



# MOBILE NETWORKS BENCHMARK REPORT OF PAKISTAN 2022

NETWORK PERFORMANCE SCORE

ENFORCEMENT WIRELESS – II DIRECTORATE  
ENFORCEMENT DIVISION  
PAKISTAN TELECOMMUNICATION AUTHORITY

# EXECUTIVE SUMMARY

## 1. NETWORK PERFORMANCE SCORE

1.1. Pakistan Telecommunication Authority (PTA) has carried out Benchmarking Campaign from 11<sup>th</sup> January to 2<sup>nd</sup> February 2022 to calculate Network Performance Score (NPS) of Cellular Mobile Operators (CMOs). During this campaign data has been in accordance with ETSI TR 103 559 methodology.

## 2. DATA COLLECTION & VALIDATION

2.1. A total of 5 x Cities, 4 x Towns and 4 x Motorways/Highways surveyed in Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan. The collected data has been validated by Rohde & Schwarz (Pvt.) Ltd., and NPS report has been generated as per aforesaid Technical Report.

## 3. CAMPAIGN HIGHLIGHTS

3.1. Key Performance Indicators (KPIs) of Voice and Data Services, have been analyzed as per the above referred NPS standard. Summary of the results is as under:

### 3.1.1. VOICE SERVICE

All CMOs have shown overall good results for Voice Services, as the companies achieved 64 ~ 80% NPS points, with Ufone in the leading position.

- Ufone and ZonG have shown the best Voice Success Ratio.
- Ufone has the best Call Setup Time while ZonG has the best Voice Quality/Mean Opinion Score (MOS).
- Jazz is also good in Call Drop Ratio. High share of usage of GSM Network is visible on Jazz network even in Cities.
- There is great room for Jazz and Telenor to improve Call Setup Success Ratio.

### 3.1.2. DATA SERVICE

All CMOs have shown poor performance in Data Services, as the companies not achieving more than 21 ~ 52% NPS points for Data Services.

- Ufone has achieved the best Overall Success Ratio.
- In HTTP DL/UL Throughput, there is great room for improvement for each operator.
- Video Quality and Setup Time are on a very good level, but Web Browsing Duration has also show room for improvement for each operator.
- Jazz and ZonG are using LTE Carrier Aggregation with up to 30MHz bandwidth, while Ufone uses only 1xLTE carrier with mainly 15MHz bandwidth in Cities and 10MHz in Towns. Telenor uses LTE Carrier Aggregation, but with maximal bandwidth of 15MHz.

## 4. HIGHEST SCORER

4.1. Ufone secured highest score in the overall benchmarking campaign, whereas ZonG is on the second place followed by Jazz and Telenor. The overall NPS scores of Ufone, ZonG, Jazz and Telenor are 634, 541, 503 & 384 points respectively.

### 4.2.1. OVERALL RESULTS

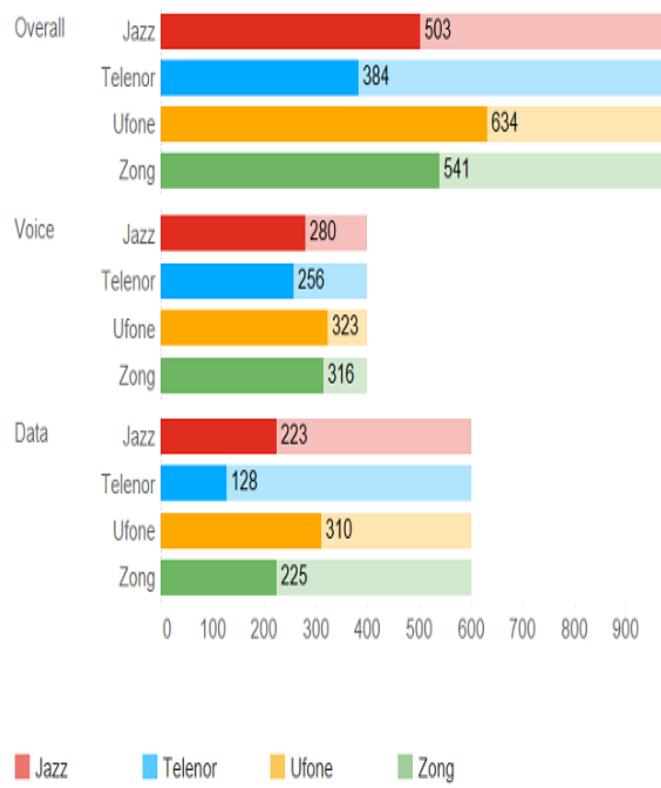
Ufone has the best overall Network Performance Score exceeding 600 points in total and having a comfortable advantage of 93 & 131 points to ZonG & Jazz positioned at the 2<sup>nd</sup> and 3<sup>rd</sup> place respectively. Telenor is at 4<sup>th</sup> with the lowest score.

### 4.2.2. VOICE SERVICE

Best Voice Service is offered by Ufone, followed by ZonG, Jazz and Telenor. The overall voice performance is on a good level for the two leading operators achieving more than 315+ points out of 400 maximum points.

### 4.2.3. DATA SERVICE

Ufone also offers the best Data Service in this campaign with a significant margin to other CMOs. However, the overall data performance is fair for Ufone and quite poor for the others.



# CAMPAIGN OVERVIEW

## 1. INTRODUCTION

1.1. European Telecommunications Standards Institute (ETSI) has published a Technical Report (TR) i.e. ETSI TR 103 559 "**SPEECH AND MULTIMEDIA TRANSMISSION QUALITY (STQ); BEST PRACTICES FOR ROBUST NETWORK QOS BENCHMARK TESTING AND SCORING**", in August 2019, commonly known as Network Performance Score (NPS). This report provides a method to collect and aggregate the test results and the weighting of the various aspects tested for each application like telephony, video and data services. The application fields are then in turn weighted and aggregated over the different areas where the data is collected i.e. City, Town and Road etc. Finally, calculation of an overall score or a joint score is performed.

## 2. BENCHMARKING CAMPAIGN

2.1. PTA in partnership with Rohde & Schwarz (Pvt.) Ltd., carried out NPS Benchmarking Campaign of CMOs from 11<sup>th</sup> January to 2<sup>nd</sup> February 2022 and collected drive test data of Voice and Data Services in different Cities, Towns and Roads throughout Pakistan. A total of 5 x Cities, 4 x Towns and 4 x Motorways/Highways surveyed and a distance of **4,522KM** travelled. This distance traveled is distributed in Cities, Towns and Motorways/Highways as 2,644KM (58.5%), **626KM** (13.8%) and **1,252KM** (27.7%) respectively. The name of Cities, Towns and Motorways/Highways alongwith survey dates are shown in **Table 1.1: Name of Cities, Towns & Roads**. Mobile Handsets have been kept on Auto Detect Mode (LTE/UMTS/GSM) i.e. preferably 4G and fallback to 3G and 2G. The signal strength samples i.e. RSRP (4G), RSCP (3G) and RxLev (2G) recorded alongwith maps of Cities, Towns and Motorways/Highways are attached as [Annex-A](#), [Annex-B](#) and [Annex-C](#) respectively.

TYPE	NAME		DAYS	DATE	KM
CITY	Islamabad		4	11 <sup>th</sup> ~ 14 <sup>th</sup> Jan 22	354
			1	18 <sup>th</sup> Jan 22	
	Lahore		3	11 <sup>th</sup> ~ 13 <sup>th</sup> Jan 22	699
			2	17 <sup>th</sup> ~ 18 <sup>th</sup> Jan 22	
			2	24 <sup>th</sup> ~ 25 <sup>th</sup> Jan 22	
	Karachi		2	13 <sup>th</sup> ~ 14 <sup>th</sup> Jan 22	889
			5	17 <sup>th</sup> ~ 21 <sup>st</sup> Jan 22	
	Peshawar		3	24 <sup>th</sup> ~ 26 <sup>th</sup> Jan 22	359
TOWN	Quetta		1	31 <sup>st</sup> Jan 22	343
			2	1 <sup>st</sup> ~ 2 <sup>nd</sup> Feb 22	
	Sub-Total				<b>2644</b>
	Fath e Jhang		2	17 <sup>th</sup> ~ 18 <sup>th</sup> Jan 22	156
	Thatta		2	24 <sup>th</sup> ~ 25 <sup>th</sup> Jan 22	198
	Charsadda		2	28 <sup>th</sup> ~ 31 <sup>st</sup> Jan 22	130
Motorway / Highway	Lodhran		1	31 <sup>st</sup> Jan 22	142
			1	1 <sup>st</sup> Feb 22	
	Sub-Total				<b>626</b>
	M-1	Islamabad to Peshawar	1	20 <sup>th</sup> Jan 22	158
	M-2	Lahore to Islamabad	1	20 <sup>th</sup> Jan 22	333
M-9 / N-55		Karachi to Sukkur	1	27 <sup>th</sup> Jan 22	431
M-3 / M-4		Lahore to Multan	1	28 <sup>th</sup> Jan 22	330
Sub-Total					<b>1252</b>
<b>TOTAL</b>					<b>4522</b>

Table 1.1: Name of Cities, Towns & Roads

2.2. Total test attempts made during this campaign for each type of service are detailed as **15,427 Voice Calls**, **17,608 Fixed Size Download**, **16,670 Fixed Size Upload**, **5,651 Capacity Download**, **5,668 Capacity Upload**, **15,300 Social Media App**, **10,230 Video Streaming**, **4,99,638 Latency**, and **82,192 Web Browsing Tests**. The Benchmarking Campaign details are described in Figure1.1: Network Performance Score Benchmarking Campaign.

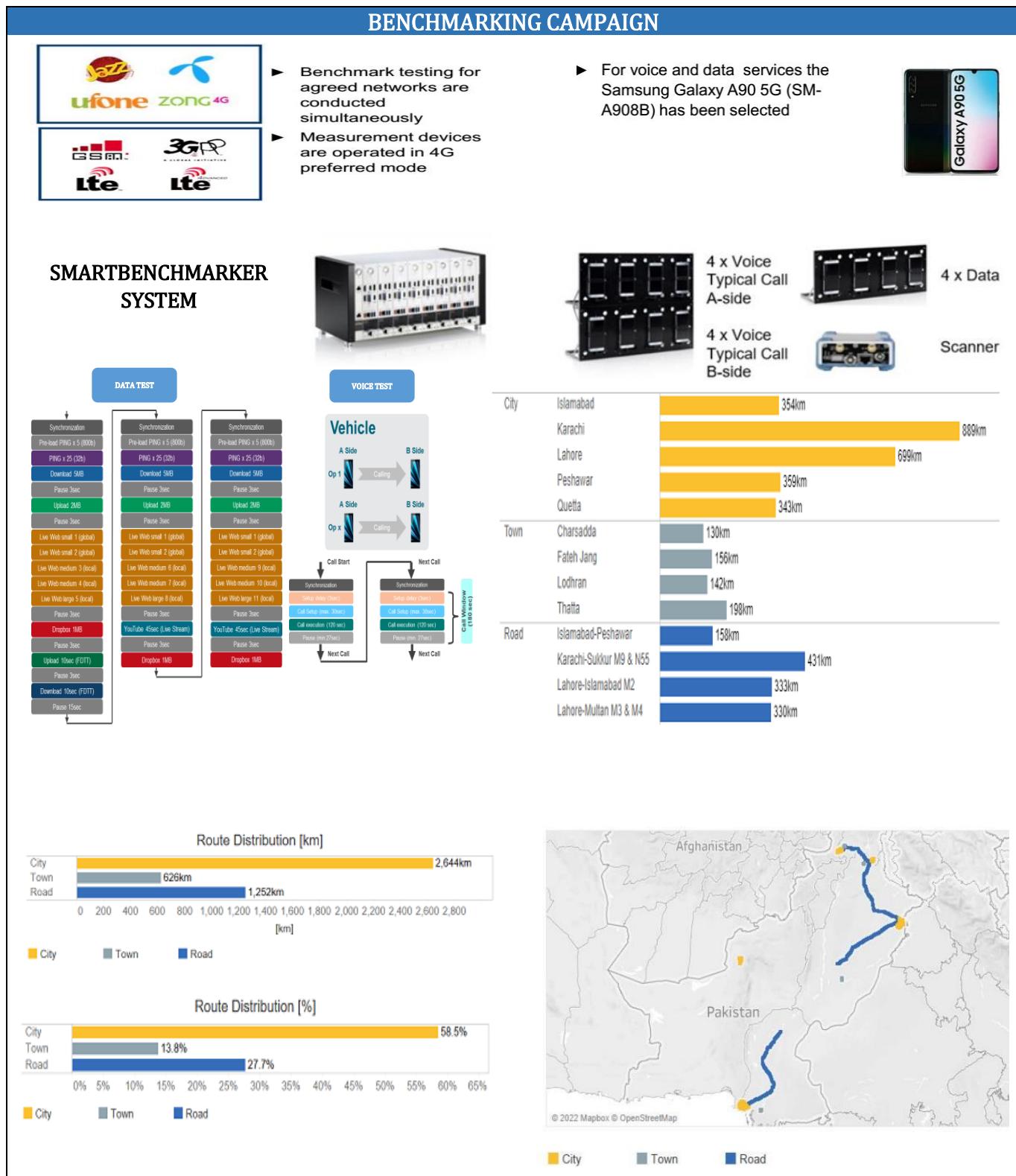


Figure 1.1: Network Performance Score Benchmarking Campaign

### 3. KEY PERFORMANCE INDICTORS

3.1. During the said campaign, Key Performance Indicators (KPIs) for Voice and Data Services (i.e. Data Transfer, Video Streaming and Web Browsing & Social Media) have been measured. The same are mentioned in **Table 1.2: Voice and Data Service Key Performance Indicators**

S. #.	SERVICE	KEY PERFORMANCE INDICATORS	
1.	VOICE	Call Setup Success Ratio	Call Drop Ratio
		Call Setup Time Average	Call Setup Time > 15 seconds Ratio
		Call Setup time 10 <sup>th</sup> Percentile	Voice MOS Average
		Voice MOS < 1.6	Voice MOS 90 <sup>th</sup> Percentile
2.	DATA TRANSFER	Http DL Success Ratio	Http UL Success Ratio
		Http DL Throughput Average	Http UL Throughput Average
		Http DL Throughput 10 <sup>th</sup> Percentile	Http DL Throughput 90 <sup>th</sup> Percentile
		Http UL Throughput 10 <sup>th</sup> Percentile	Http UL Throughput 90 <sup>th</sup> Percentile
3.	VIDEO STREAMING	Video Success Ratio	Video MOS Average
		Video MOS 10 <sup>th</sup> Percentile	Video Setup Average
		Video Setup Time > 10 seconds Ratio	
4.	BROWSING	Browsing Success Ratio	Browsing Duration Average
		Browsing Duration < 6 Seconds Ratio	
5.	SOCIAL MEDIA	Social Media Success Ratio	Social Media Duration Average
		Social Media Duration > 15 Seconds Ratio	

Table 1.2: Voice and Data Service Key Performance Indicators

### 4. NPS KPIS THRESHOLD VALUES

4.1. ETSI TR 103 559 defined the NPS KPIs High and Low Thresholds Values for Voice and Data Services (i.e. Data Transfer, Video Streaming, Web Browsing & Social Media). The Network Score rates the overall Quality of Experience (QoE) of a network by combining the fulfillment of main KPIs from different services. It takes into account the technical performance of the services only. Billing, tariffs or support quality are not considered. Each NPS QoS KPI High and Low Threshold values are listed in **Table 1.3: NPS KPIs High & Low Threshold Values**.

VOICE KPI THRESHOLD			VOICE KPI WEIGHT	
KPI	THRESHOLD	VALUE	KPI	WEIGHT
CSSR	Low	85%	CSSR	0.3125
	High	100%		
CST Average	Low	12.00 Seconds	CST	0.0625
	High	4.50 Seconds		
CST 10 <sup>th</sup> Percentile	Low	8.00 Seconds	CST 10 <sup>th</sup> Percentile	0.0375
	High	4.00 Seconds		
CST Excess Ratio	Low	3.00%	CST Excess Ratio	0.0875
	High	0.00%		
CDR	Low	10.00%	CDR	0.3750
	High	0.00%		
POLQA MOS Average	Low	2.00	POLQA MOS	0.0438
	High	4.30		
POLQA MOS 90 <sup>th</sup> Percentile	Low	4.00	POLQA MOS 90 <sup>th</sup> Percentile	0.0250
	High	4.30		
POLQA MOS Bad Rate	Low	10.00%	POLQA MOS Bad Rate	0.0562
	High	0.00%		

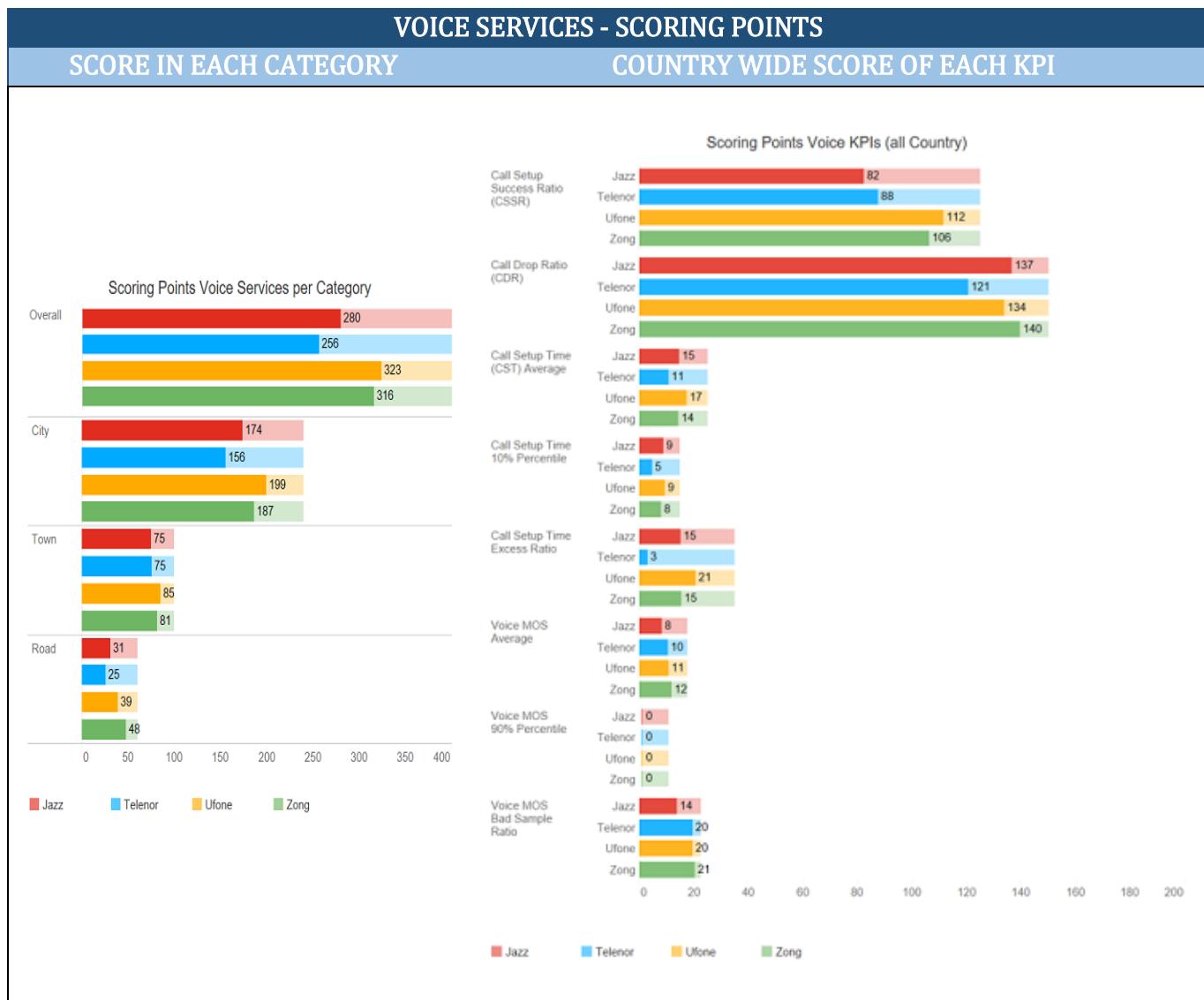
DATA KPI THRESHOLD			DATA KPI WEIGHT	
KPI	THRESHOLD	VALUE	KPI	WEIGHT
HTTP Success Rate	High	100%	HTTP Success Rate	0.0550
	Low	80%		
HTTP Download Throughput	High	100.0 Mbps	HTTP Download Throughput	0.0350
	Low	1.0 Mbps		
HTTP Download Throughput 10 <sup>th</sup> Percentile	High	40.0 Mbps	HTTP Download Throughput 10 <sup>th</sup> Percentile	0.0450
	Low	1.0 Mbps		
HTTP Download Throughput 90 <sup>th</sup> Percentile	High	240.0 Mbps	HTTP Download Throughput 90 <sup>th</sup> Percentile	0.0175
	Low	10.0 Mbps		
HTTP Upload Throughput	High	50.0 Mbps	HTTP Upload Throughput	0.0350
	Low	0.5 Mbps		
HTTP Upload Throughput 10 <sup>th</sup> Percentile	High	30.0 Mbps	HTTP Upload Throughput 10 <sup>th</sup> Percentile	0.0450
	Low	0.5 Mbps		
HTTP Upload Throughput 90 <sup>th</sup> Percentile	High	100.0 Mbps	HTTP Upload Throughput 90 <sup>th</sup> Percentile	0.0175
	Low	5.0 Mbps		
VIDEO KPI THRESHOLD			VIDEO KPI WEIGHT	
KPI	THRESHOLD	VALUE	KPI	WEIGHT
Video Success Rate	Low	80.00%	Video Success Rate	0.1276
	High	100.00%		
Video MOS Average	Low	3	Video MOS	0.363
	High	5		
Video MOS 10 <sup>th</sup> Percentile	Low	2	Video MOS 10 <sup>th</sup> Percentile	0.0363
	High	4		
Video Time To First Frame (TTFP) Average	Low	7.00 Seconds	Video Time To First Frame (TTFP) Average	0.0099
	High	2.00 Seconds		
Video Time To First Frame (TTFP) > 5.0 s Ratio	Low	5.00 %	Video Time To First Frame (TTFP) > 5.0 s Ratio	0.0099
	High	0.00 %		
BROWSING & SOCIAL SERVICE KPI THRESHOLD			BROWSING & SOCIAL SERVICE KPI WEIGHT	
KPI	THRESHOLD	VALUE	KPI	WEIGHT
Browsing Success Ratio	Low	80.00 %	Browsing Success Ratio	0.2533
	High	100.00 %		
Browsing Duration Average	Low	6.00 Seconds	Browsing Duration Average	0.1086
	High	1.00 Seconds		
Browsing Duration > 5.0 s Ratio	Low	15.00 %	Browsing Duration > 5.0 s Ratio	0.0181
	High	0.00 %		
App Testing Success Ratio	Low	80.00 %	App Testing Success Ratio	0.1000
	High	100.00 %		
App Testing Duration Average	Low	15.00 Seconds	App Testing Duration Average	0.0429
	High	3.00 Seconds		

Table 1.3: NPS KPIs High & Low Threshold Values

# NETWORK PERFORMANCE RESULTS – VOICE

## 1. OVERALL SCORE

1.1. In case of Voice Service Ufone, ZonG, Jazz and Telenor obtained an overall score of 323, 316, 280 and 256 respectively. Ufone and ZonG are very close in overall voice results. Ufone wins in Cities and Towns while ZonG takes a lead on the Roads. The scoring points of CMOs are mentioned in **Figure 2.1: Voice Service Scoring Points**



**Figure 2.1: Voice Service Scoring Points**

## 2. CALL SETUP SUCCESS RATIO & CALL DROP RATIO

2.1. The survey results revealed that Ufone achieves the best CSSR in Cities and Towns, while ZonG has the best CDR in Cities and Roads. Jazz has the best CDR in Towns. The details of CSSR and CDR of each CMO are stated in **Figure 2.2: CSSR, CDR & Call Status per RAT at Dial & Technology**.

