompe	2.80%	1.00%	0.90%	1.70%	0.90%
Gampaha	3.60%	6.40%	3.90%	2.70%	2.90%
Hanwella	1.90%	1.30%	1.80%	1.60%	0.80%
Homagama	4.60%	5.60%	5.20%	3.10%	3.70%
Horana	2.00%	1.40%	1.40%	1.80%	1.10%
JaEla	3.70%	5.10%	4.70%	3.20%	2.80%
Kaduwela	5.20%	8.60%	6.10%	4.10%	6.30%
Kalutara	2.50%	1.30%	1.40%	2.00%	1.40%
Katana	4.30%	3.70%	3.50%	5.00%	5.60%
Kelaniya	2.30%	2.50%	2.40%	3.10%	1.60%
Kesbewa	5.20%	7.30%	7.00%	2.50%	5.70%
Kolonnawa	3.50%	3.70%	3.40%	2.40%	2.10%
Mahara	3.90%	0.10%	3.50%	1.40%	0.40%
Maharagama	4.40%	0.20%	3.70%	3.50%	1.40%
Mathugama	0.60%	3.90%	0.10%	0.00%	0.00%
Minuwangoda	2.80%	0.10%	1.30%	1.50%	0.40%
Mirigama	2.50%	1.40%	0.80%	1.50%	0.10%
Moratuwa	3.30%	0.70%	3.30%	2.70%	2.30%
Negombo	2.80%	3.50%	1.30%	3.10%	1.30%
Padukka	1.30%	1.30%	0.70%	0.70%	0.40%
Panadura	3.30%	0.60%	3.10%	2.50%	0.50%
Rathmalana	1.80%	0.90%	2.00%	2.70%	1.30%

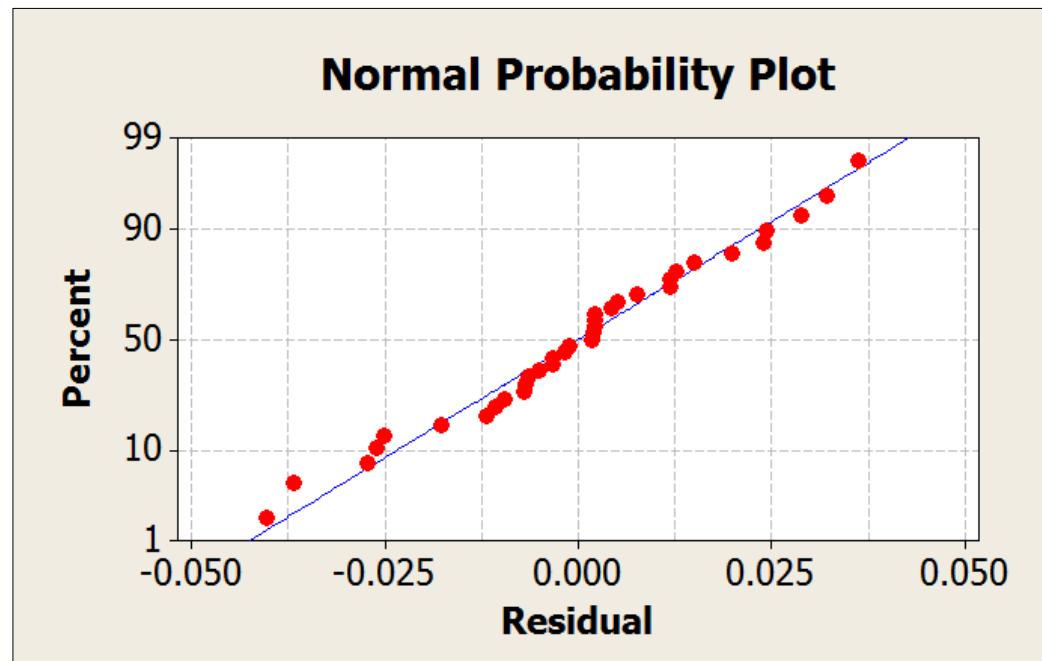
Home				Work	
DSD	HVS	Mobile (10 PM- 4AM)	Mobile (7PM- 4AM)	HVS	Mobile
Sri Jayawardanapura Kotte	2.30%	2.10%	1.80%	3.80%	2.30%
Thimbirigasyaya	1.50%	2.10%	0%	2.60%	12.20%
Wattala	2.90%	5.30%	1.00%	2.60%	1.20%

APPENDIX D

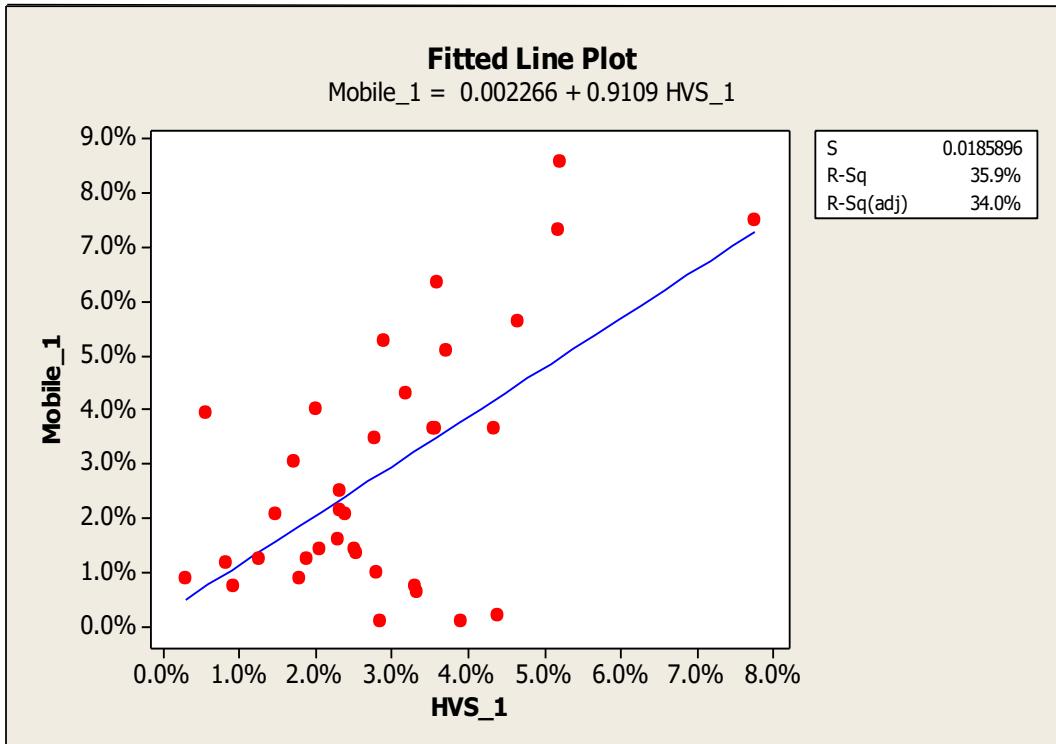
Fitted line plot - Work location distribution at DSD level



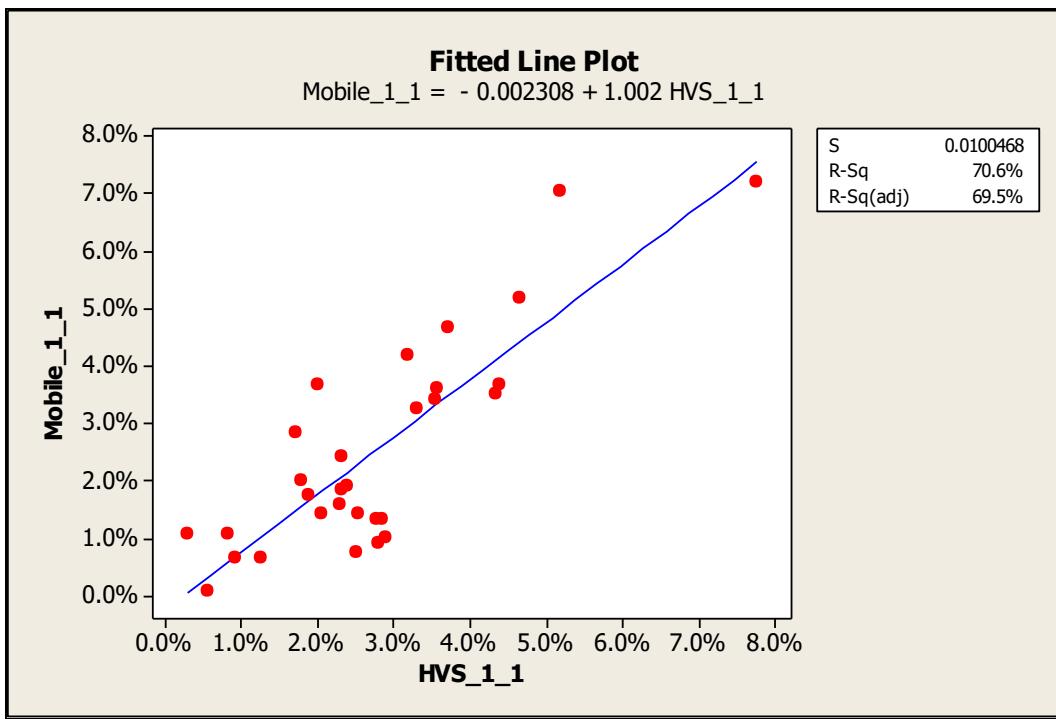
Residual plot of work location distribution