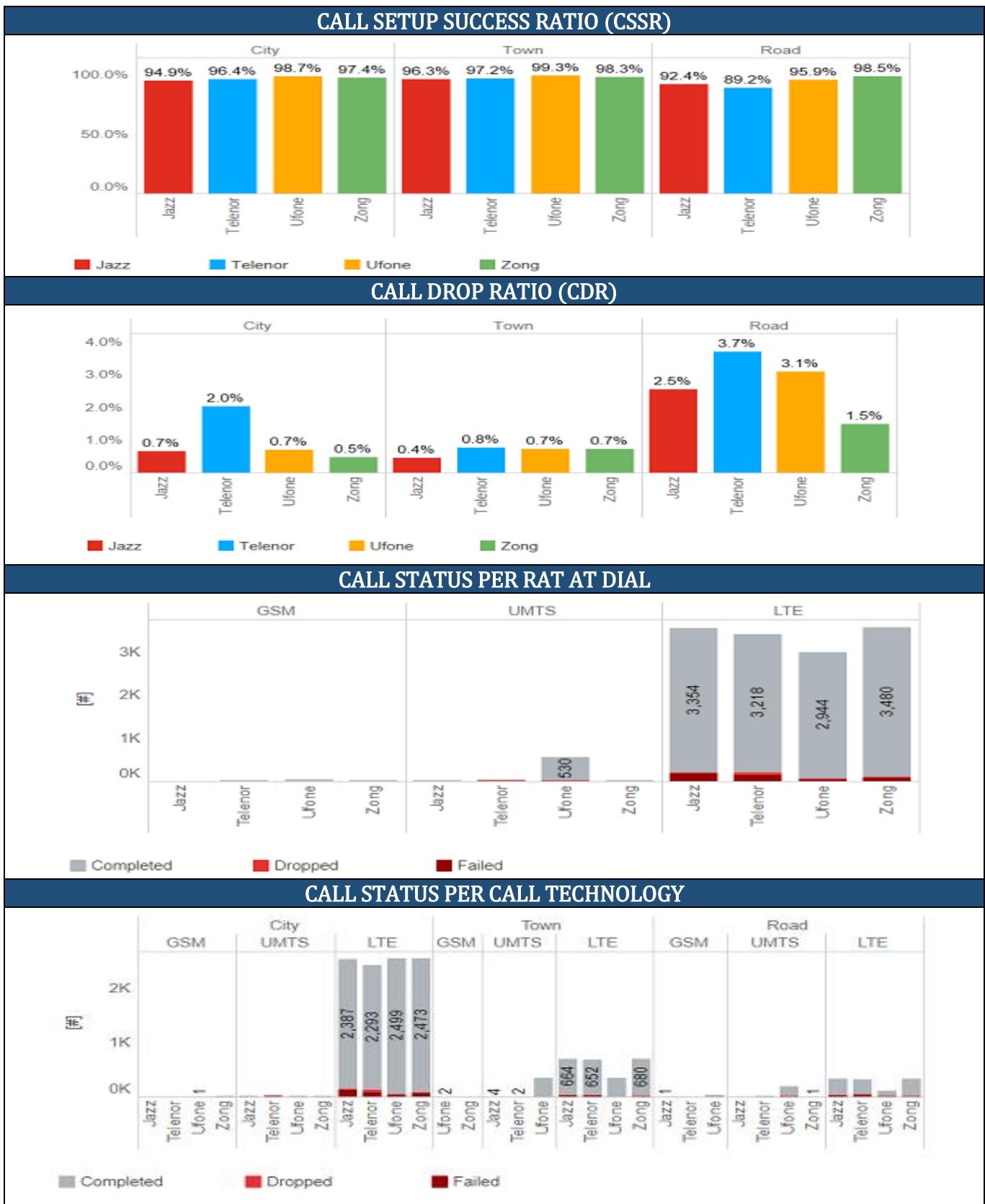


Figure 2.2: CSSR, CDR & Call Status Per RAT & Technology

### 3. CALL SETUP TIME

3.1. Ufone take a lead in Call Setup Time and Excess Ratio. Telenor shows very high Excess Ratio, even in the Cities, and the highest Call Setup Time. The detail of different aspects of Call Setup Time can be seen in **Figure 2.3: Call Setup Time of CMOs**.

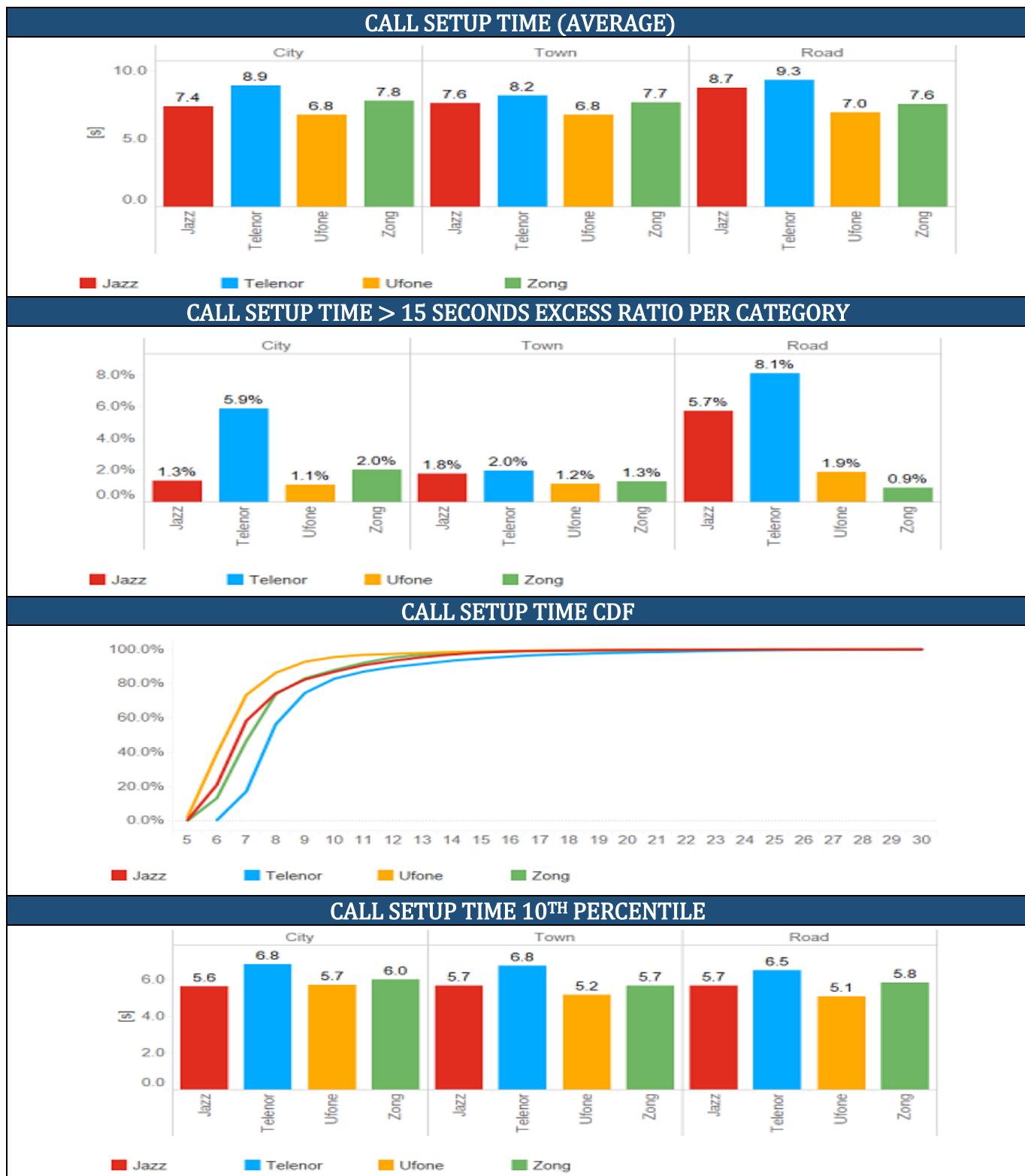


Figure 2.3: Call Setup Time of CMOs

## 4. CALL SETUP TIME PER CALL MODE

4.1. Ufone has the highest amount of pure calls without CSFB indicating possible issue with LTE coverage, but Call Setup Time is the lowest in both scenarios. Furthermore, the time to switch from LTE to UMTS is shorter for Ufone and Zong users compared to Jazz and Telenor. The **Figure 2.4: Call Setup Time per Call Mode** shows the company wise details of Calls both in CSFB and CS modes.

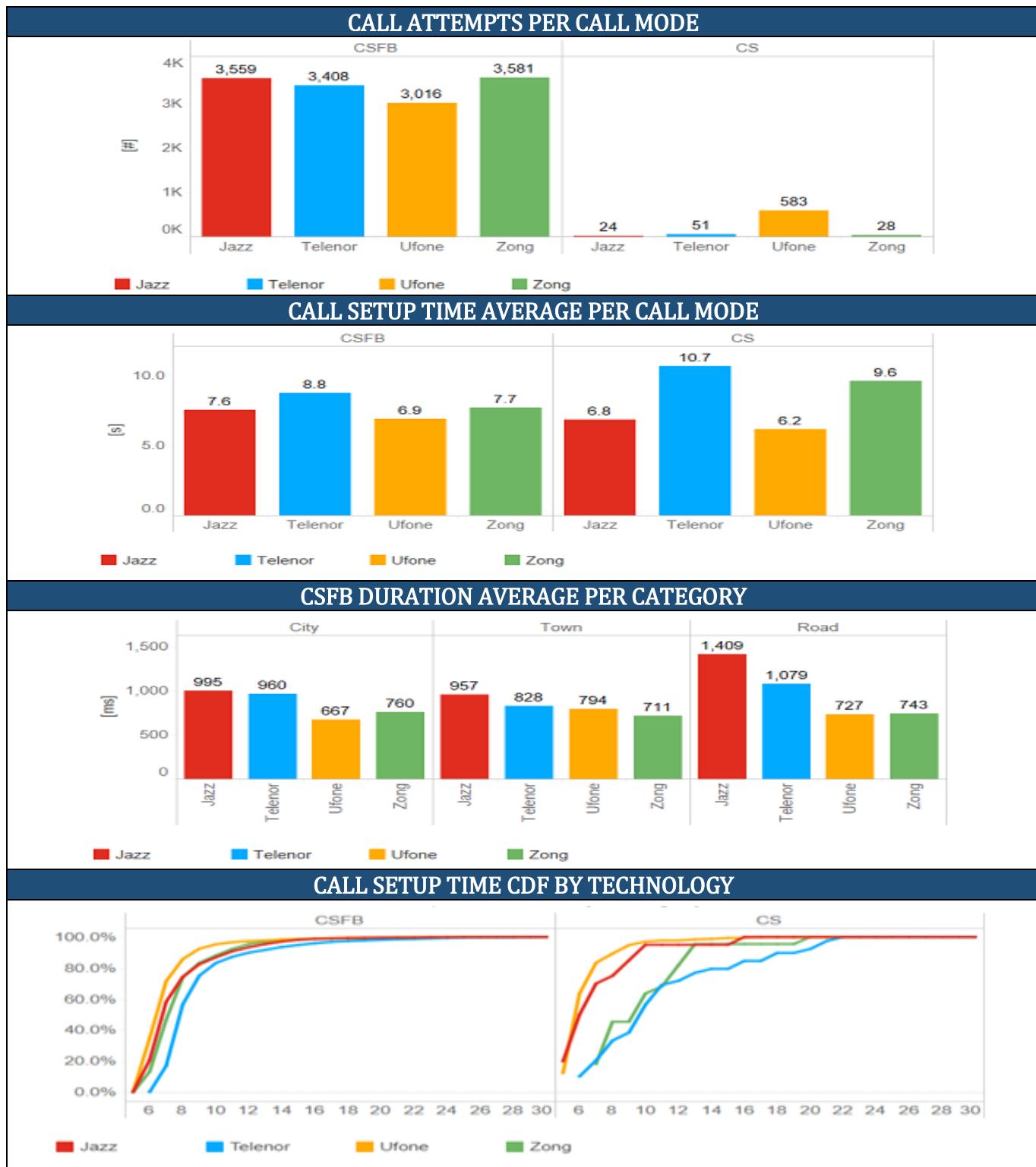


Figure 2.4: Call Setup Time per Call Mode

## 5. SPEECH QUALITY / MEAN OPINION SCORE

5.1. ZonG has the best Voice Quality, while Jazz is clearly behind other operators not only in Voice MOS, but also in amount of silent samples. Different aspects of Mean Opinion Score i.e. average value, 90<sup>th</sup> percentile, Cumulative Distribution Function (CDF) and bad sample ratio obtained by CMOs is shown in Figure 2.5: Voice Mean Opinion Score.

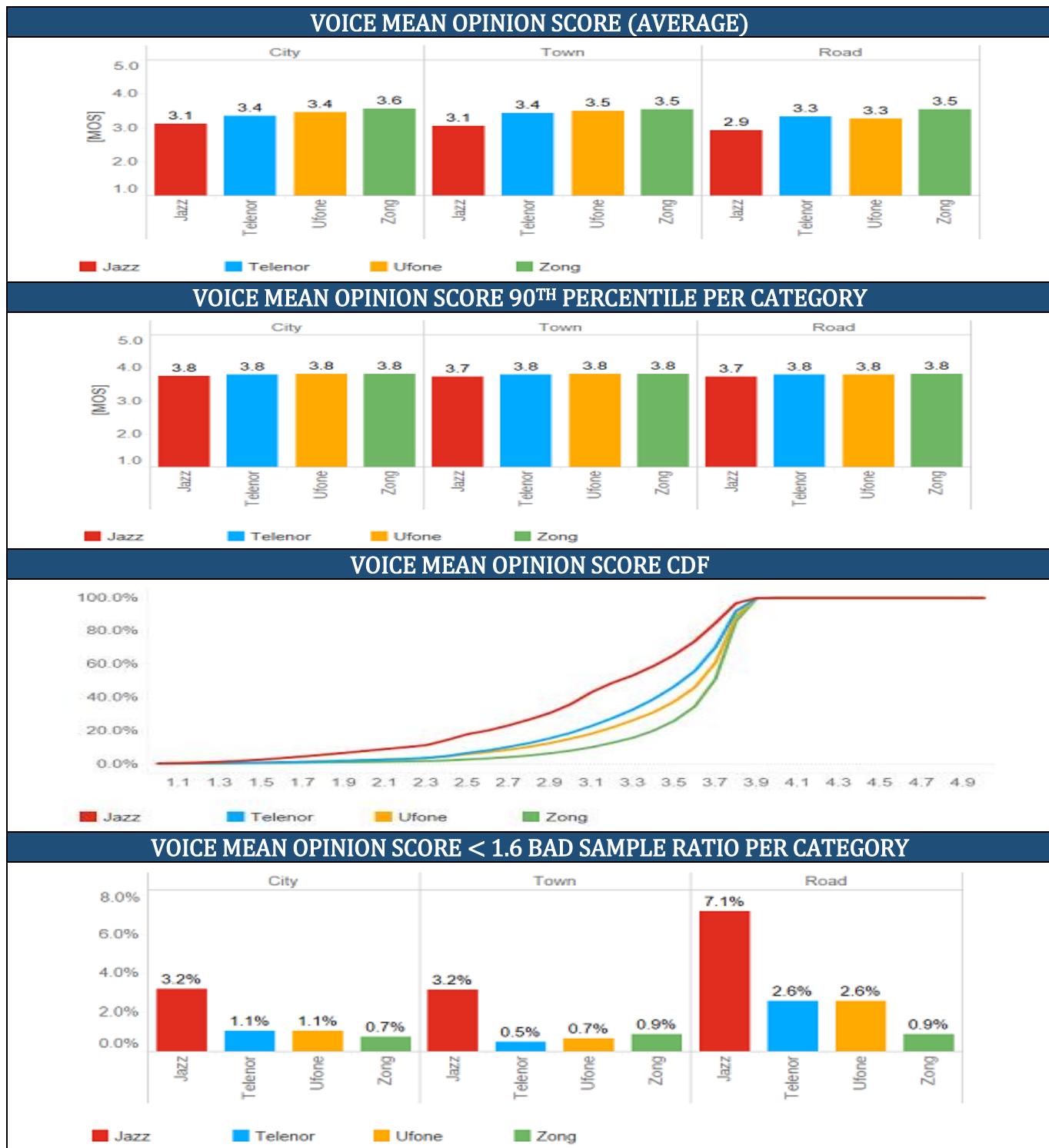


Figure 2.5: Voice Mean Opinion Score

## 6. SPEECH QUALITY BREAKDOWN

6.1. The breakdown of the Speech Quality into the used Speech Codecs (i.e. HR, EFR, AMR & AMR-WB) and bitrates (i.e. 4.75, 5.60, 5.90, 6.60, 7.40, 8.85, 12.20 & 12.65) revealed that ZonG has the best Voice MOS no matter of used Codecs set and perfect AMR WB share over each category. Jazz has very high share on non AMR WB codec usage with lower bit rates. The company wise Speech Codecs and bitrates utilization is shown in **Figure 2.6: Breakdown of Mean Opinion Score in Used Speech Codecs & Bitrates.**

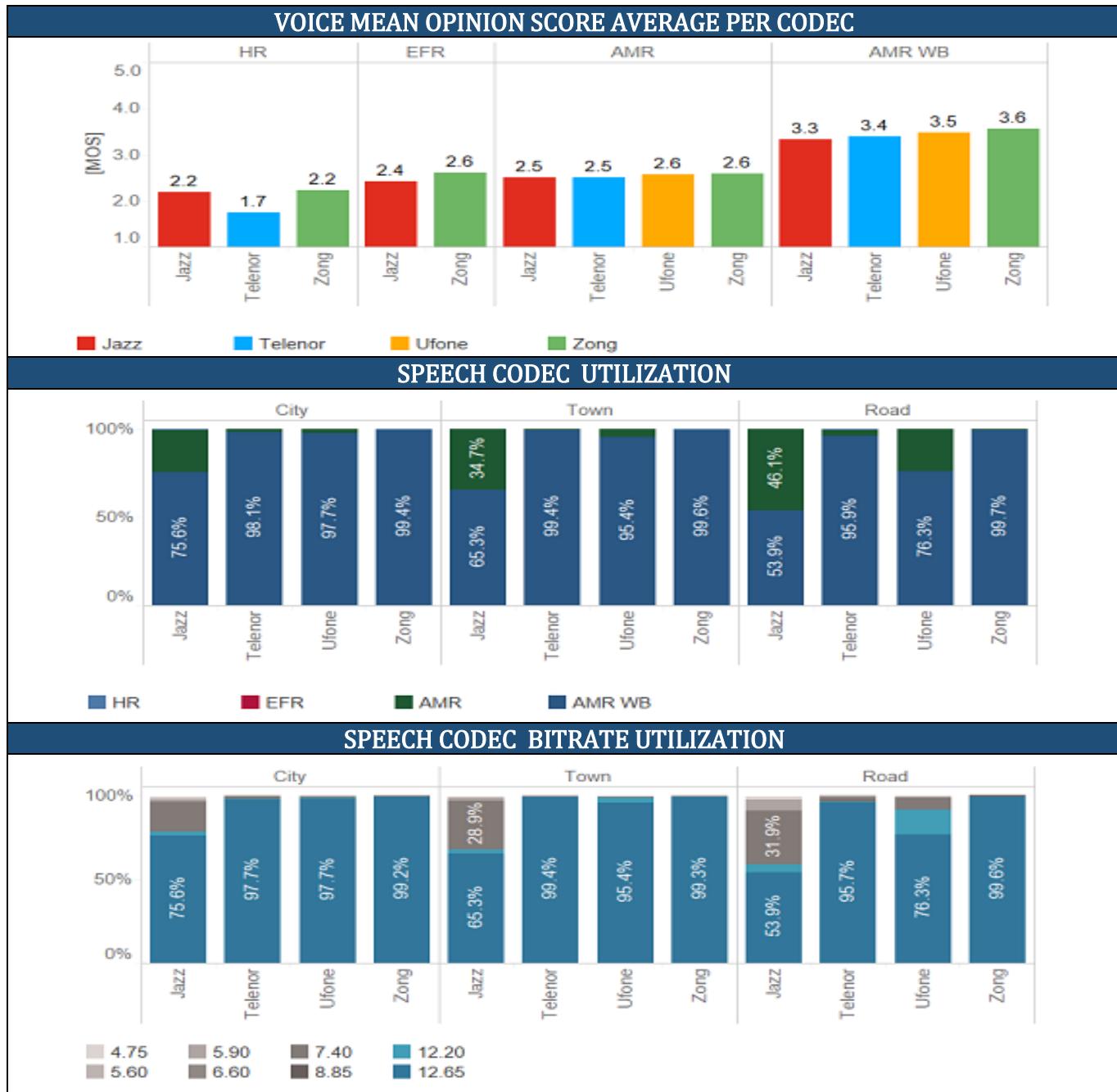


Figure 2.6: Breakdown of Mean Opinion Score in Used Speech Codecs & Bitrates

## 7. CALL SETUP FAILURE LOCATIONS

7.1. Call setup failure locations with the related call modes A -> B are shown both statistically and on map in **Figure 2.7: Call Setup Failure Locations**. Call mode indicated by “-” refers to LTE call modes, where the failure occurred before the CSFB was successfully established.

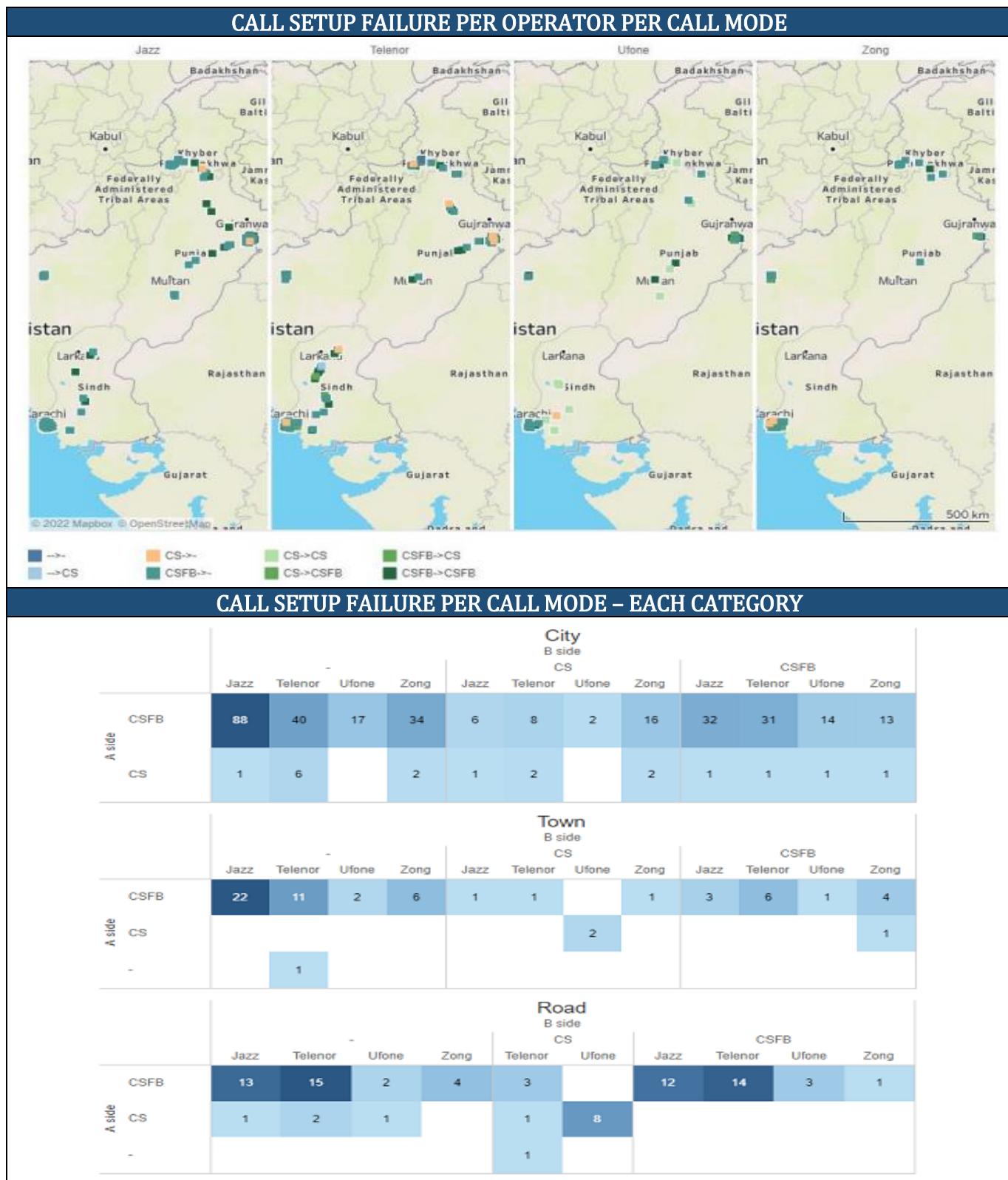


Figure 2.7: Call Setup Failure Locations

## 8. DROPPED CALLS LOCATIONS

8.1. Dropped Calls Locations with the related call modes A -> B are shown on the map in the Figure 2.8: Dropped Calls Locations.

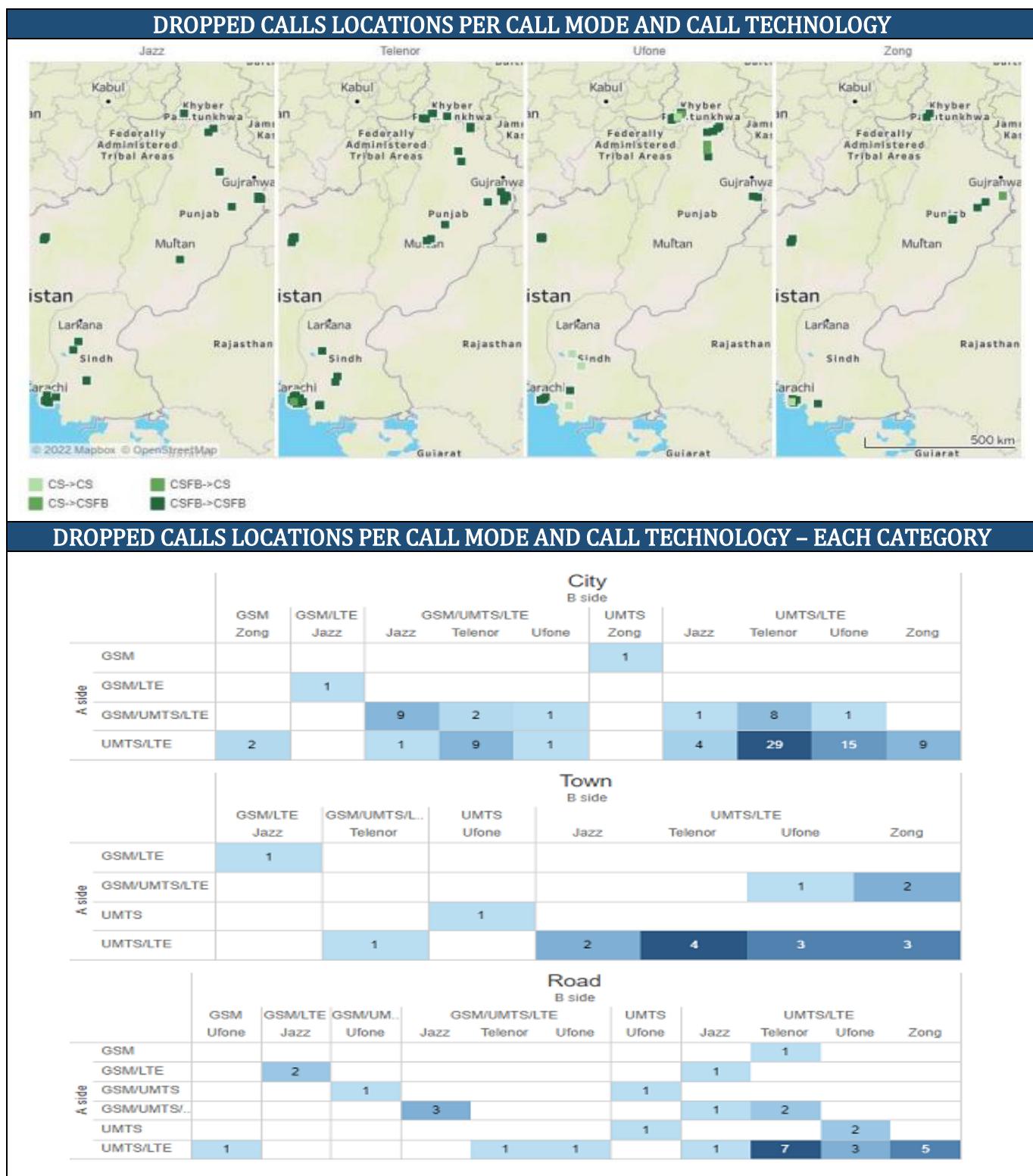
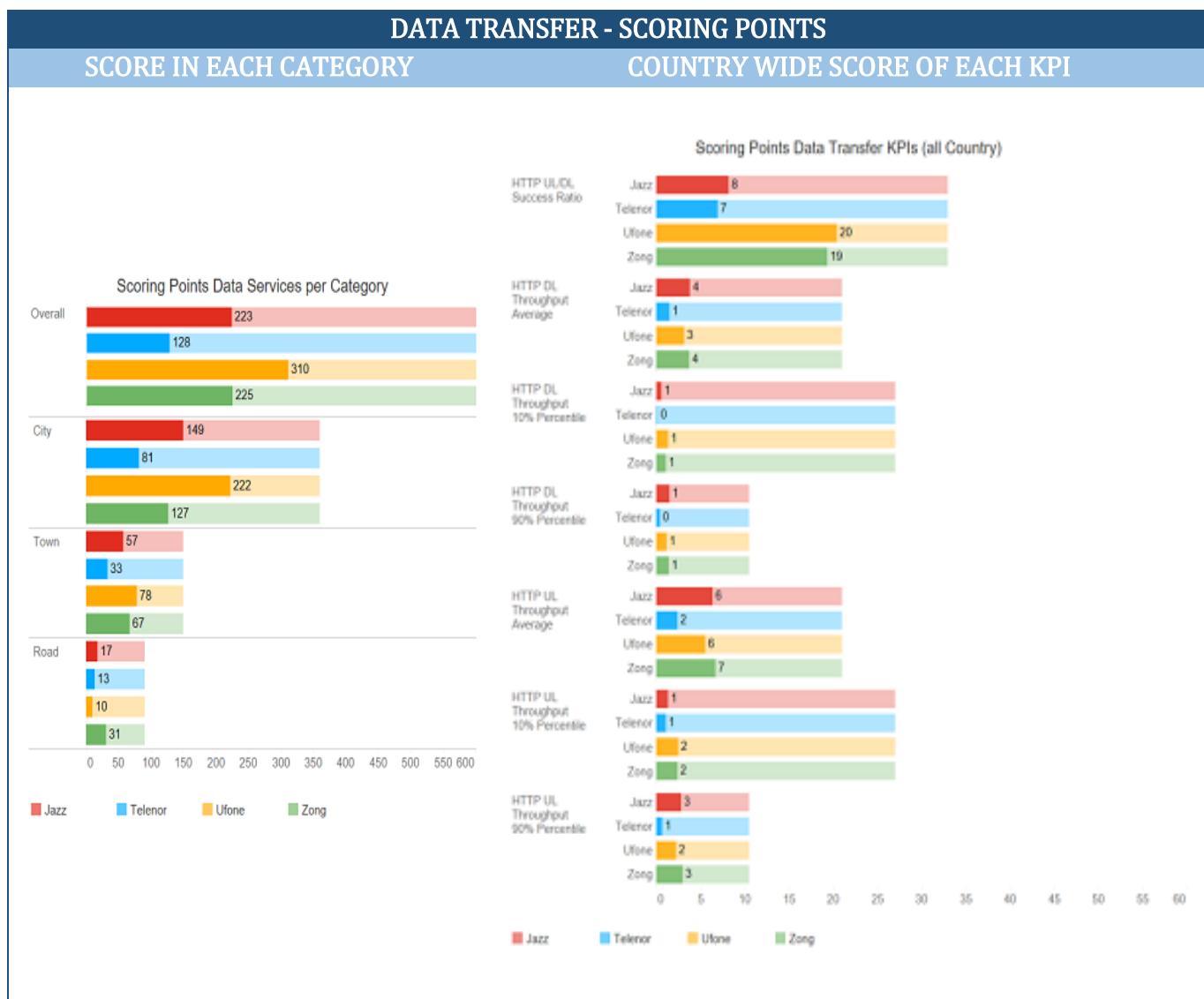


Figure 2.8: Dropped Calls Locations

# NETWORK PERFORMANCE RESULTS – DATA

## 1. DATA TRANSFER- OVERALL SCORE

1.1. In case of Data Service (i.e. Data Transfer, Video Streaming and Web Browsing & Social Media) Ufone, ZonG, Jazz and Telenor have obtained score of 310, 225, 223 and 128 respectively. Ufone and ZonG takes a lead and create significant gap in Success Ratio, while for HTTP KPIs Jazz, Ufone and ZonG are comparable. The **Figure 3.1: Data Transfer- Overall Score**, shows the details of Data NPS Breakdown into individual KPIs (pale colors showing maximum achievable points) scoring card offers opportunities of biggest improvement potentials.



**Figure 3.1: Data Transfer- Overall Score**

## 2. HTTP FILE TRANSFER

2.1. In case of HTTP File Transfer, Ufone takes a clear lead in Success Ration in Cities, but fails on the last position on the Roads. Jazz and Telenor significantly behind leader. The **Figure 3.2: Http Success Ratio & UL/DL Duration Ratio.**

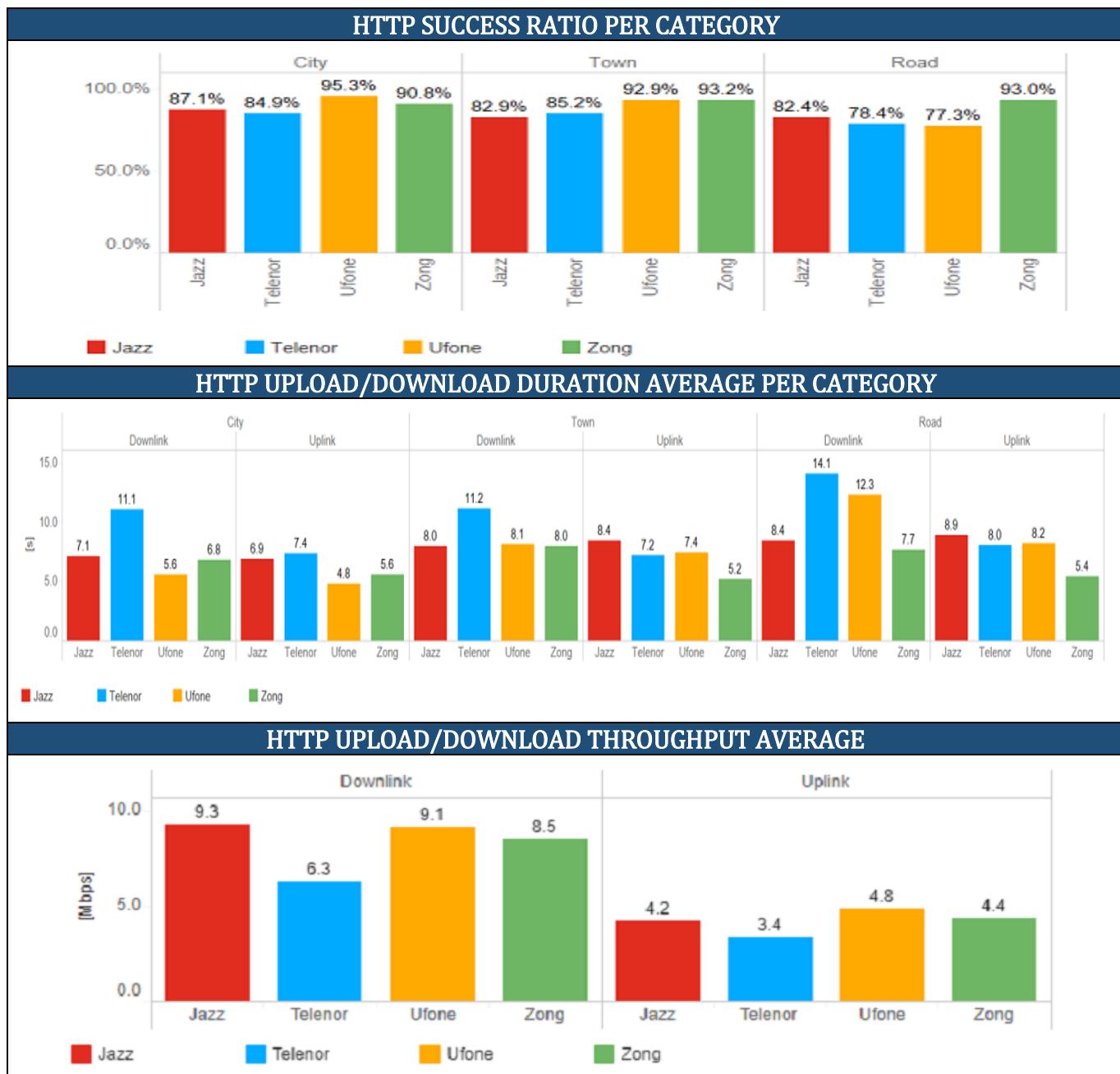
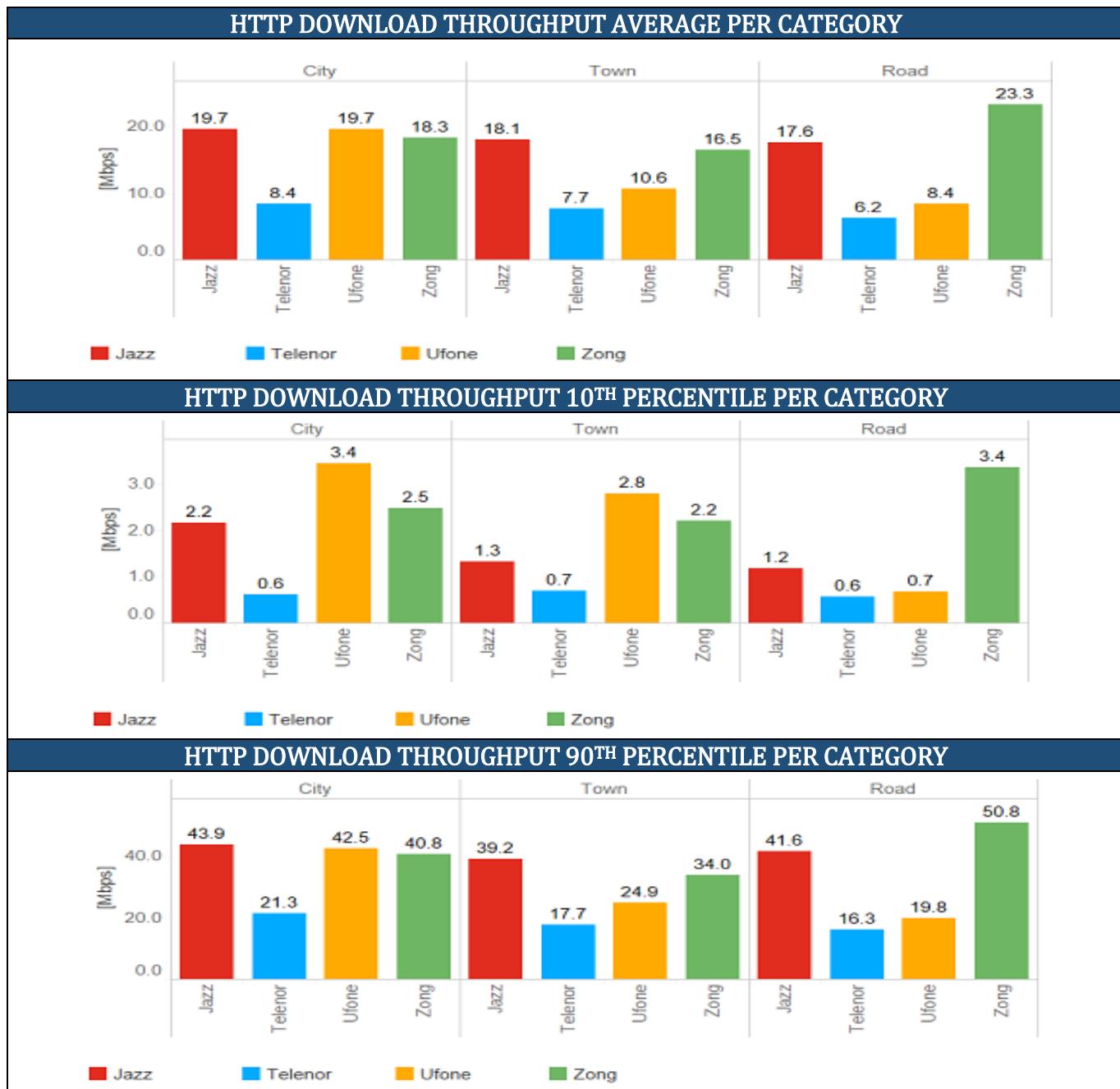


Figure 3.2: Http Success Ratio & UL/DL Duration Ratio

## 3. CAPACITY TEST

3.1. When it is up to Capacity Download Test, Jazz and Ufone shows the best average throughput in Cities, Jazz is the best in Towns and ZonG takes a lead on Roads. Ufone shows the best results in 10<sup>th</sup> Percentile (P10) range in Cities and Towns while Jazz has the best results in the fastest sample

range i.e. 90<sup>th</sup> Percentile (P90). On the Roads, ZonG takes a lead in both P10 and P90 range. The details is listed in **Figure 3.3: Http Download Throughput**.



**Figure 3.3: Http Download Throughput**

3.2. In regards to Capacity Upload Test, Ufone has the best average UL throughput in Cities while ZonG is the best in Towns and Roads. In P10 range, Ufone clearly leads in Cities and ZonG is clearly the best in Towns, while Jazz takes over leading position on the Roads with only 200kbps gap towards ZonG. In P90 range, ZonG take a lead on each category tightly followed by Jazz. The company wise details is shown in **Figure 3.4: Http Uplink Throughput**.

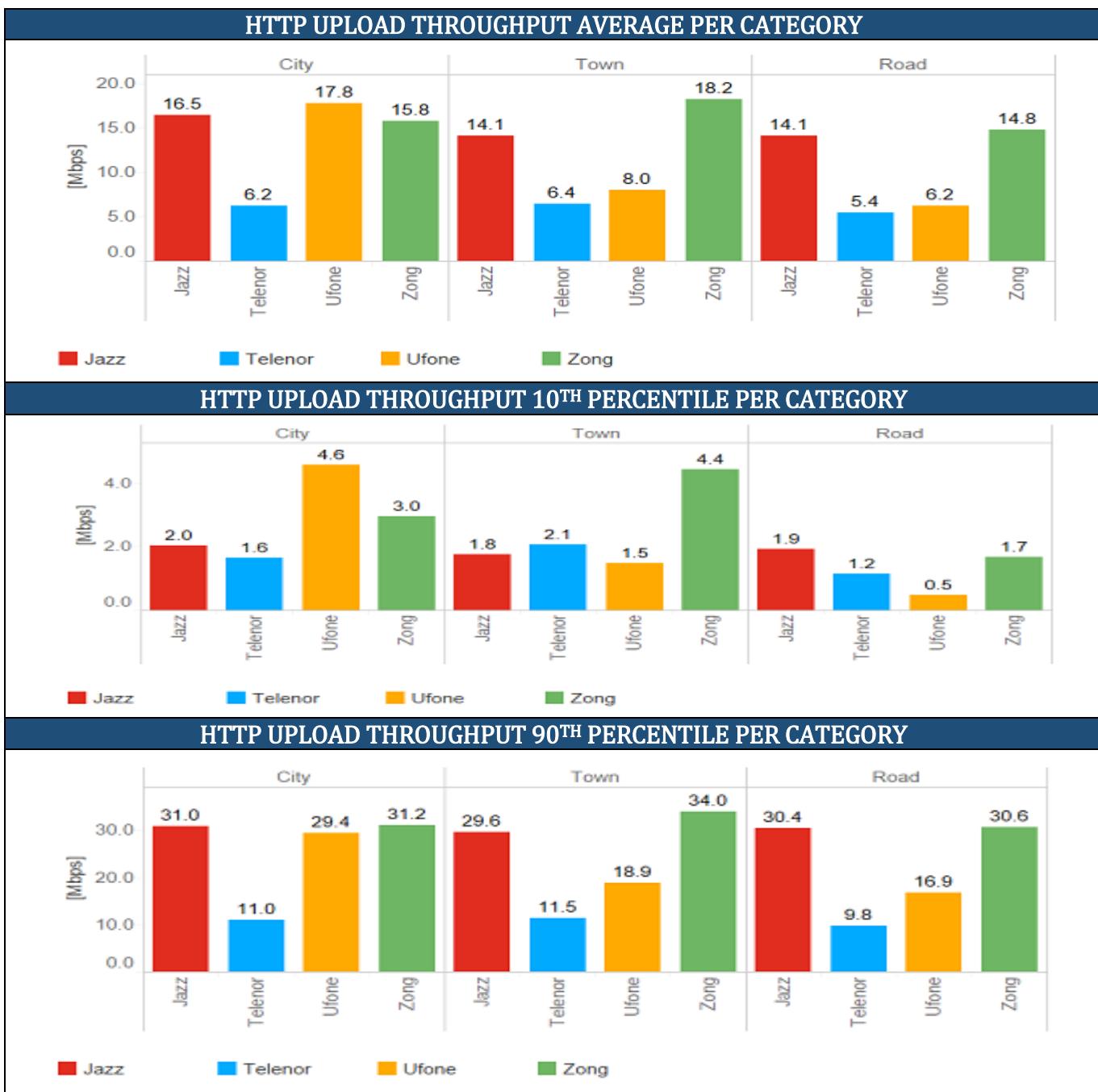


Figure 3.4: Http Uplink Throughput

### 3. CARRIER AGGREGATION & USED BANDWIDTH

3.1. Carrier Aggregation utilization and used bandwidth (Downlink) shows that Ufone is the only operator without LTE CA with maximal 15MHz bandwidth. ZonG has the widest BW (30MHz) followed by Jazz. The details are mentioned in **Figure 3.5: Carrier Aggregation Utilization & Used Bandwidth (DL)**.

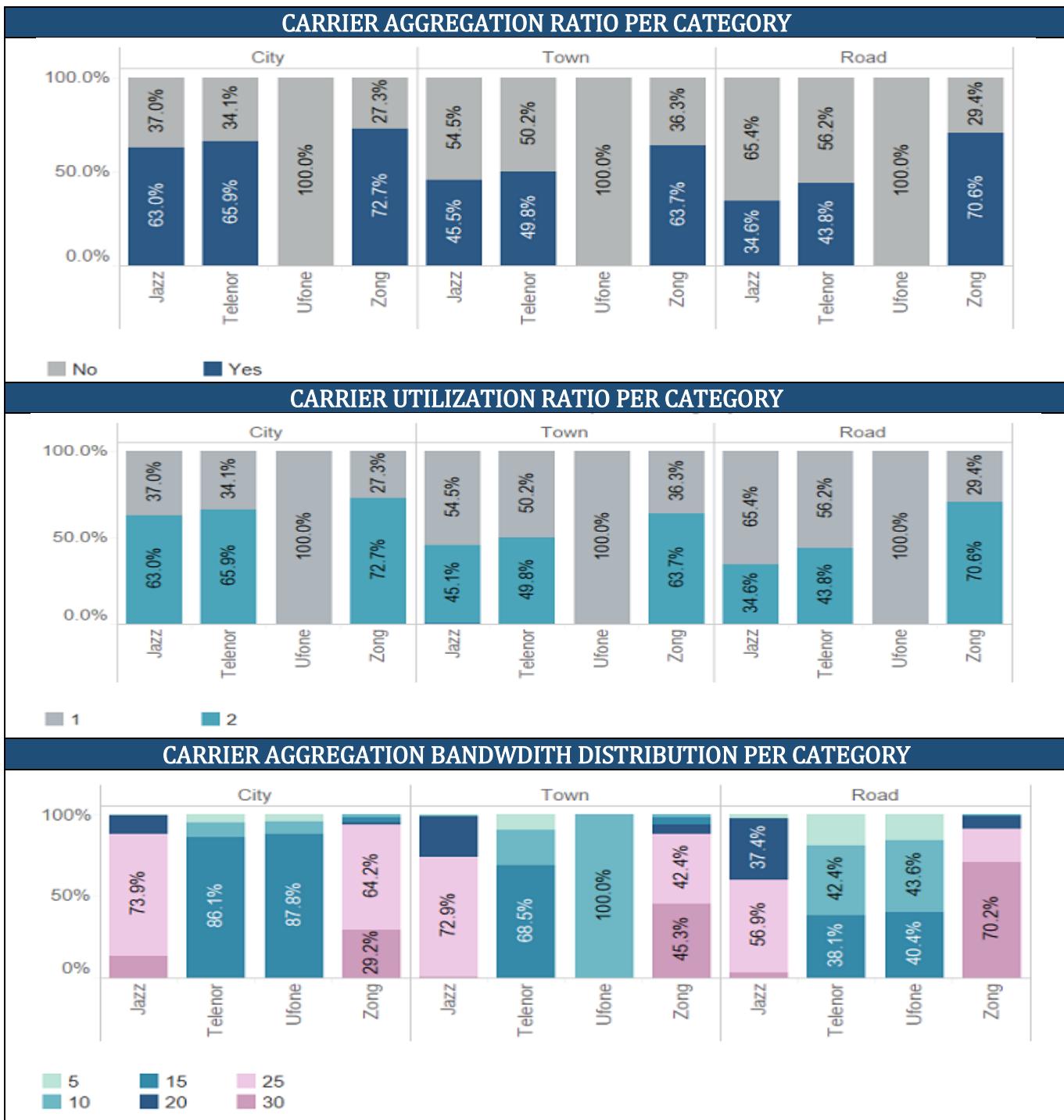


Figure 3.5: Carrier Aggregation Utilization & Used Bandwidth (DL)

#### 4. MODULATION DISTRIBUTION & RESOURCE BLOCK UTILIZATION

4.1. Modulation Distribution per Carrier Component and Category shows utilization of 256QAM, 64QAM, 16QOAM and QPSK of CMOs in Cities, Towns and Roads. The Resource Block (RB) usage is an indicator for the network load. Jazz, Telenor and ZonG are showing a low usage, pointing to shared resources which reduced the data throughput. Ufone is slightly better positioned with more than 60% RB usage. The company wise details is shown in **Figure 3.6: Modulation Distribution & Resource Block Utilization**.