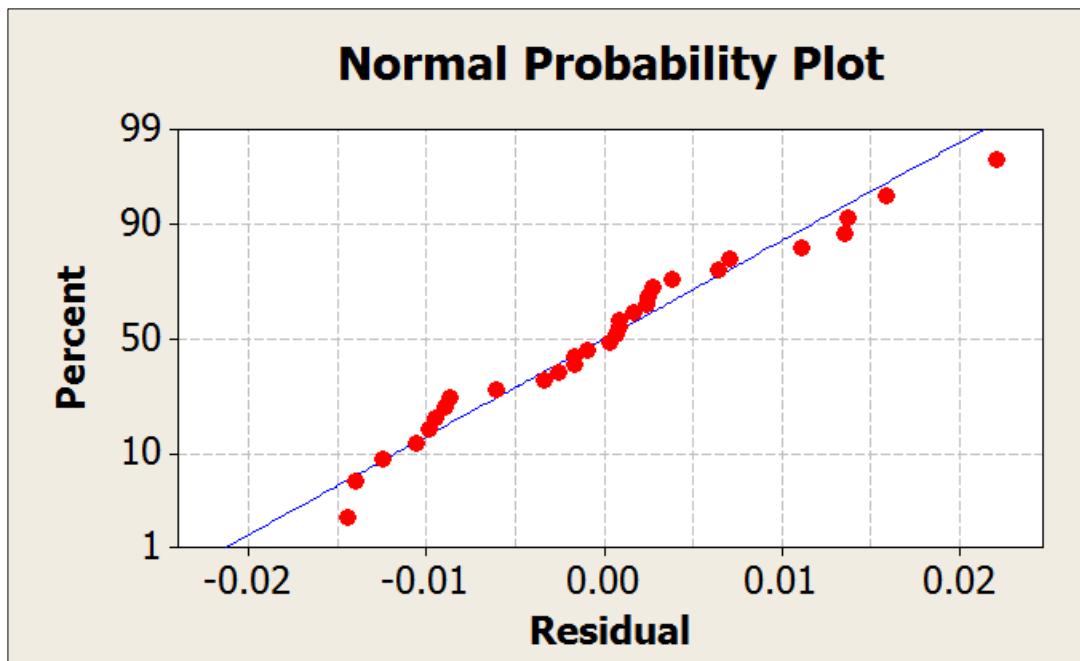
Fitted line plot-Home location distribution at DSD level (Time window-10 PM-4 PM)