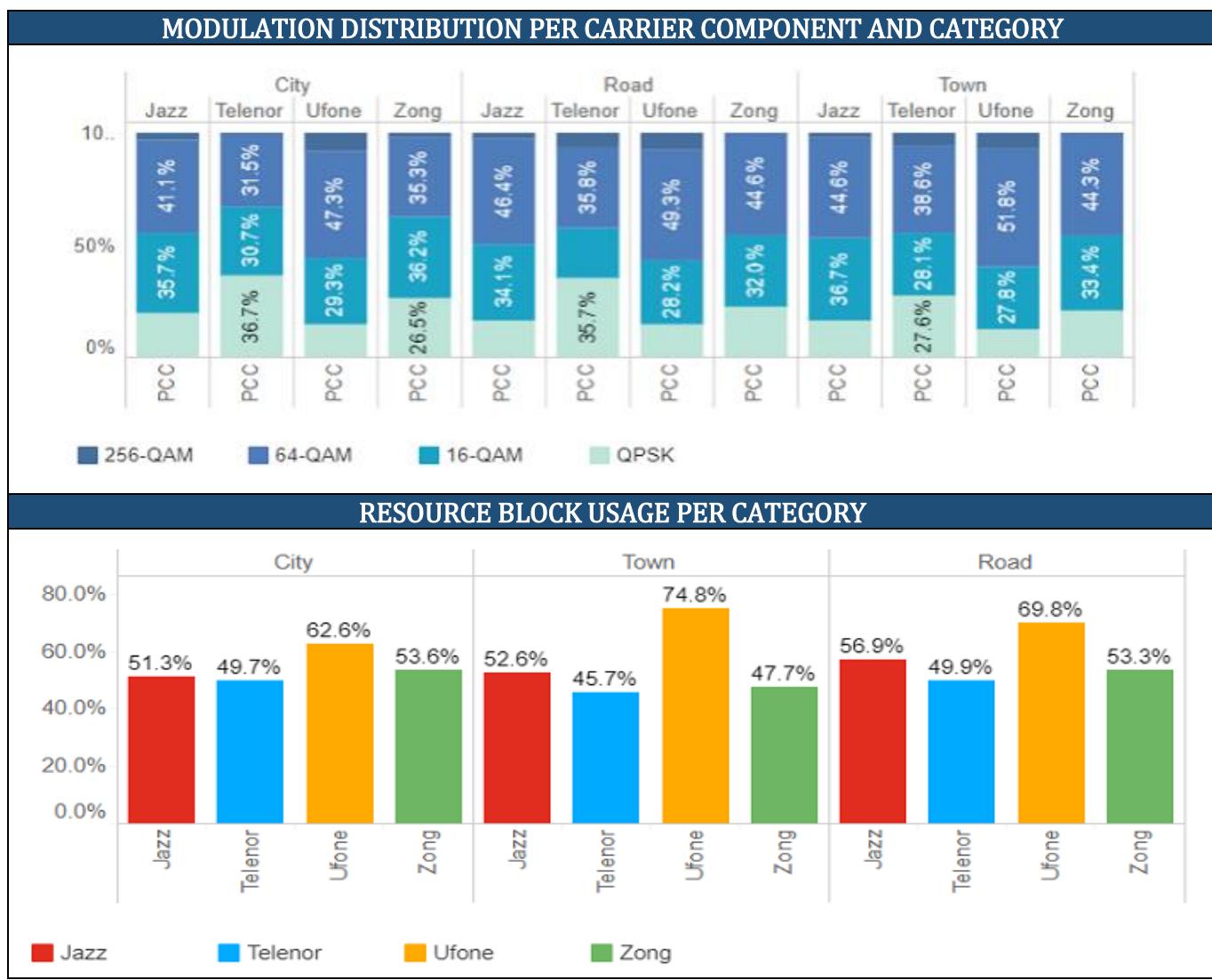


Figure 3.6: Modulation Distribution & Resource Block Utilization

## 5. VIDEO STREAMING - OVERALL SCORE

5.1. The **Figure 3.7: Video Streaming- Overall Score**, shows the details of Video NPS Breakdown into individual KPIs (pale colors showing maximum achievable points) scoring card offers opportunities of biggest improvement potentials. Ufone and Jazz take a lead and create significant gap in Video Success Ratio, while for Video KPIs show comparable results for all operators.

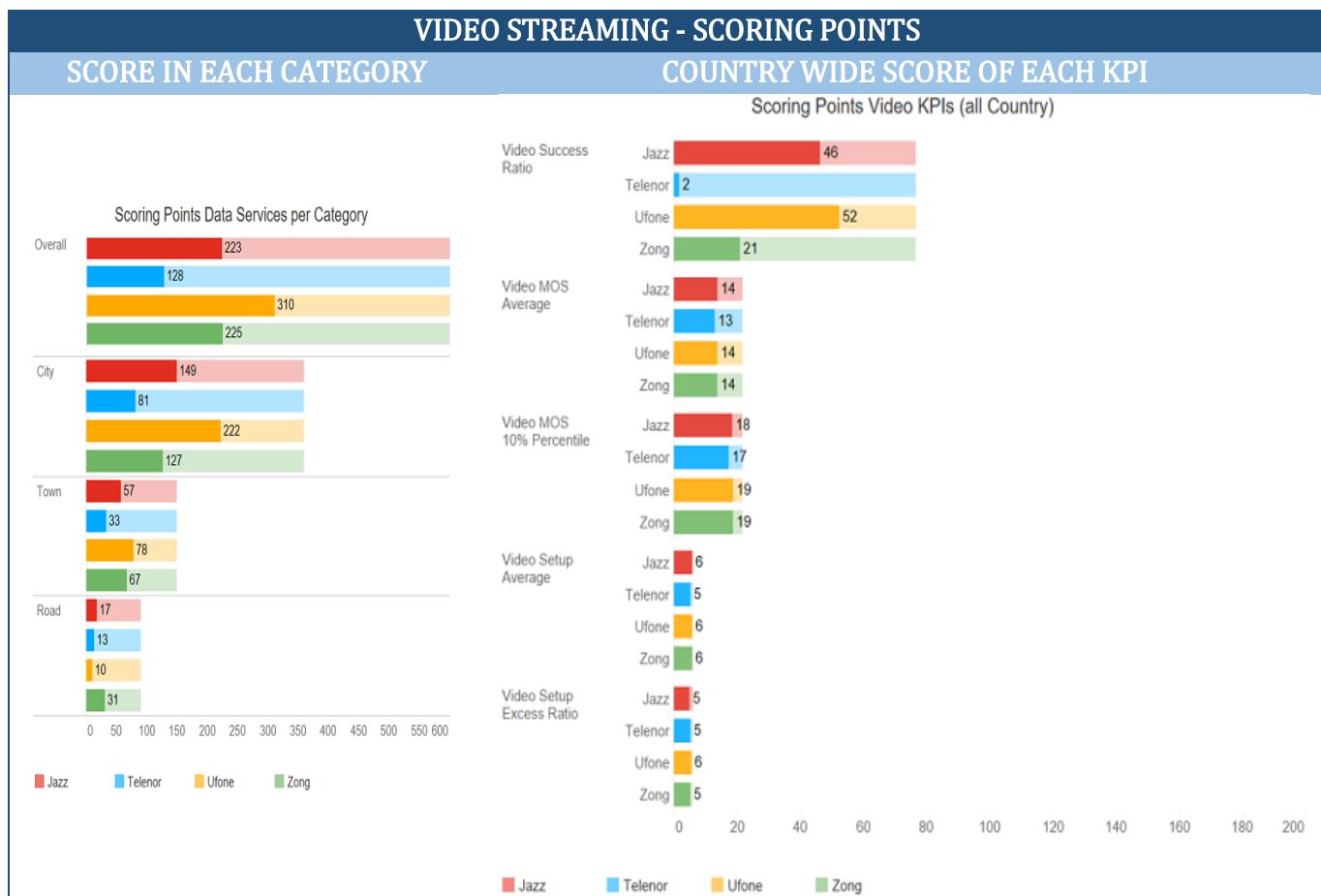
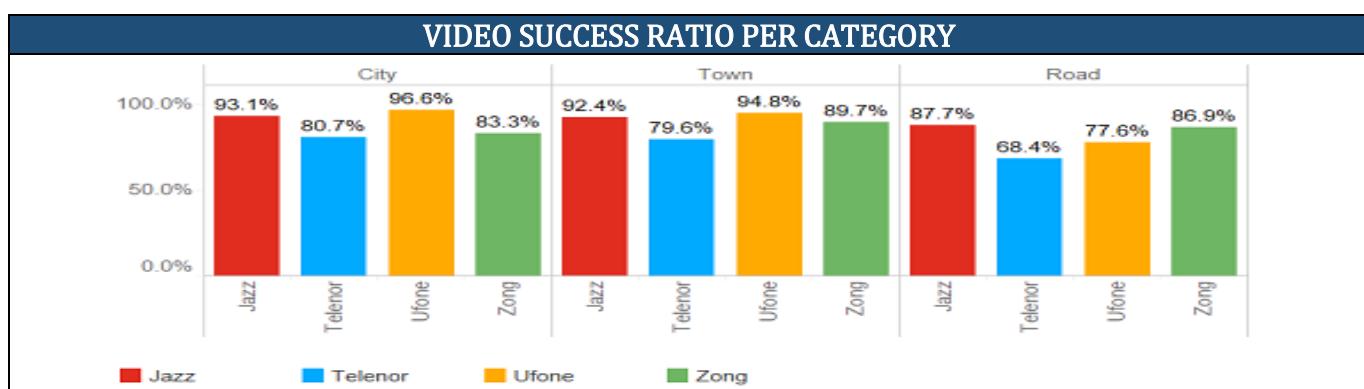


Figure 3.7: Video Streaming- Overall Score

## 6. VIDEO SUCCESS RATIO & SETUP TIME

6.1. Ufone has the best Video Success Ratio in Cities and Towns closely followed by Jazz, but Jazz takes over leading position on the Roads. Telenor users' needs to wait the longest amount of time before video start playing. The company wise details is listed in **Figure 3.8: Video Success Ratio & Setup Time**.



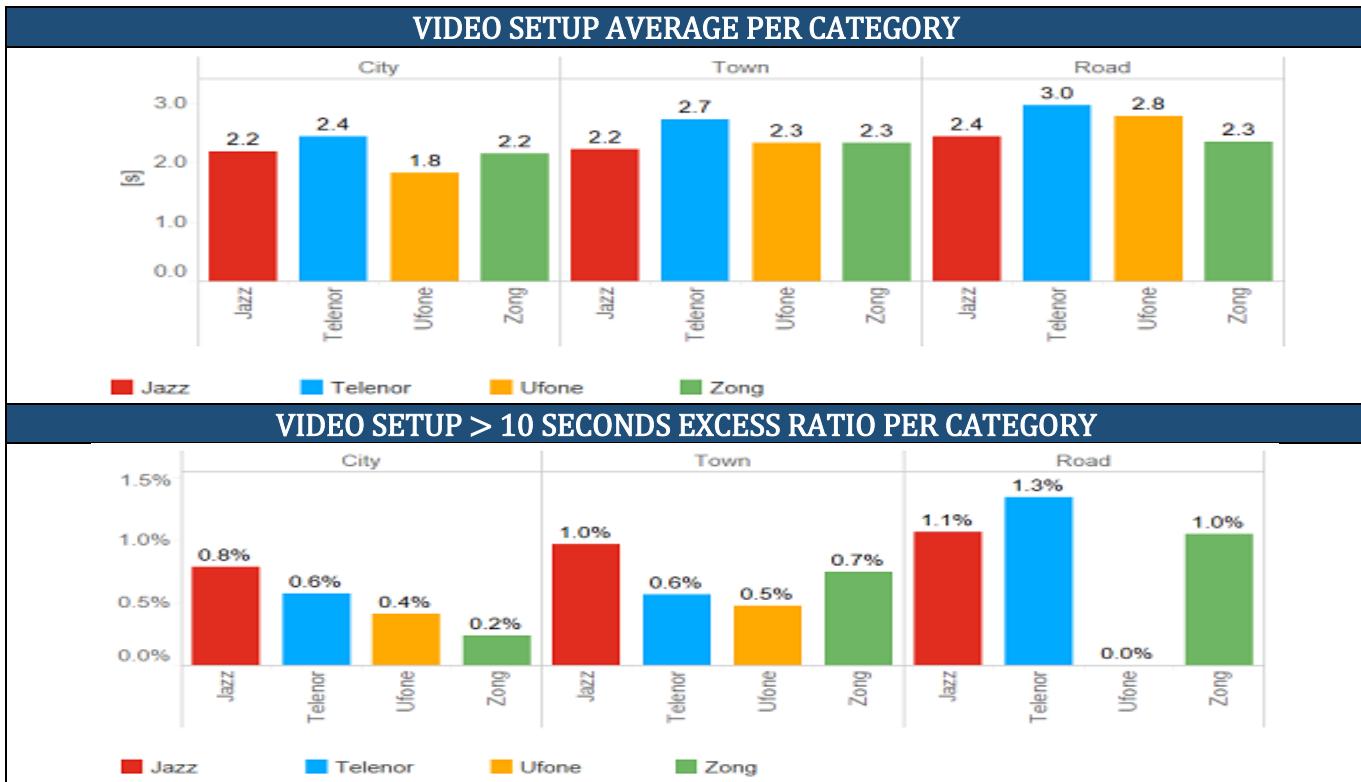
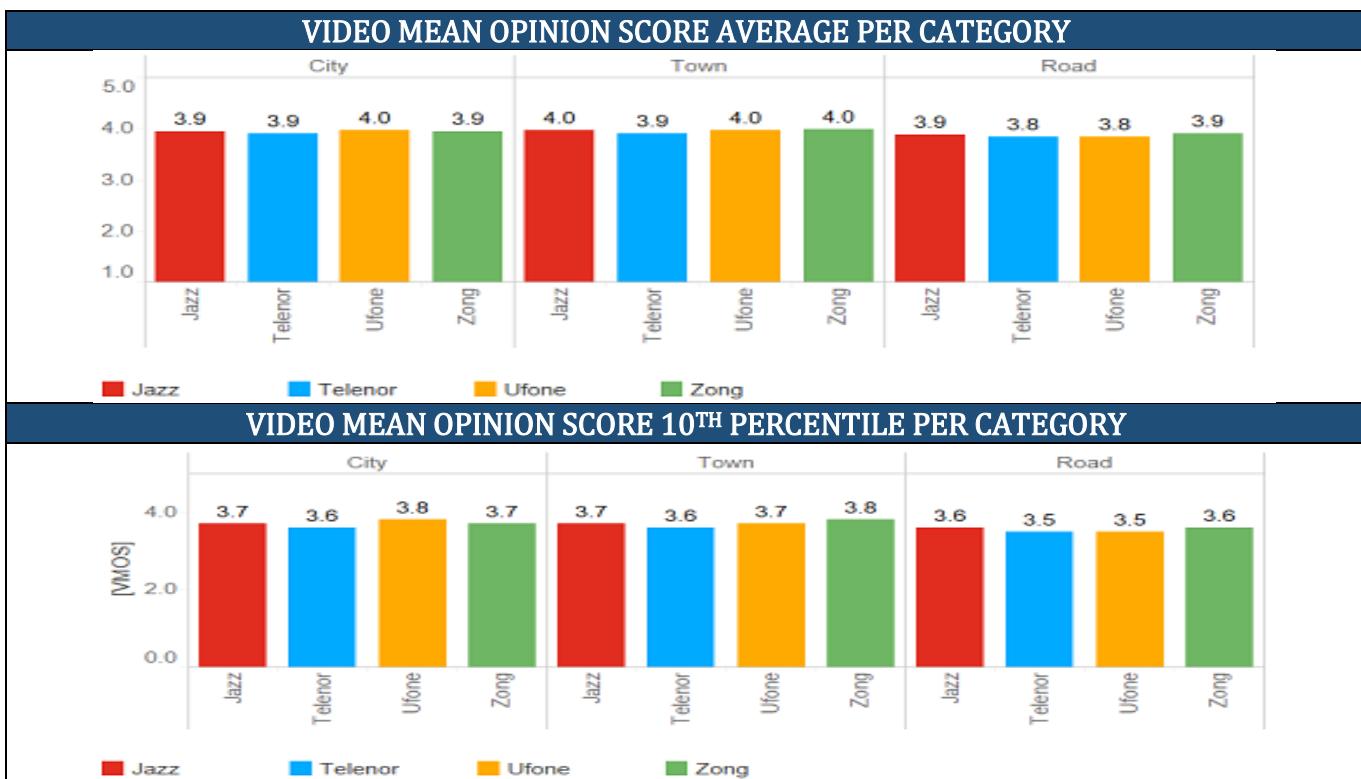


Figure 3.8: Video Success Ratio & Setup Time

## 7. VIDEO MEAN OPINION SCORE & RESOLUTION

7.1. The overall Video MOS average reflects good result for all operators. Ufone with the highest amount of video sessions displayed in pure HD. The company wise details is listed in **Figure 3.9: Video Mean Opinion Score & Resolution**.



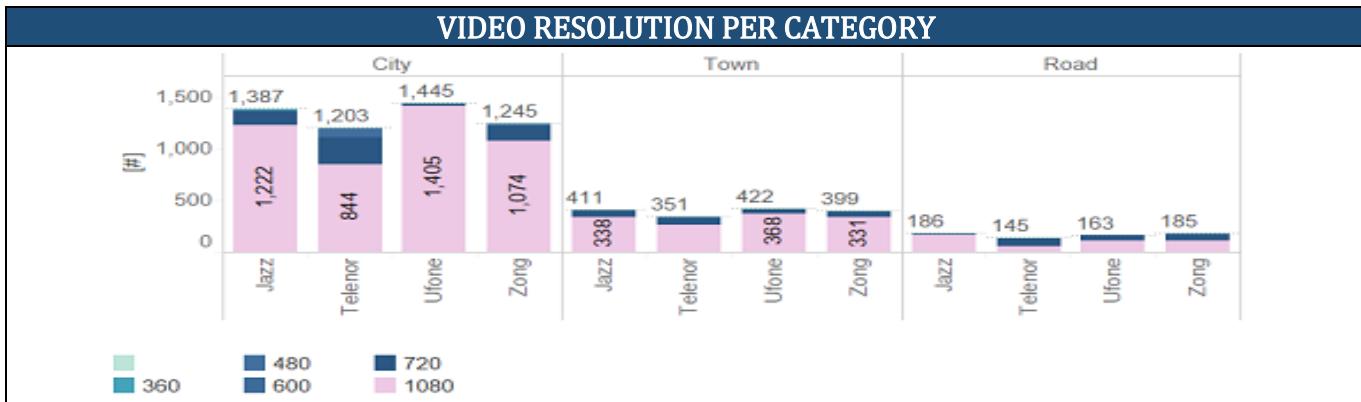


Figure 3.9: Video Mean Opinion Score & Resolution

## 8. BROWSING & SOCIAL MEDIA – OVERALL SCORE

8.1. The **Figure 3.10: Browsing & Social Media - Overall Score**, shows the details of Browsing & Social Media NPS Breakdown into individual KPIs (pale colors showing maximum achievable points) scoring card offers opportunities of biggest improvement potentials. Ufone creates huge gap towards Jazz and ZonG in terms of Browsing Success Ratio. The results of all operators show considerable room for improvement in regards to Web Browsing Duration.

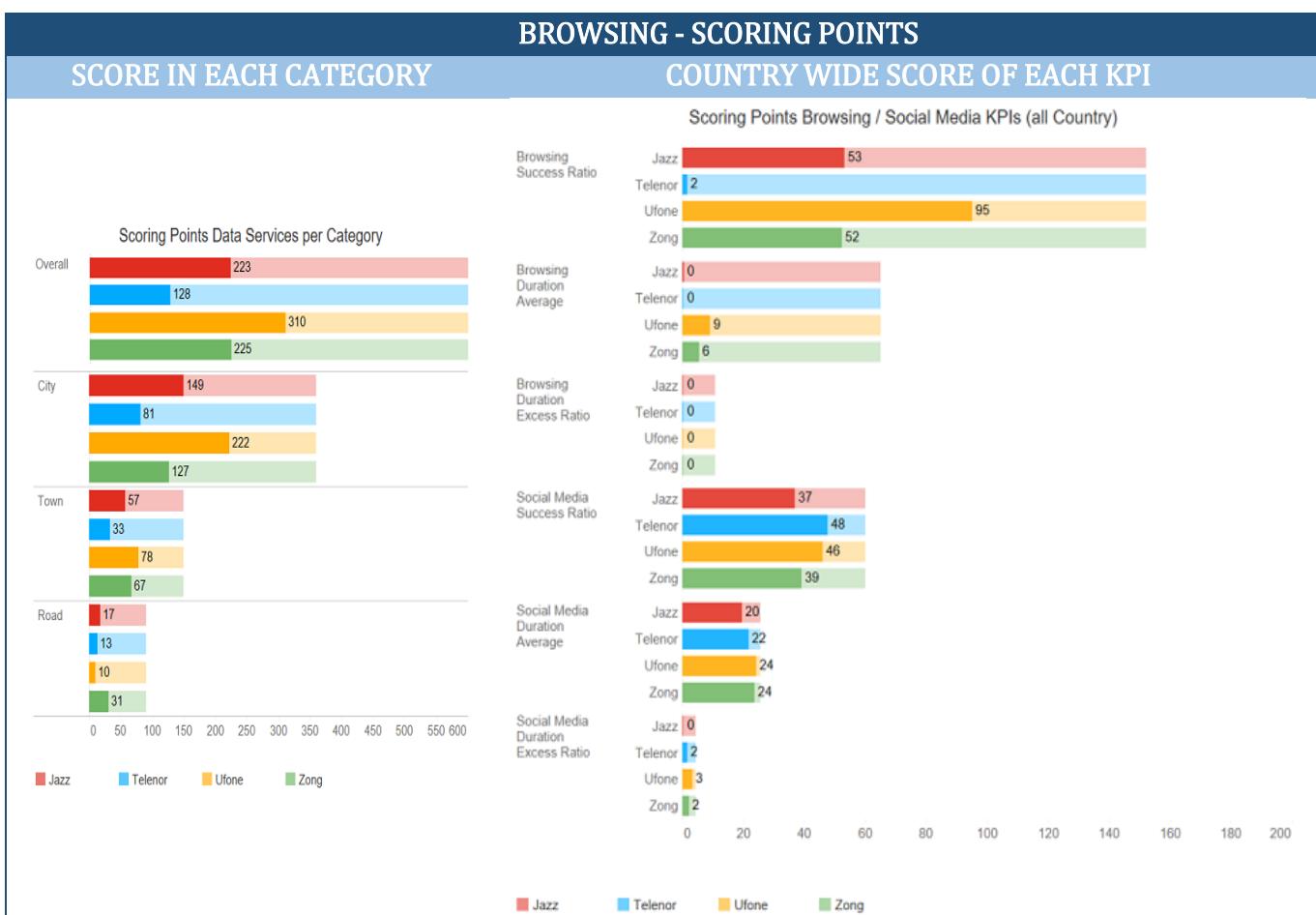
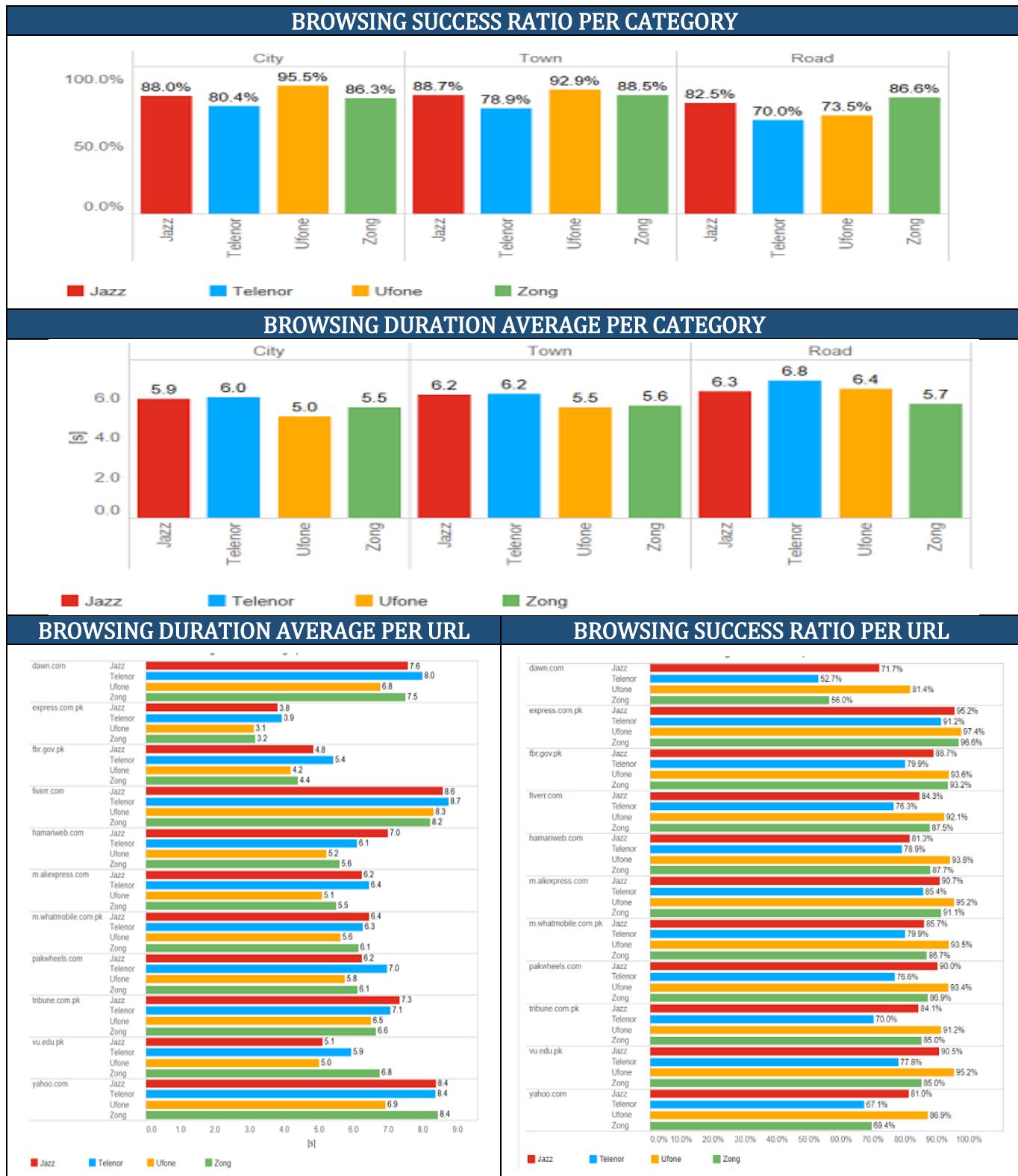


Figure 3.10: Browsing & Social Media - Overall Score

## 9. BROWSING KEY PERFORMANCE INDICTORS

9.1. Ufone has the lowest Webpage Browsing Duration for almost every webpage under test and keeps leading position in Success Ratio in Cities and Towns. The company-wise details of Browsing Success Ratio and Duration etc., are shown in **Figure 3.11: Browsing Key Performance Indicators**.



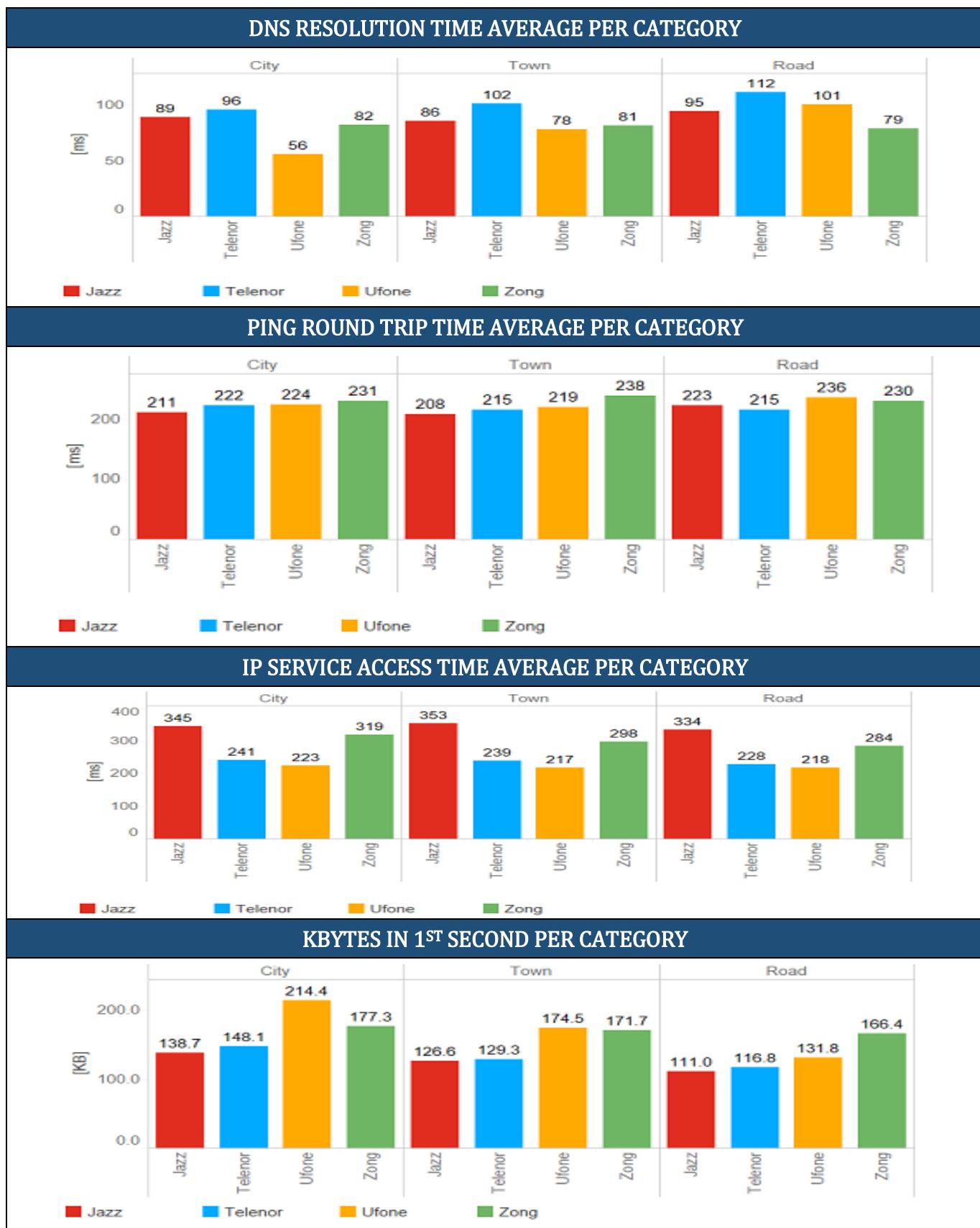


Figure 3.11: Browsing & Social Media Key Performance Indicators

## 10. SOCIAL MEDIA (DROPBOX) EVALUATION

10.1. Ufone and Telenor show very good Success Ratio. Ufone takes a lead in Cities while Telenor is better in Towns and Roads. Ufone has clearly the shortest duration in Cities, while ZonG is the best in Towns and on the Roads. The company wise detail is shown in **Figure 3.12: Social Media Key Performance Indicators**.

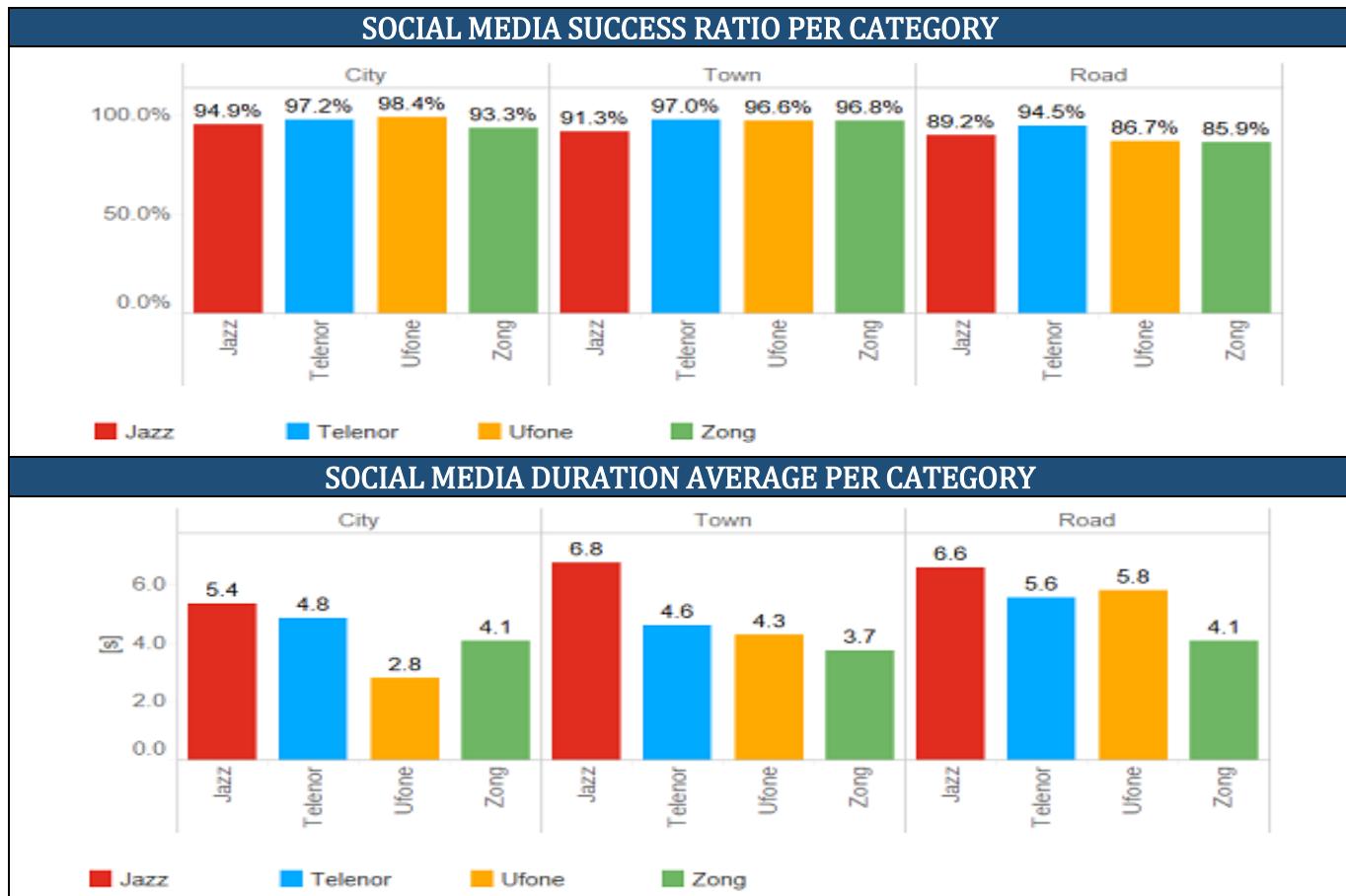


Figure 3.12: Social Media Key Performance Indicators.

# NETWORK PERFORMANCE RESULTS – SPECTRUM

## 1. VOICE SERVICE – TECHNOLOGY BREAKDOWN

1.1. The analysis of Calls Sessions Duration per Technology / Band and Category shows that ZonG has perfect UMTS share over each category in 2100MHz frequency range. Telenor and ZonG also shows very good UMTS share in Cities and Towns, however, GSM is still visible on Roads. Jazz has high share of usage of GSM Network even in Cities. The details is shown in **Figure 4.1: Call Session Duration per Technology / Band & Category** and this distribution is considering the complete session duration including the idle time before/ after the calls.

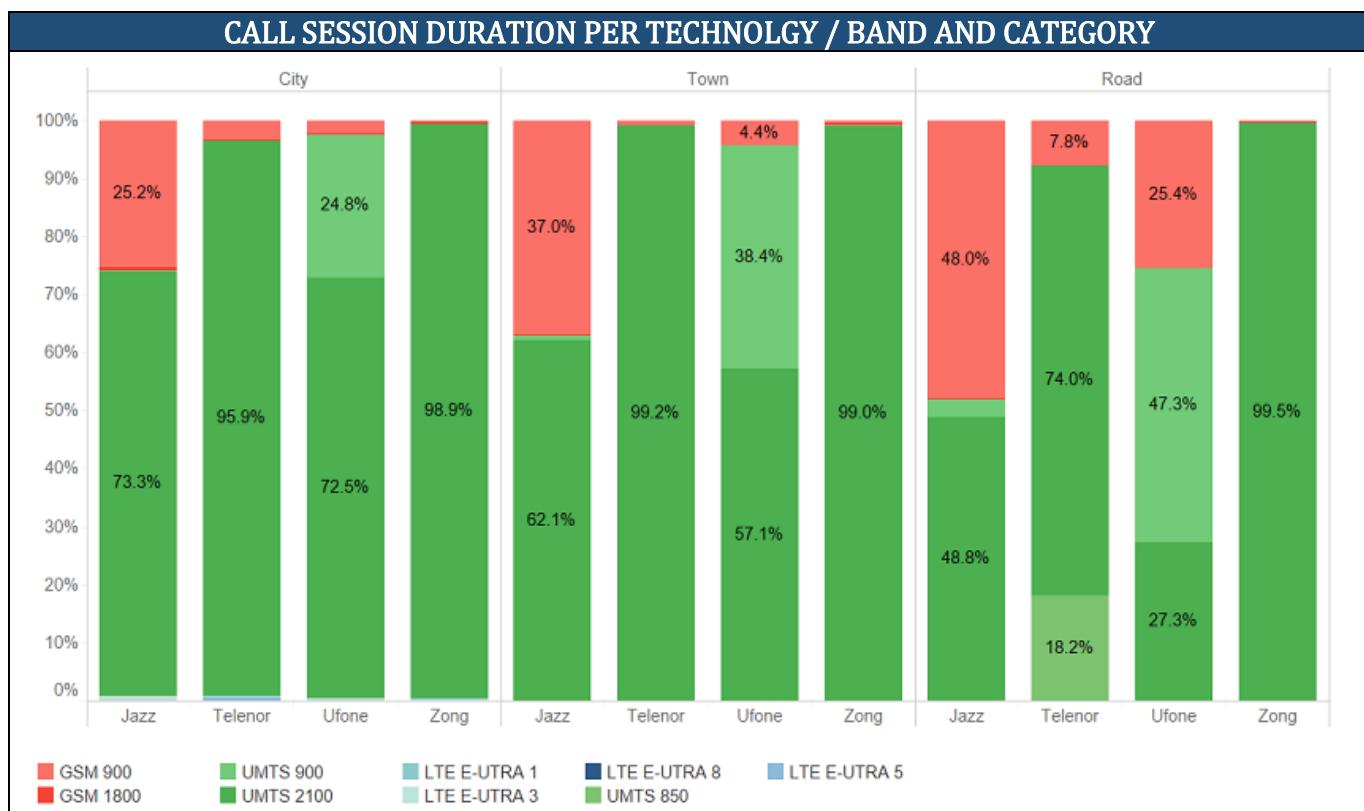
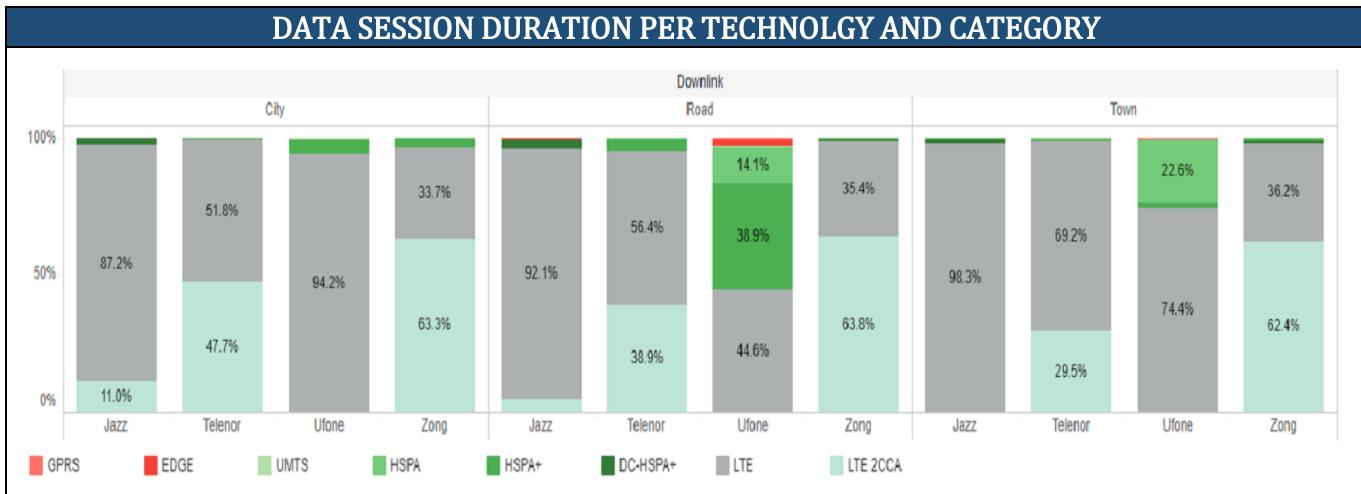


Figure 4.1: Call Session Duration per Technology / Band & Category

## 2. DATA SERVICE – TECHNOLOGY BREAKDOWN

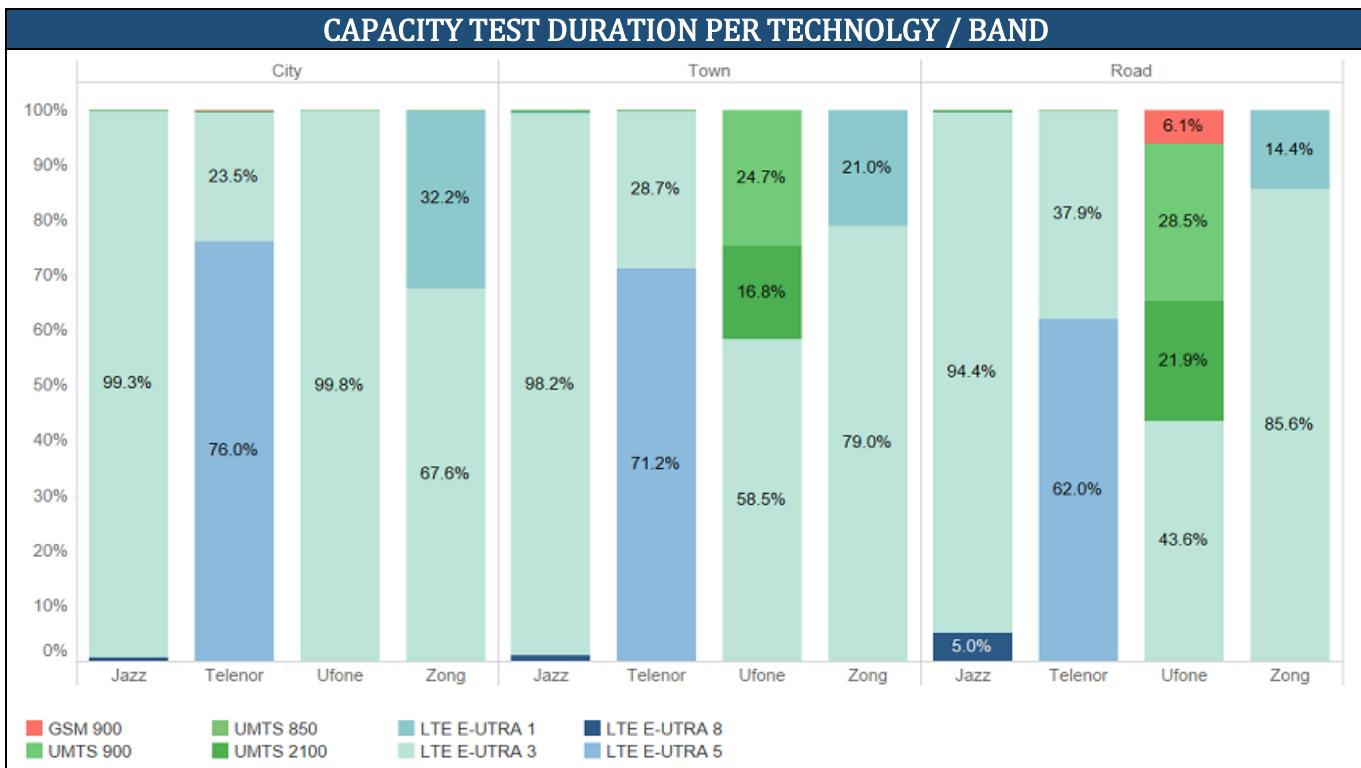
2.1. The analysis of Data Sessions Duration per Technology shows that ZonG with the best LTE utilization with more than 60% usage of 2CCA. Telenor utilizes also a wider range of 2CCA. The details is shown in **Figure 4.2: Data Session Duration per Technology and Category**.



**Figure 4.2: Data Session Duration per Technology and Category**

### 3. DATA SERVICE – TECHNOLOGY BANDS BREAKDOWN

3.1. The analysis of Capacity Test Duration per Technology / Primary Carrier Band shows that all operators have high LTE share in cities, whereas, Ufone shows high UMTS share in towns and roads. Telenor is dominantly using band 5 (850MHz) in LTE, while other operators are dominantly using band 3 (1800MHz). The details is shown in the **Figure 4.2: Capacity Test Duration per Technology / Band**.



**Figure 4.2: Capacity Test Duration per Technology / Band**

# WAY FORWARD

## 1. OPPORTUNITY POINTS

1.1. The Opportunity View highlights KPIs to be addressed with the highest potential to gain points on the Score by each CMO. The charts present the missed points in NPS. Longer bars indicate higher improvement potential (e.g. more missing points to the maximum score). It can be easily be concluded that CMOs have more opportunities to improve overall NPS score in Cities as well as to pay special attention for improvement of Data Services. The category wise detail is listed in **Figure 5.1: Overall, Voice & Data Scoring Point Opportunities**.