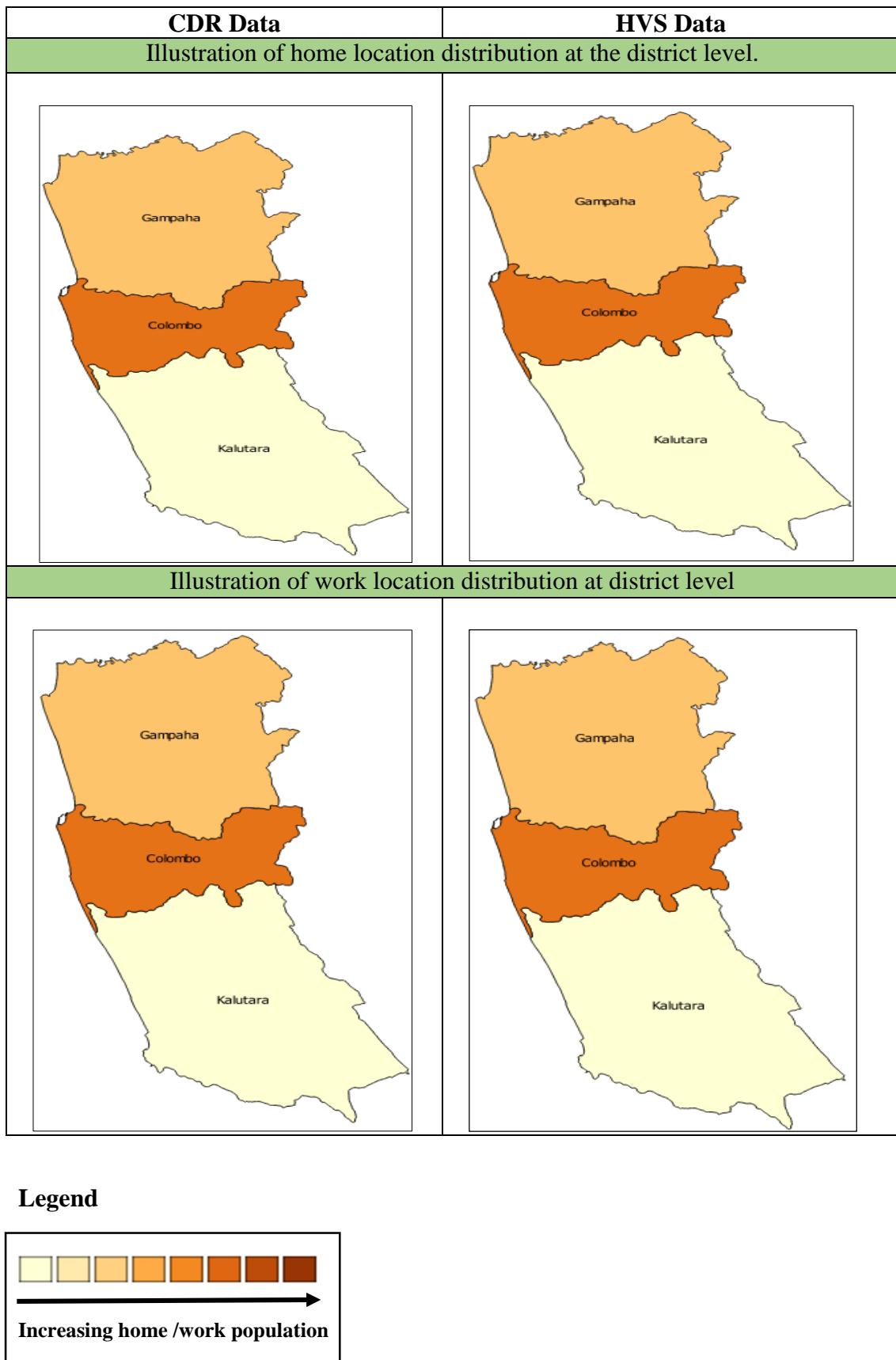
Fitted line plot Home location distribution at DSD level (Time window-7 PM-4 PM)



Residual plot of Home location distribution (7 PM – 4 PM)