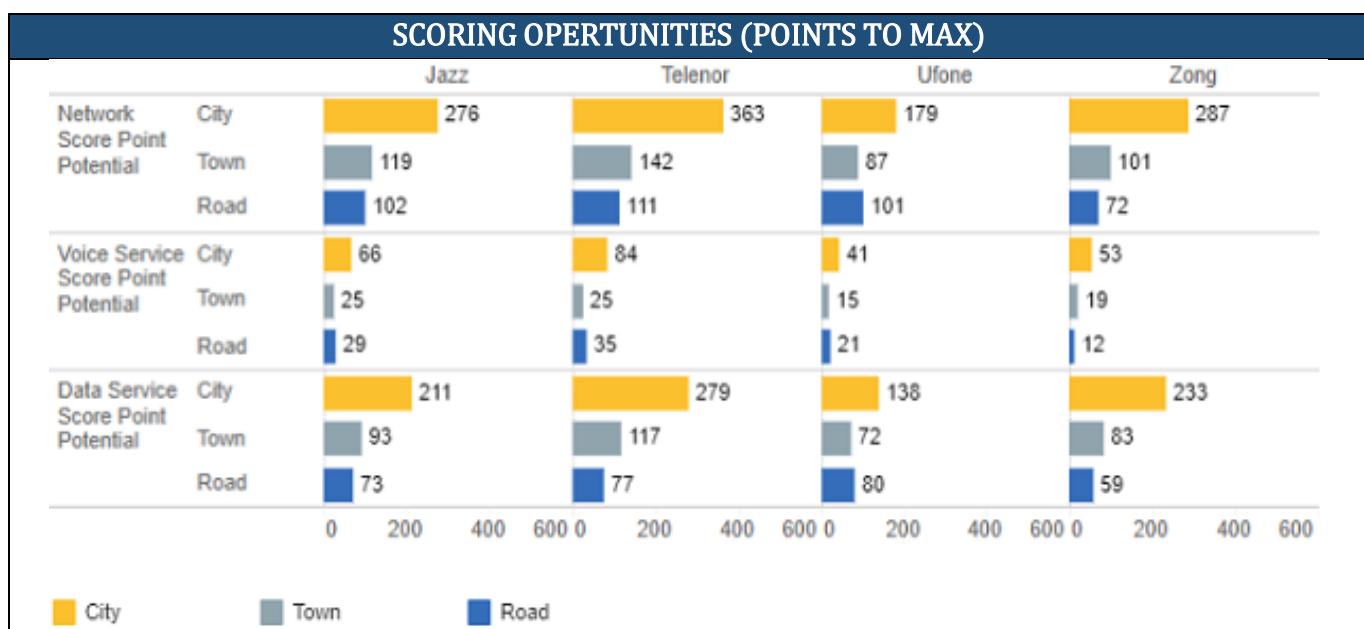
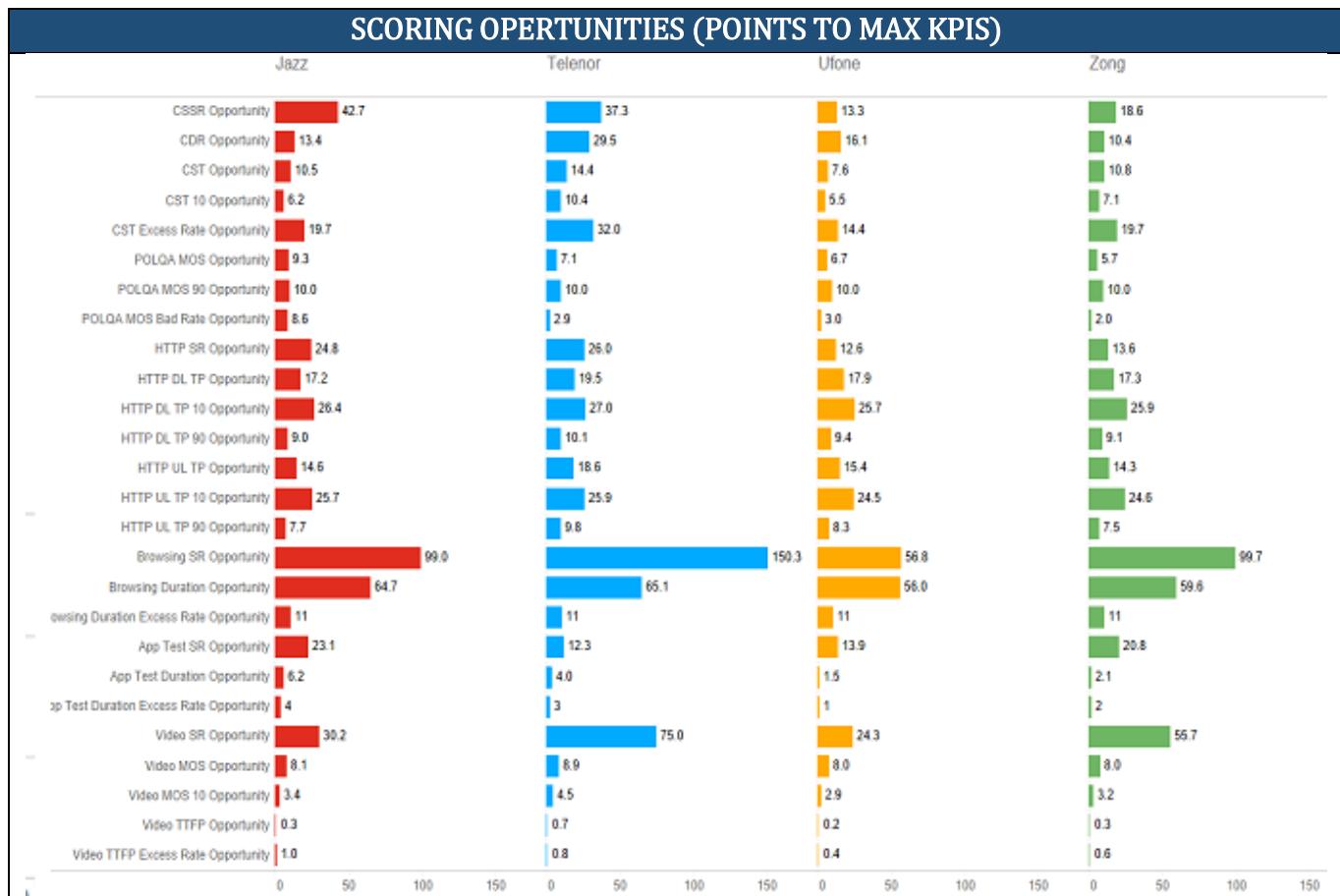


Figure 5.1: Overall, Voice & Data Scoring Point Opportunities

1.2. Overall a poor Success Ratio, especially in web browsing services is responsible for non-scoring in this KPI. Also the CSSR for voice and video have a high potential. The Success Ratios are making the key differences in the networks under tests. Most of the data KPIs are at a very low level and also have a big potential for improvements. The KPIs wise detail is listed in **Figure 5.2: KPIs Wise Scoring Point Opportunities**



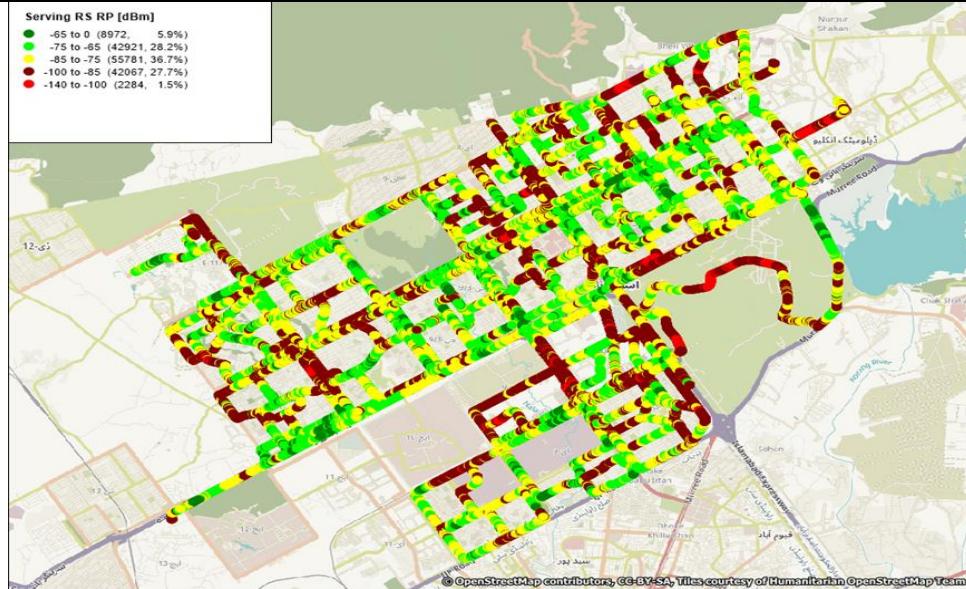
**Figure 5.2: KPIs Wise Scoring Point Opportunities**