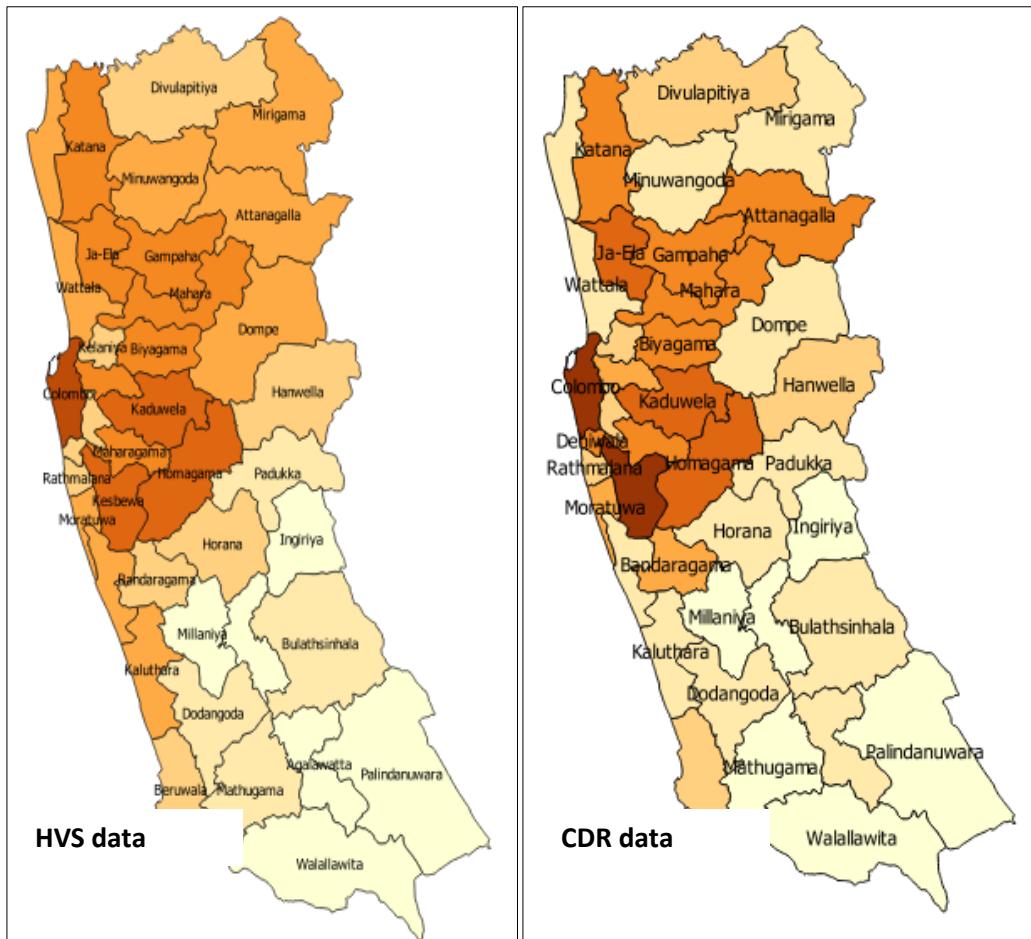


APPENDIX E



APPENDIX F

Illustration of home location distribution at DSD level.

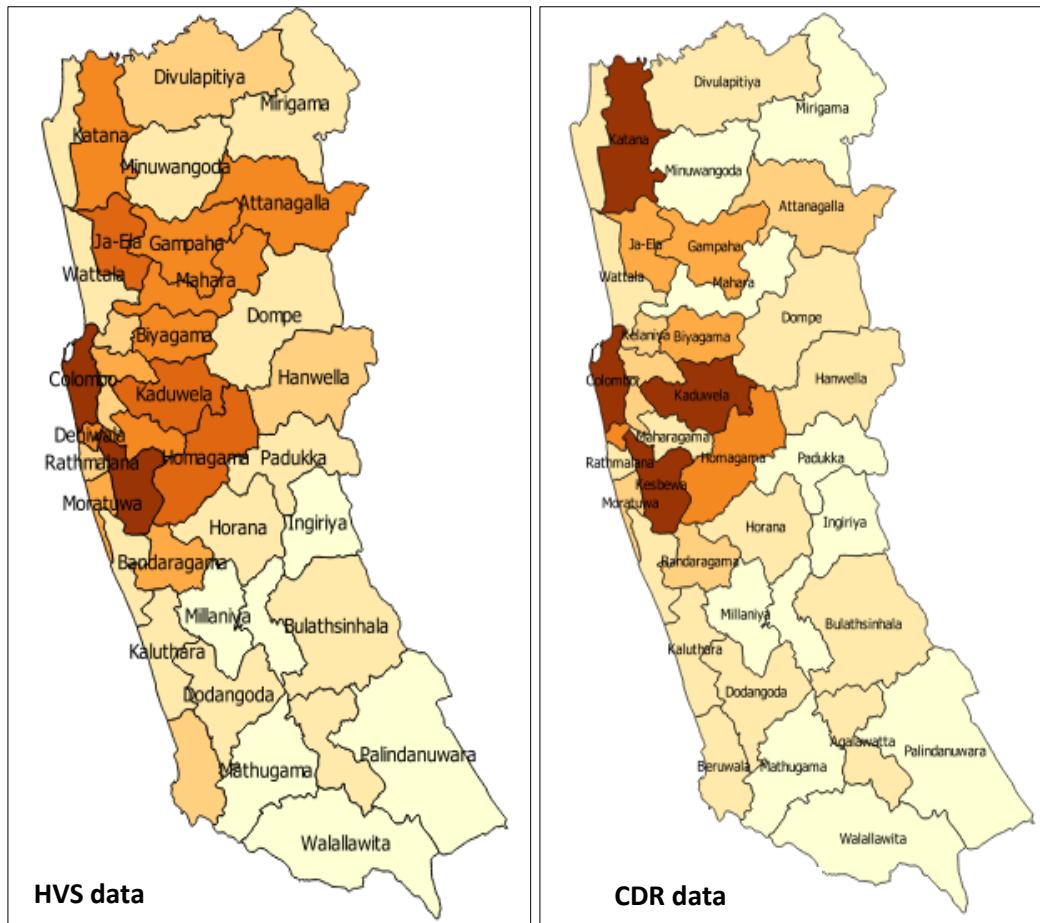


Legend



APPENDIX G

Illustration of Work location distribution at DSD level.



Legend