## **ANNEX - A**

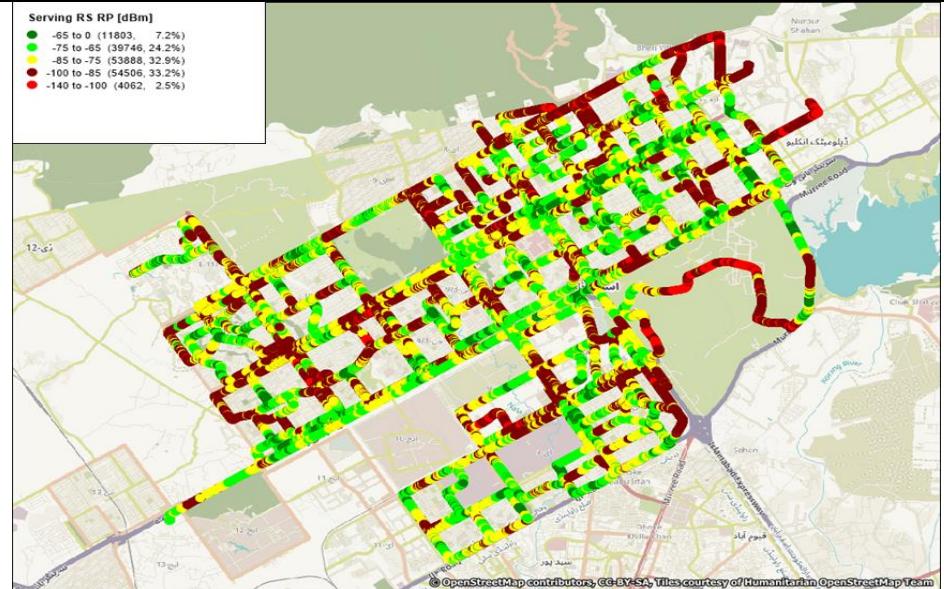
### **CITIES**

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

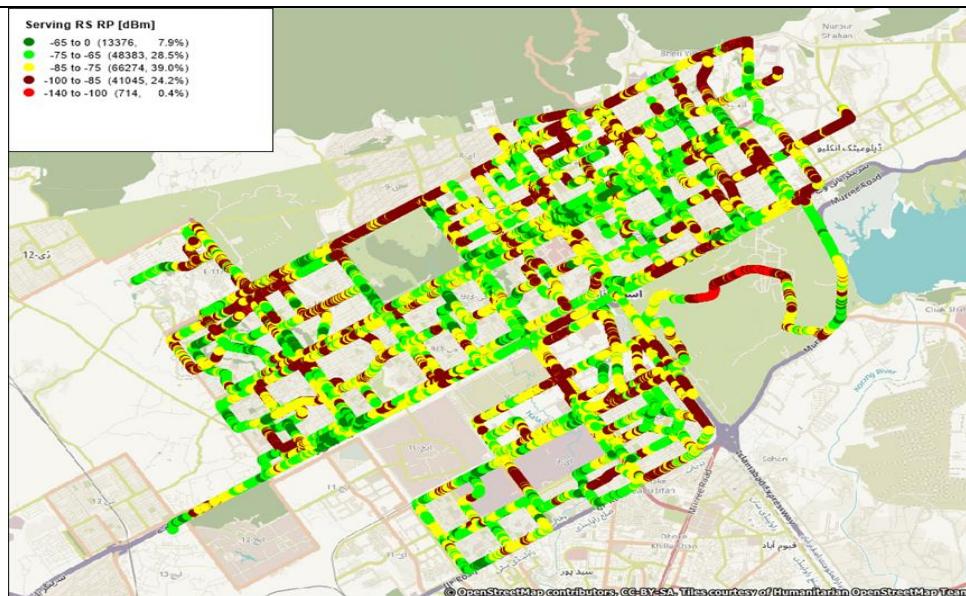
JAZZ 4G NETWORK COVERAGE – ISLAMABAD



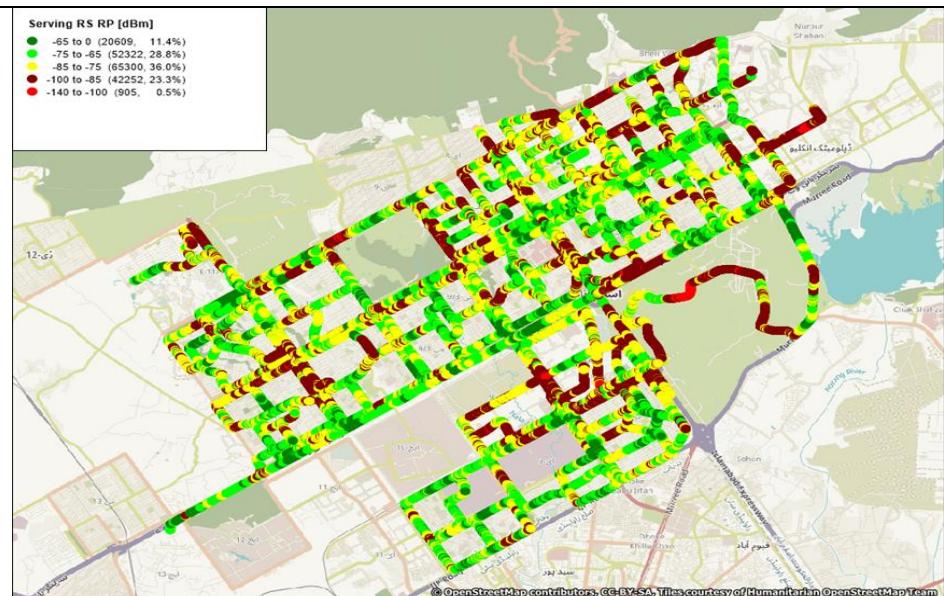
TELENOR 4G NETWORK COVERAGE – ISLAMABAD



Ufone 4G NETWORK COVERAGE – ISLAMABAD

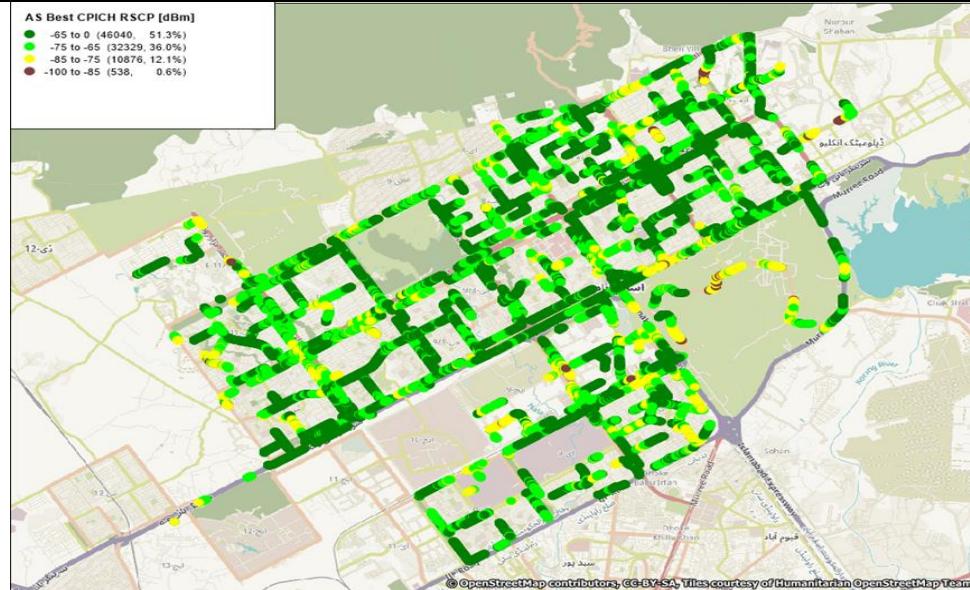


ZONG 4G NETWORK COVERAGE – ISLAMABAD

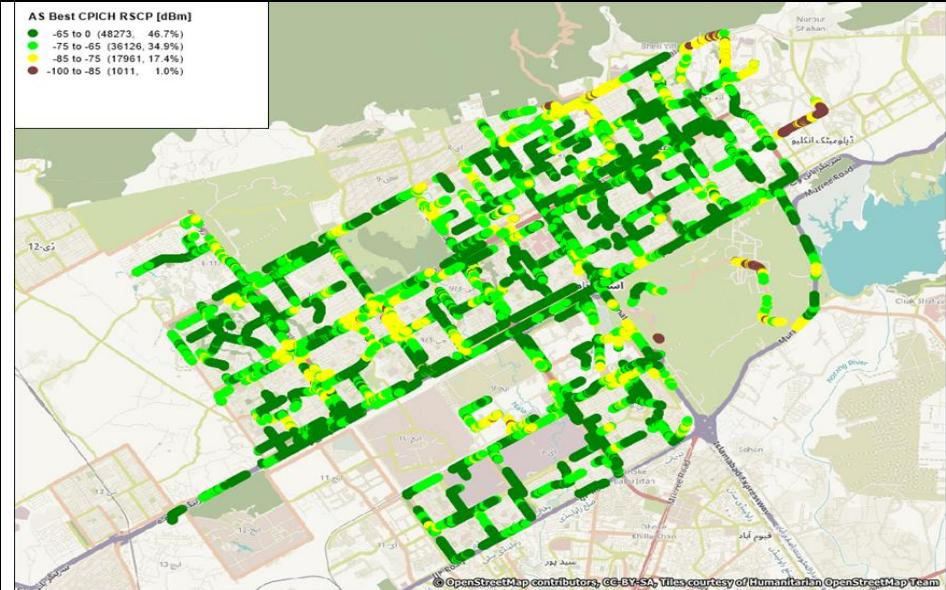


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

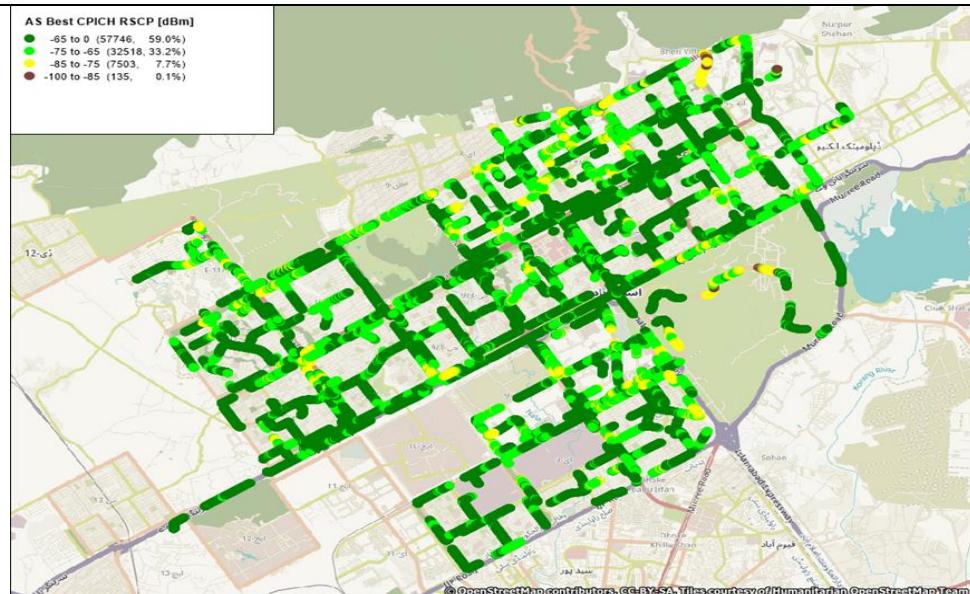
JAZZ 3G NETWORK COVERAGE – ISLAMABAD



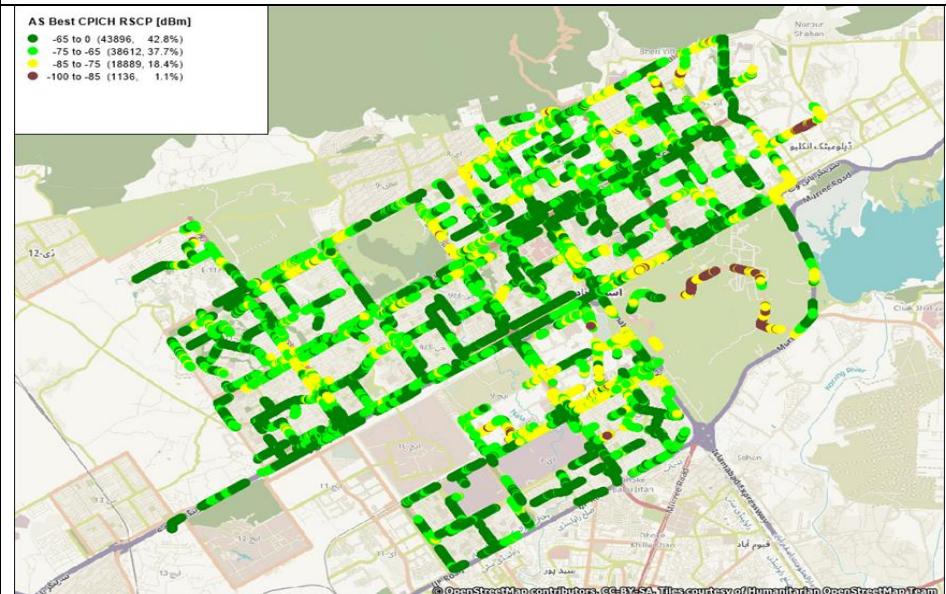
TELENOR 3G NETWORK COVERAGE – ISLAMABAD



UFONE 3G NETWORK COVERAGE – ISLAMABAD

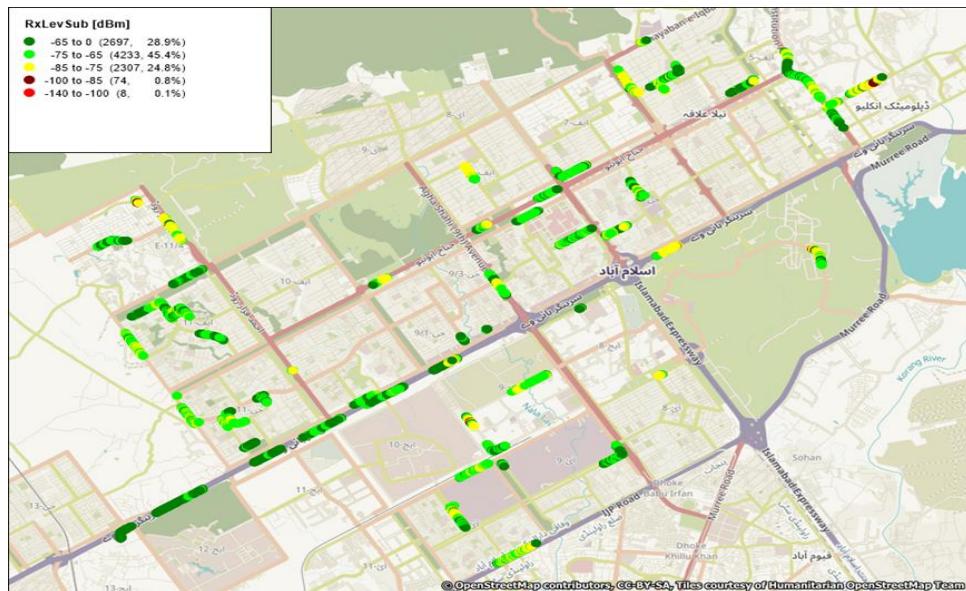


ZONG 3G NETWORK COVERAGE – ISLAMABAD



## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

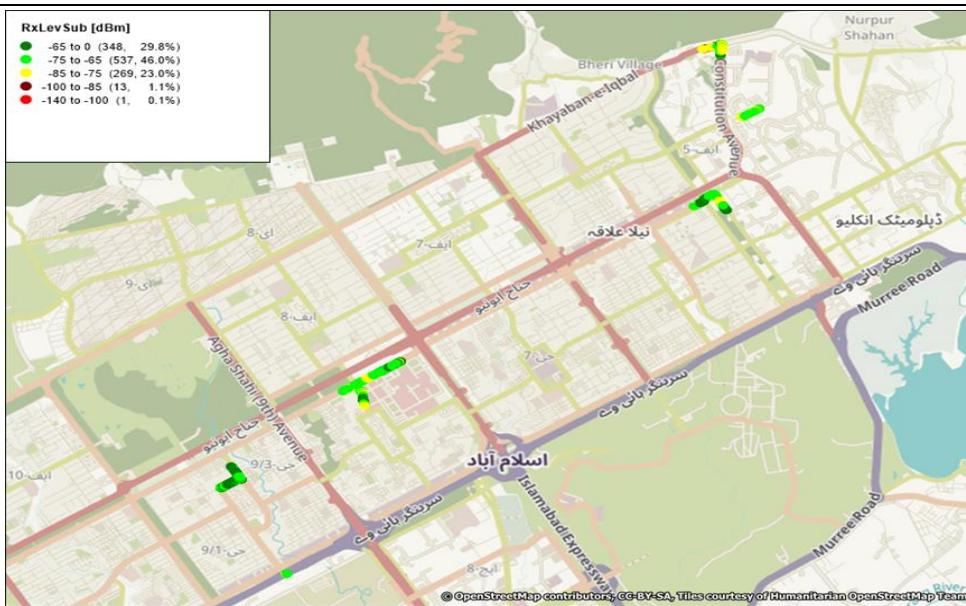
JAZZ 2G NETWORK COVERAGE – ISLAMABAD



TELENOR 2G NETWORK COVERAGE – ISLAMABAD



UFONE 2G NETWORK COVERAGE – ISLAMABAD

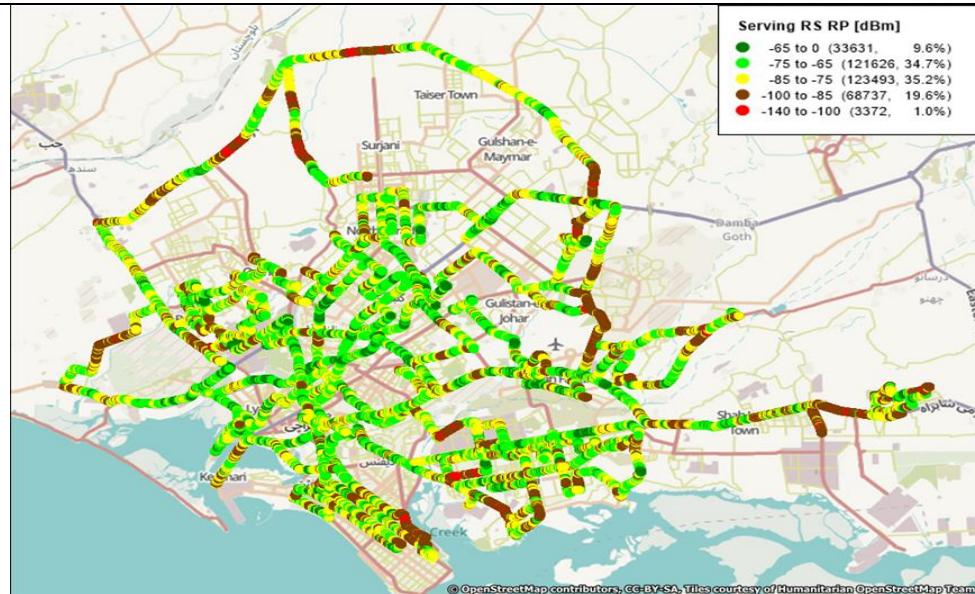


ZONG 2G NETWORK COVERAGE – ISLAMABAD

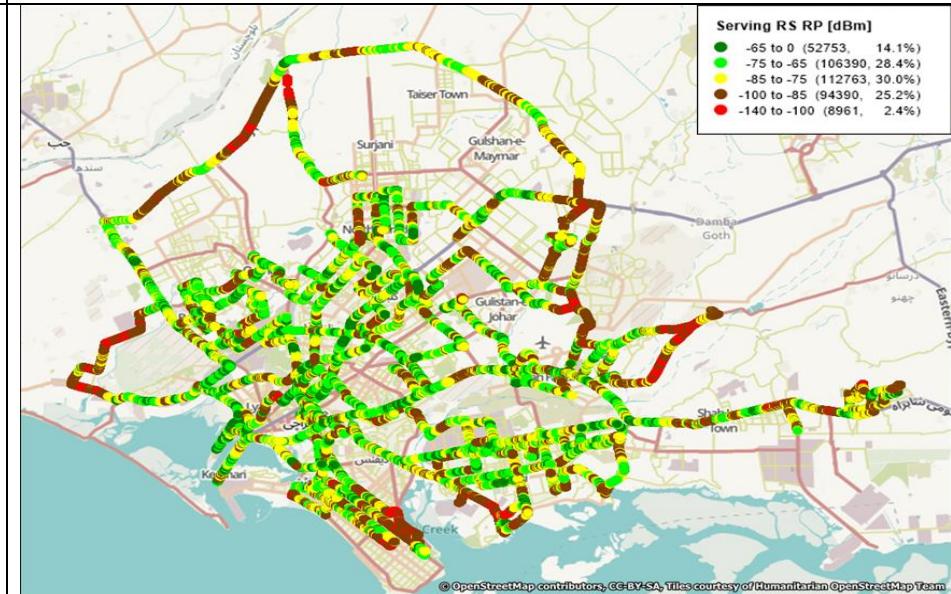
NOFallback TO 2G NETWORK

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

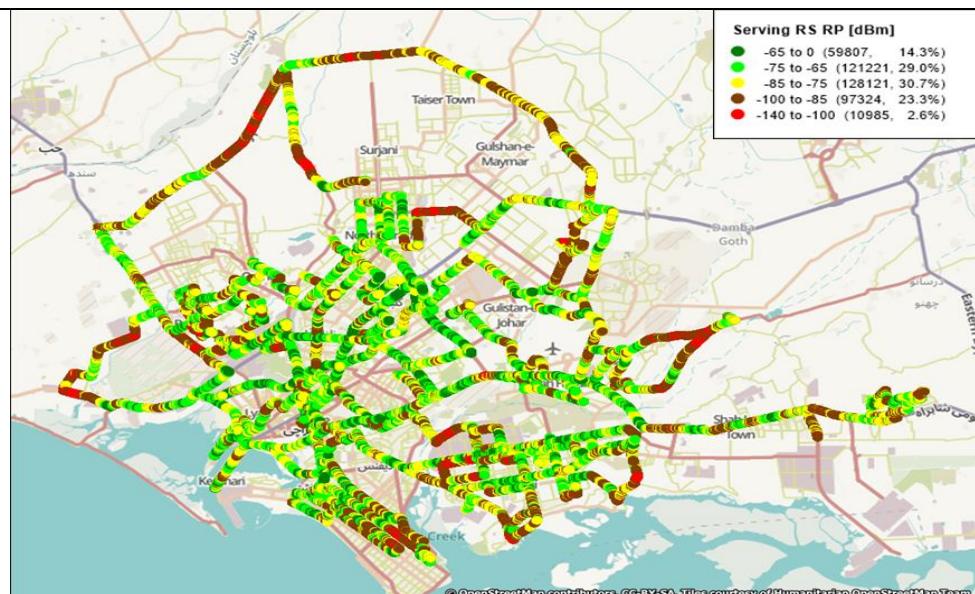
JAZZ 4G NETWORK COVERAGE – KARACHI



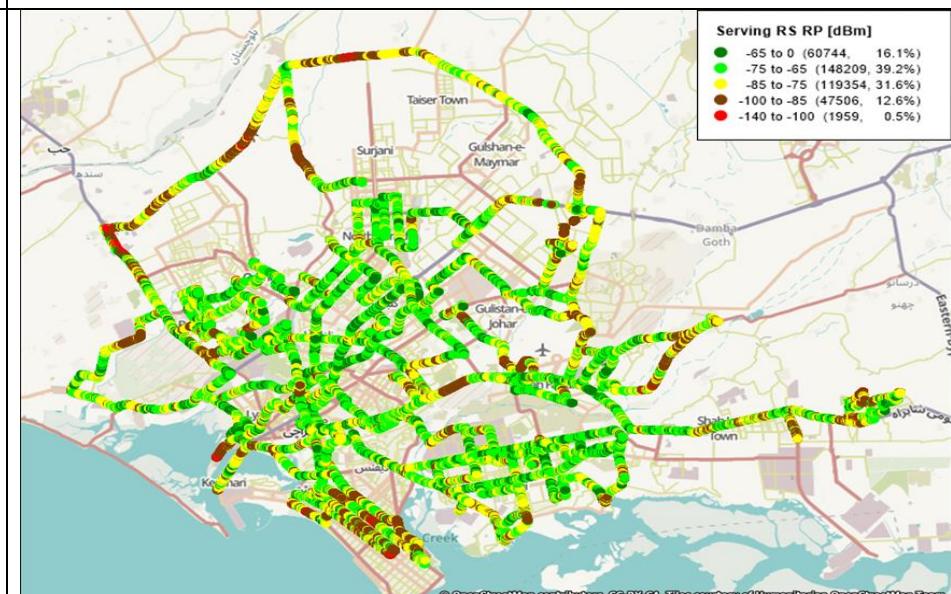
TELENOR 4G NETWORK COVERAGE – KARACHI



UFONE 4G NETWORK COVERAGE – KARACHI

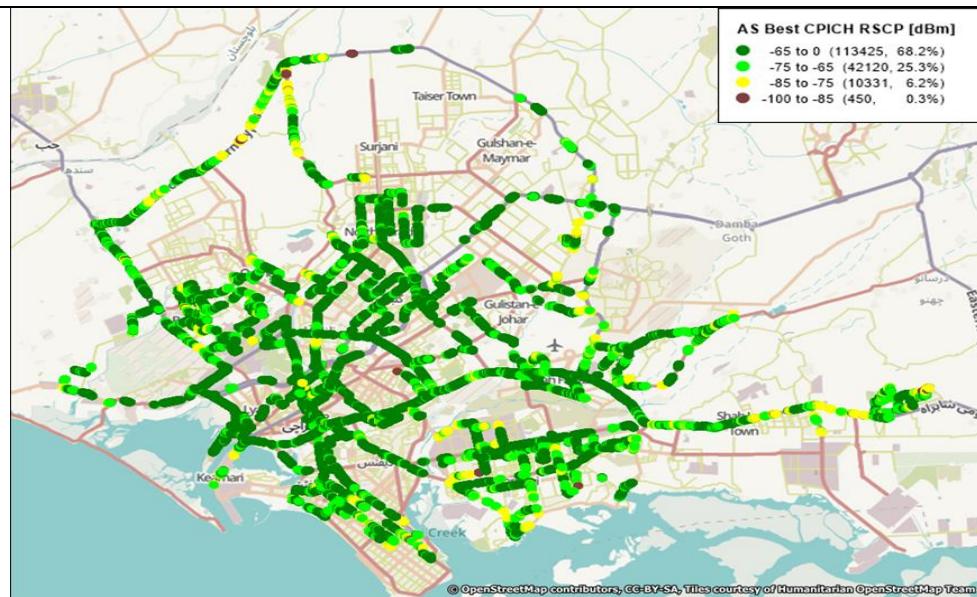


ZONG 4G NETWORK COVERAGE – KARACHI

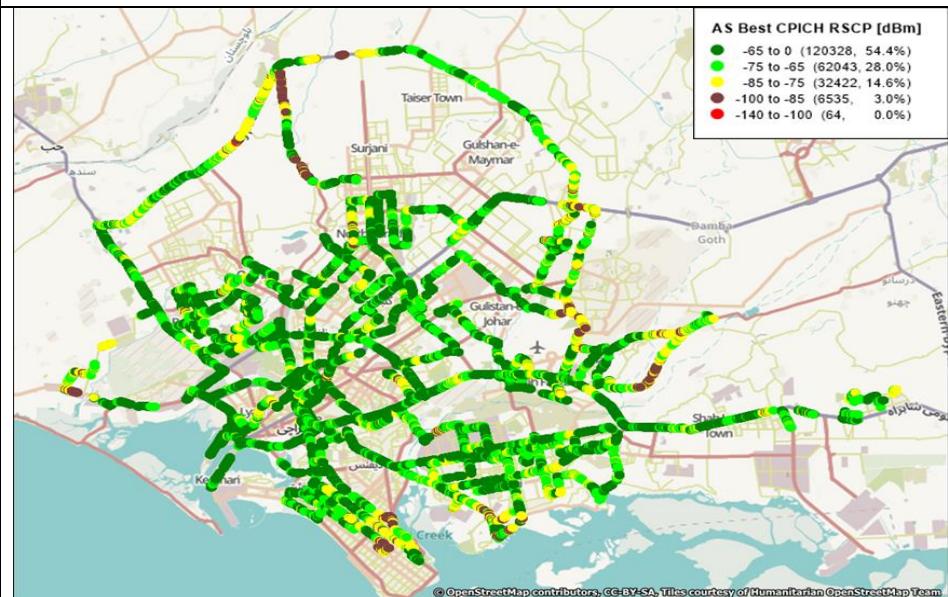


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

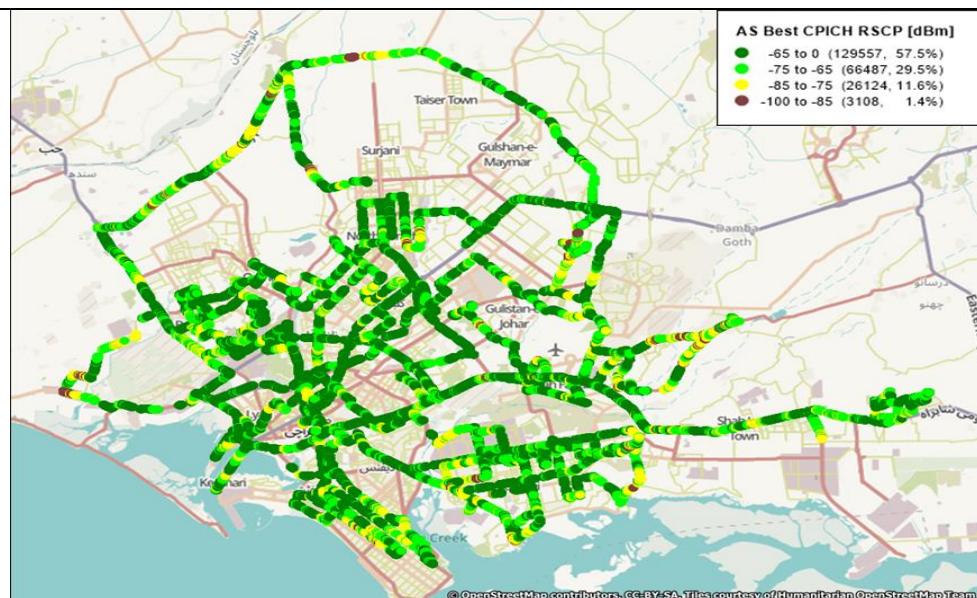
JAZZ 3G NETWORK COVERAGE – KARACHI



TELENOR 3G NETWORK COVERAGE – KARACHI



UFONE 3G NETWORK COVERAGE – KARACHI

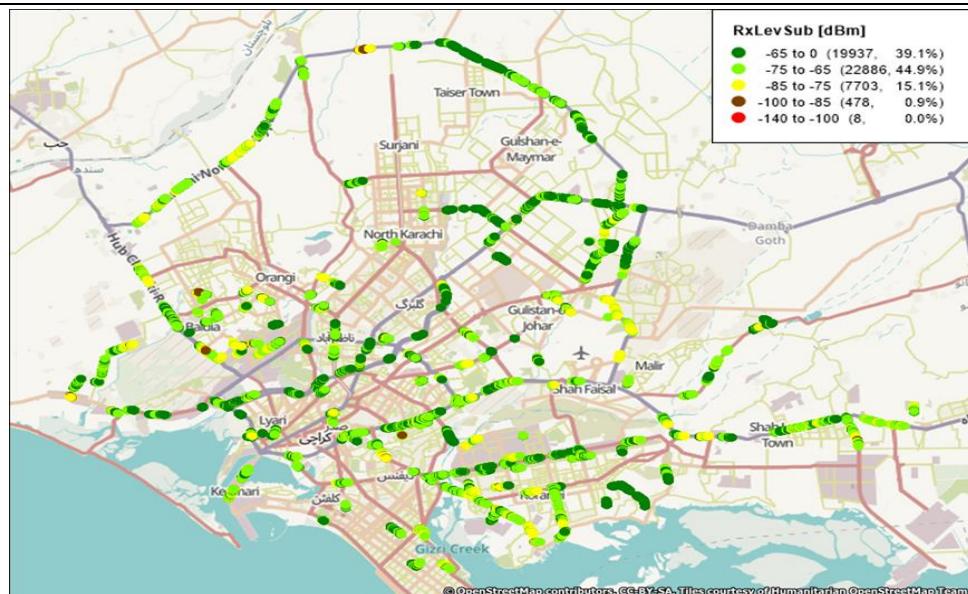


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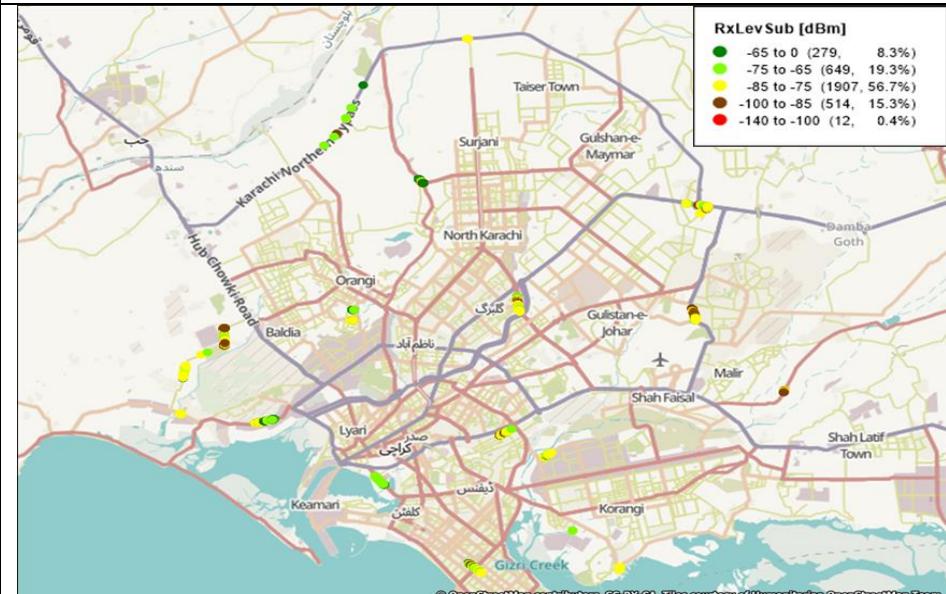


## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

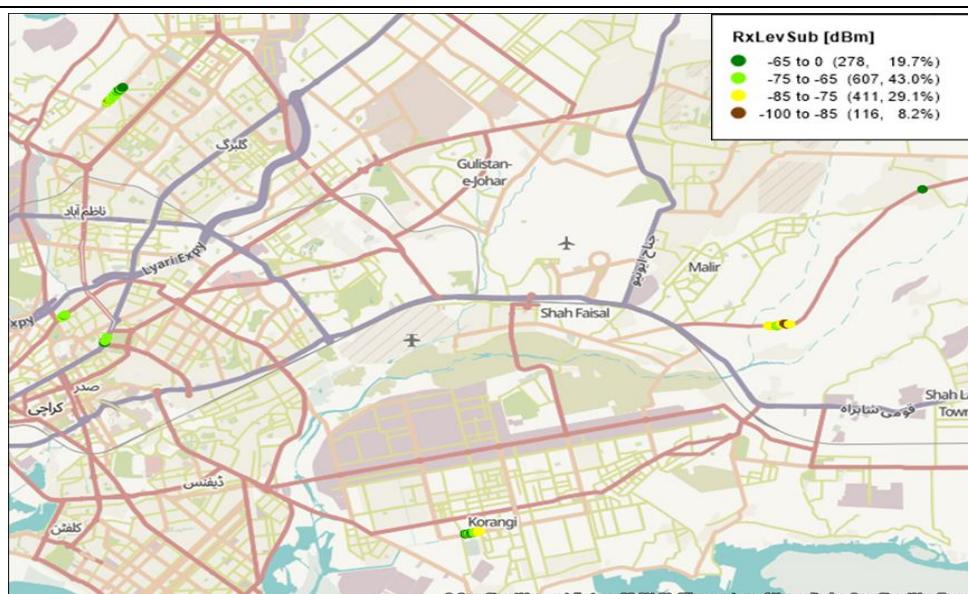
JAZZ 2G NETWORK COVERAGE – KARACHI



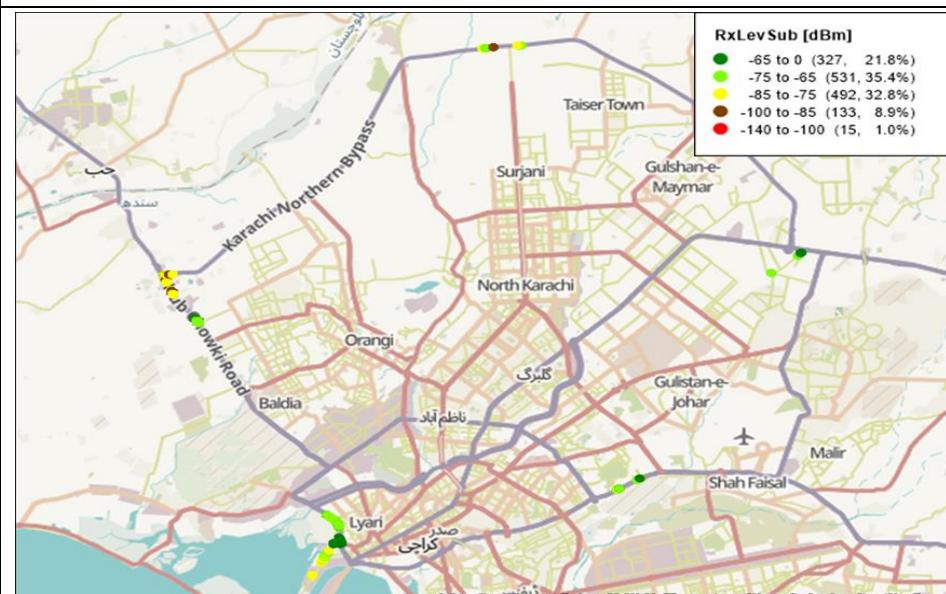
TELENOR 2G NETWORK COVERAGE – KARACHI



UFONE 2G NETWORK COVERAGE – KARACHI

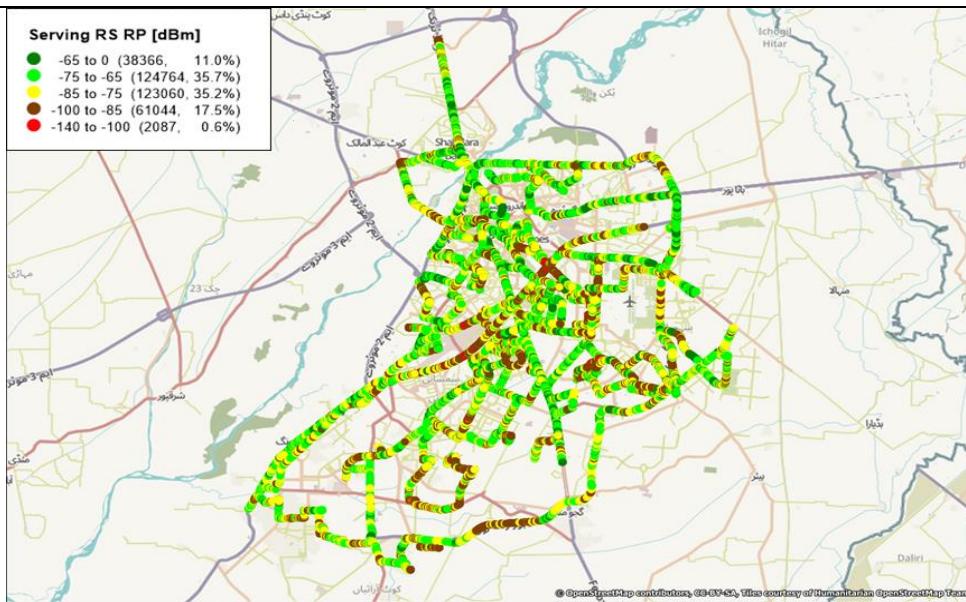


ZONG 2G NETWORK COVERAGE – KARACHI

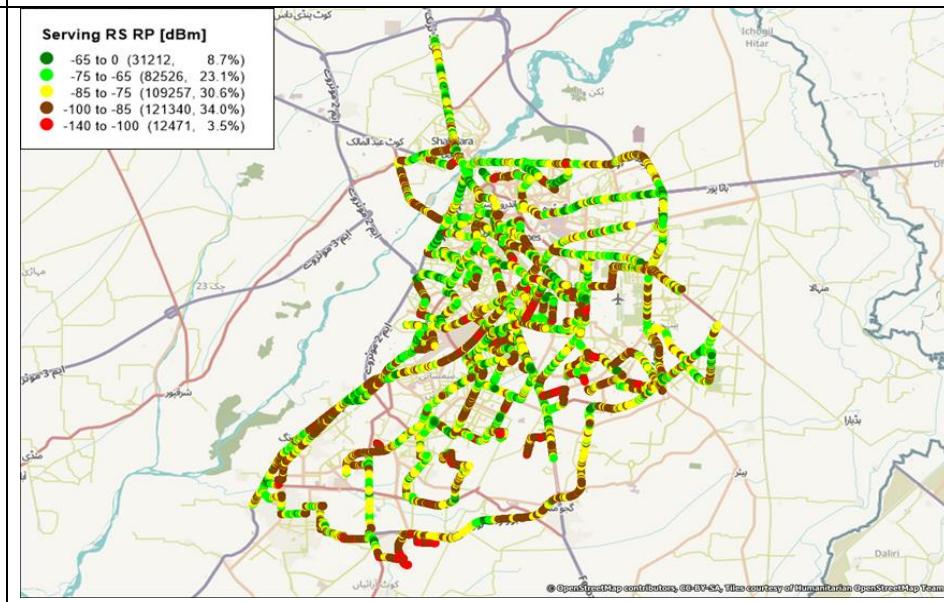


## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

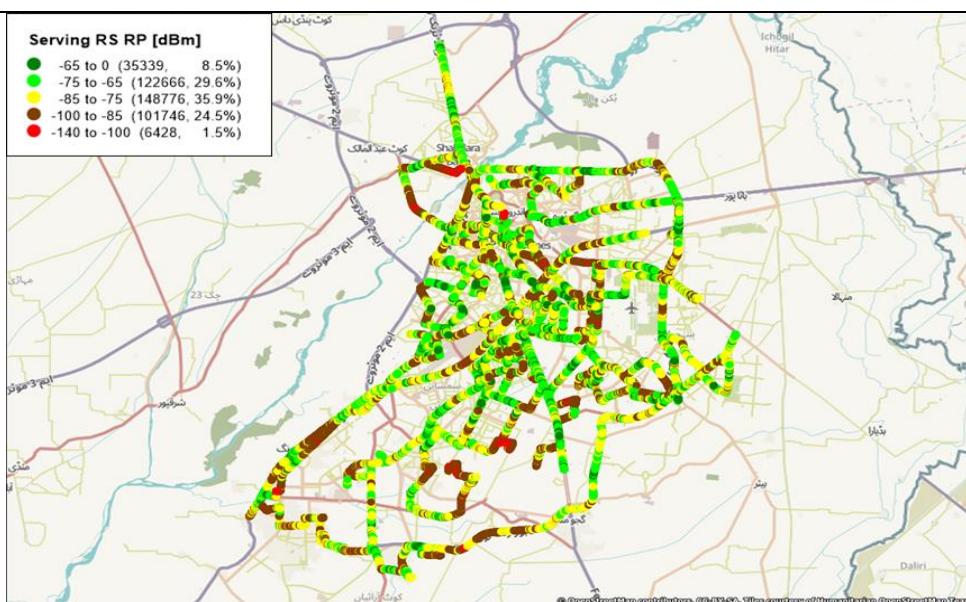
JAZZ 4G NETWORK COVERAGE – LAHORE



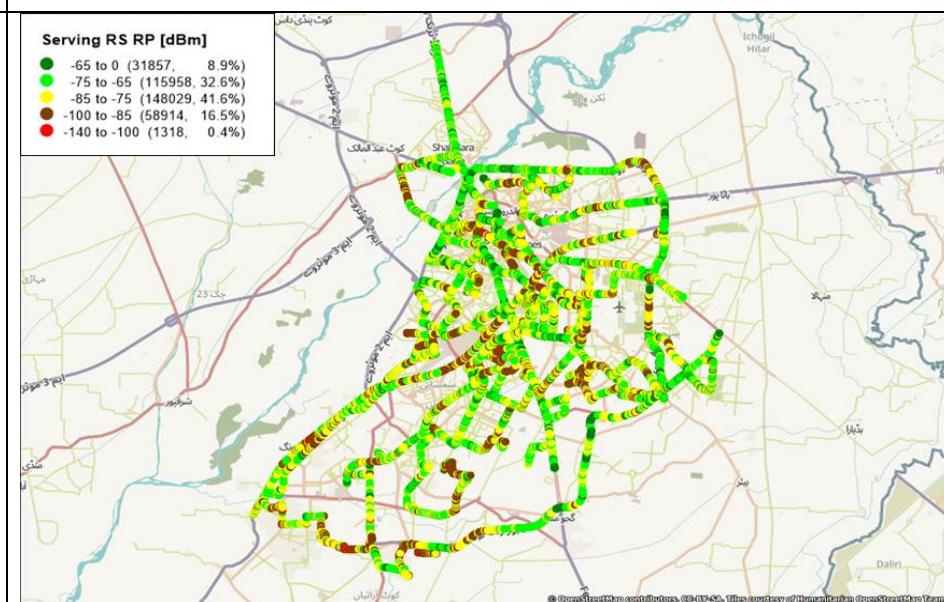
TELENOR 4G NETWORK COVERAGE – LAHORE



UZONE 4G NETWORK COVERAGE – LAHORE

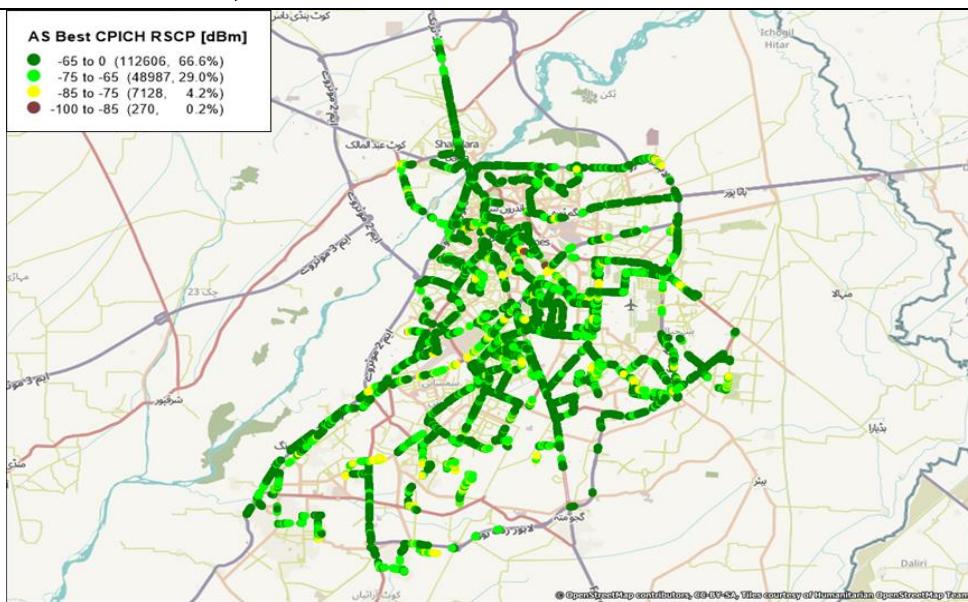


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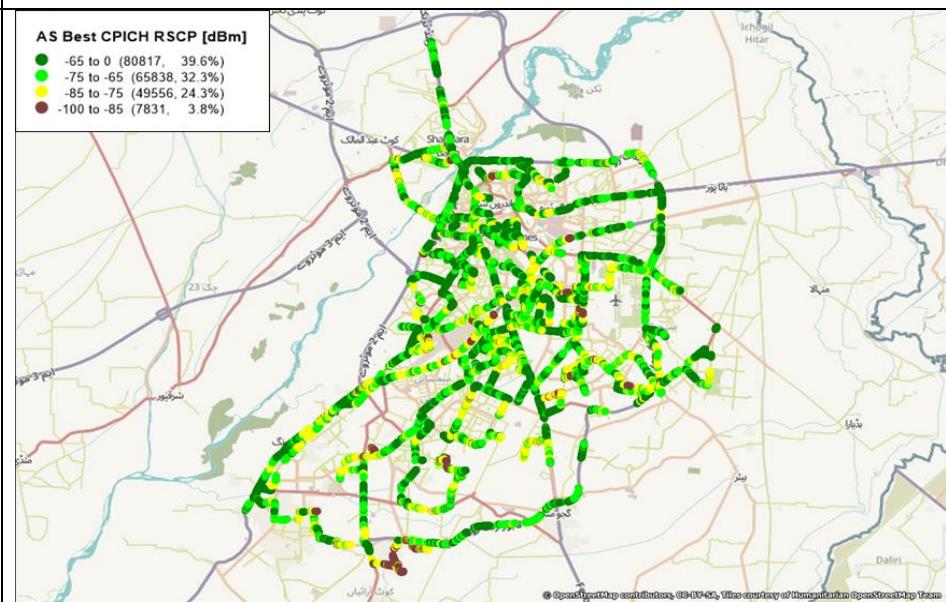


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

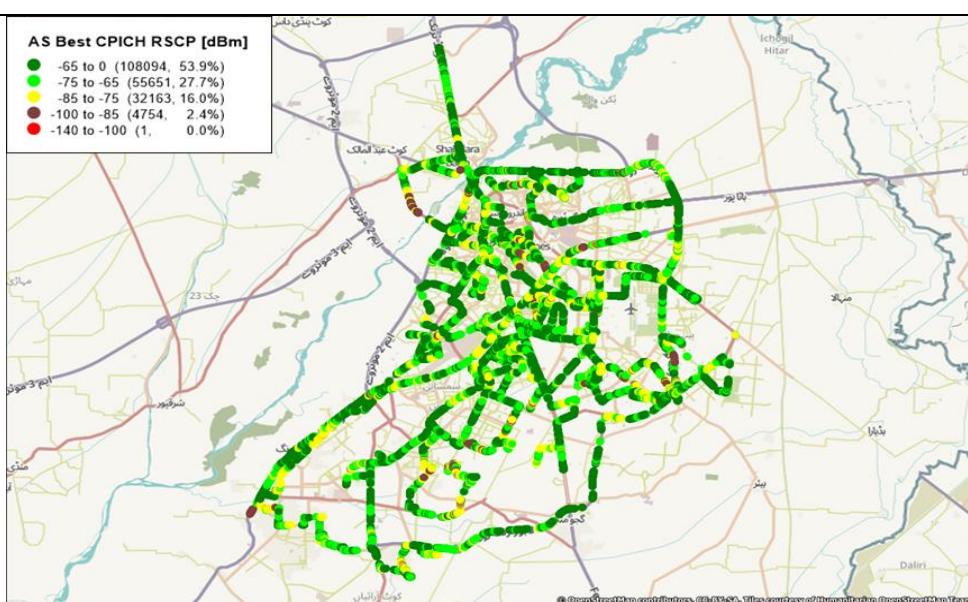
JAZZ 3G NETWORK COVERAGE – LAHORE



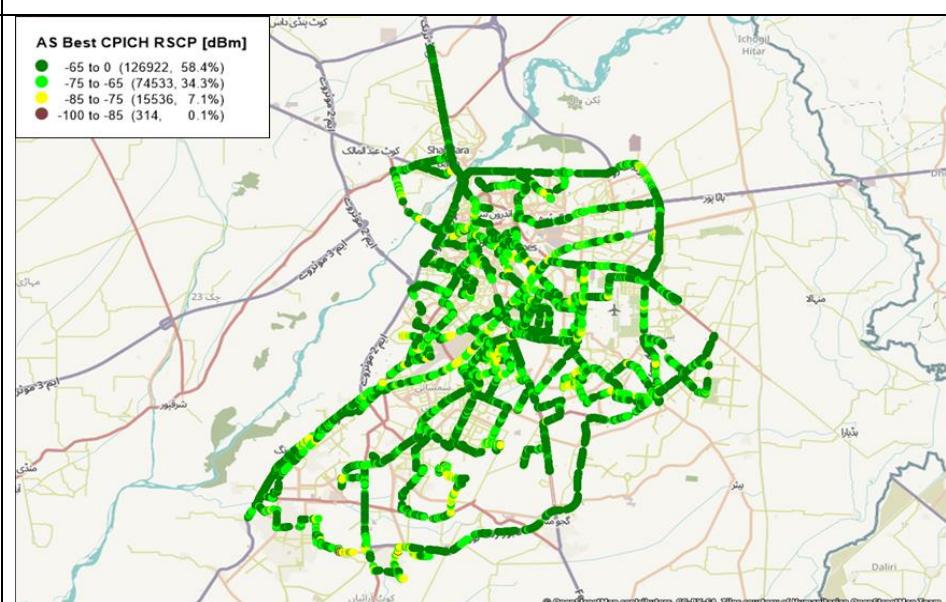
TELENOR 3G NETWORK COVERAGE – LAHORE



UFONE 3G NETWORK COVERAGE – LAHORE

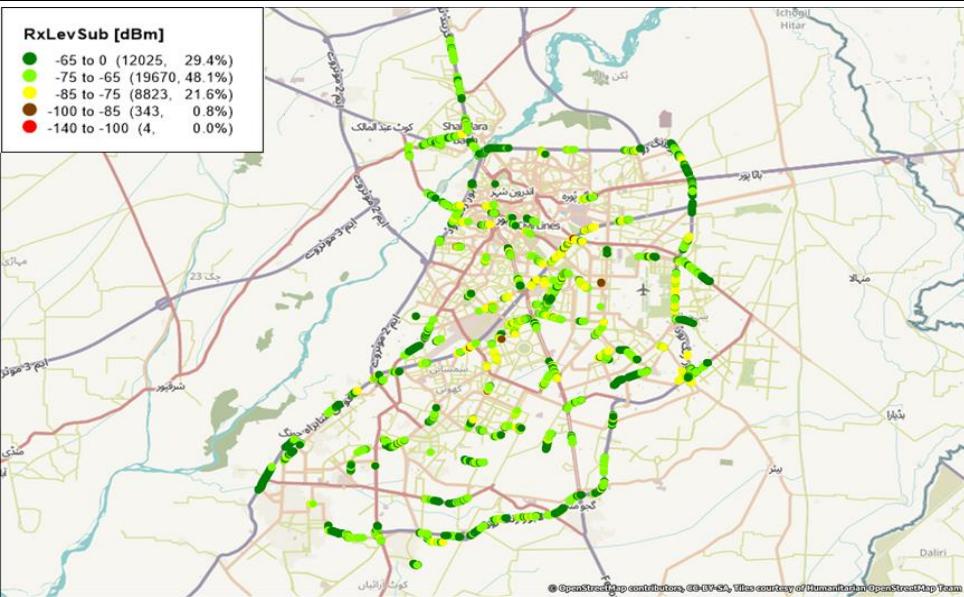


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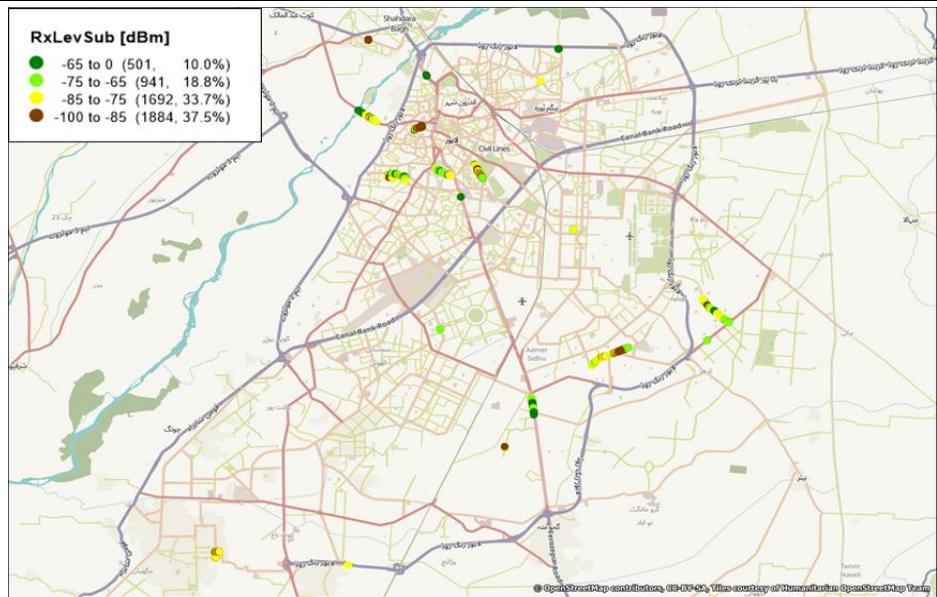


## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

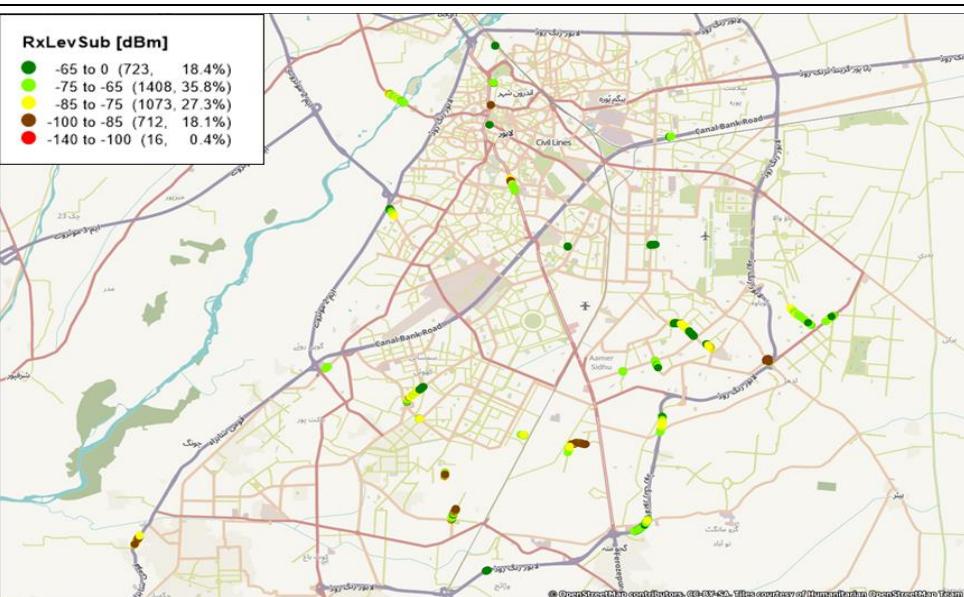
JAZZ 2G NETWORK COVERAGE – LAHORE



TELENOR 2G NETWORK COVERAGE – LAHORE



UFONE 2G NETWORK COVERAGE – LAHORE

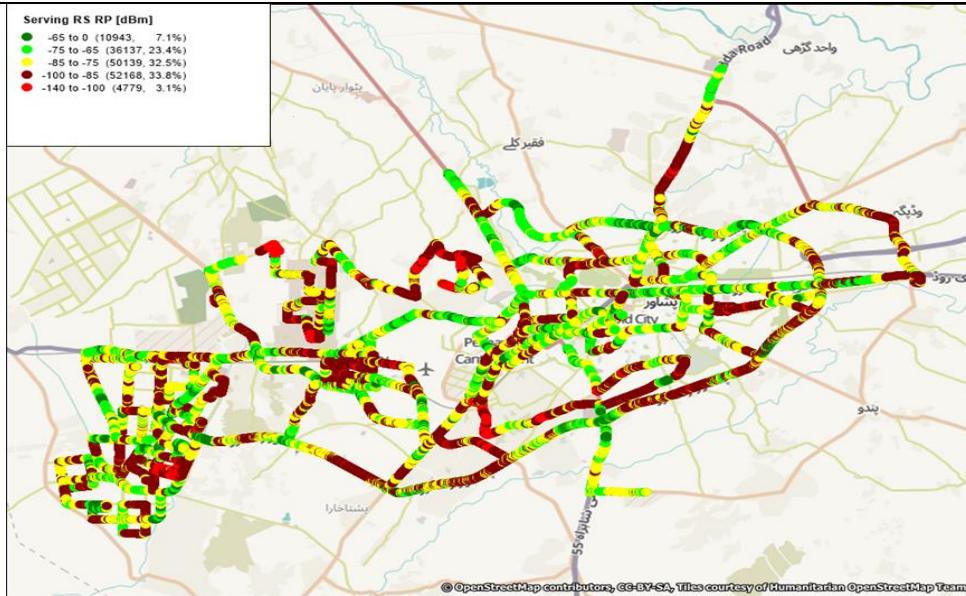


ZONG 2G NETWORK COVERAGE – LAHORE

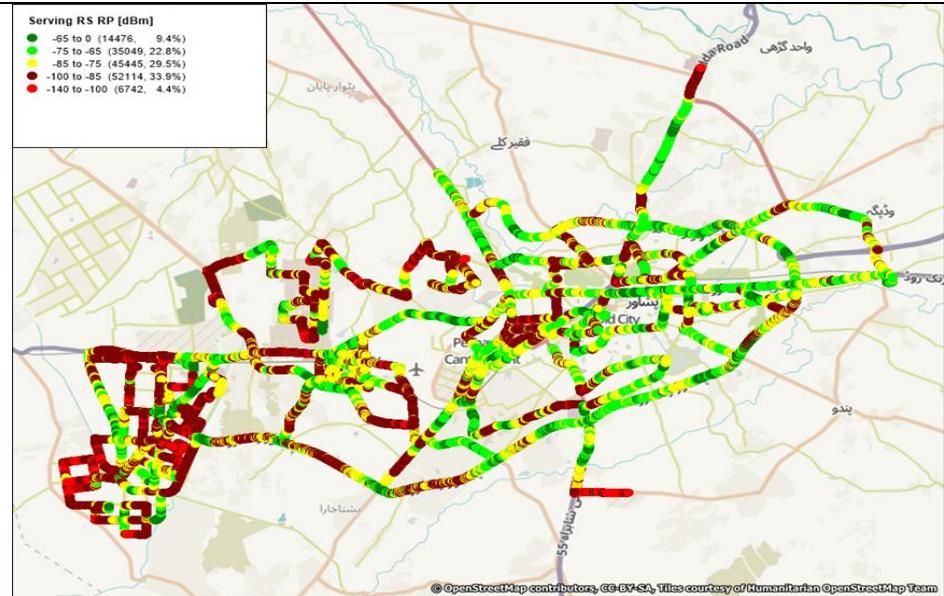
NO FALBACK TO 2G NETWORK

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

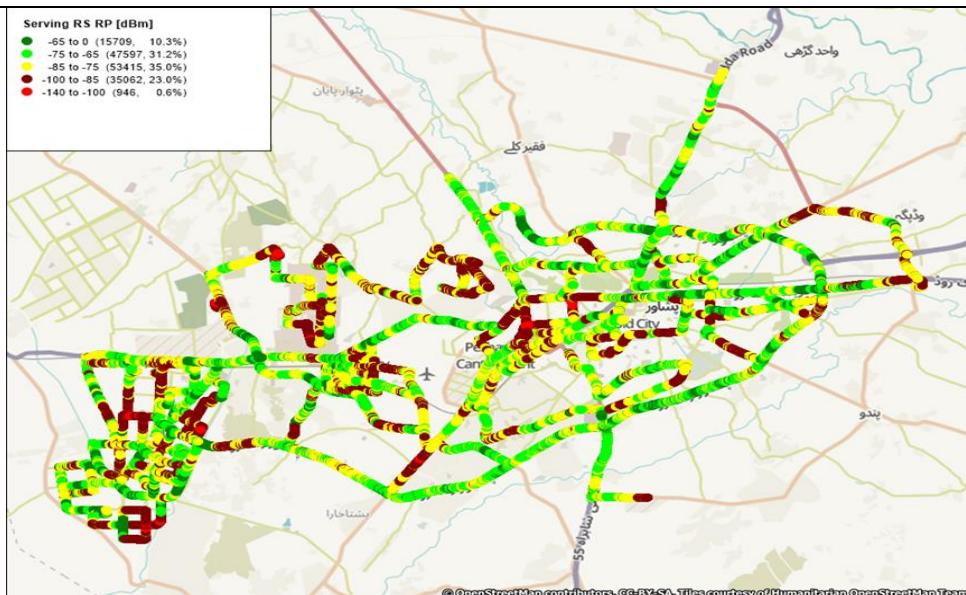
JAZZ 4G NETWORK COVERAGE – PESHAWAR



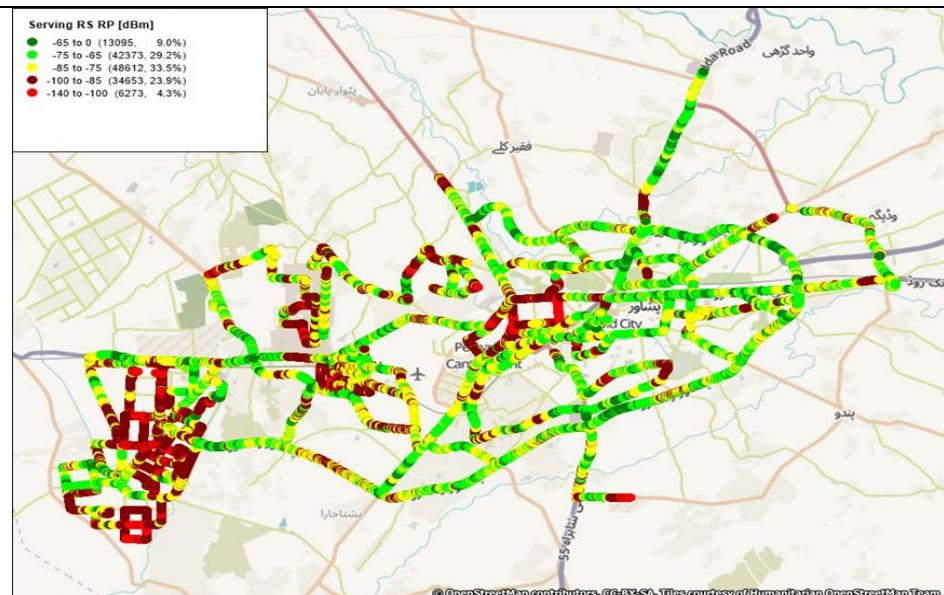
TELENOR 4G NETWORK COVERAGE – PESHAWAR



UFONE 4G NETWORK COVERAGE – PESHAWAR

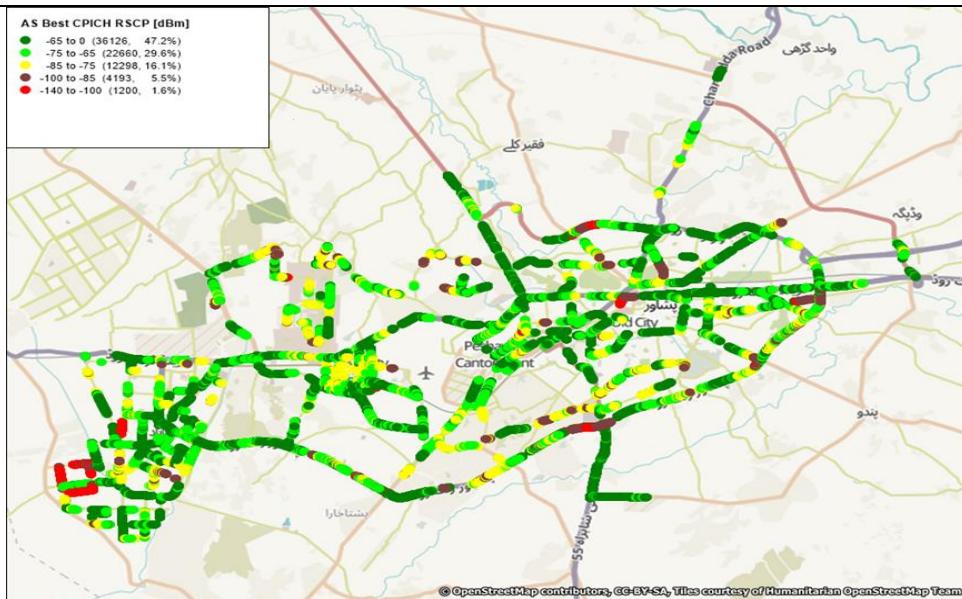


ZONG 4G NETWORK COVERAGE – PESHAWAR

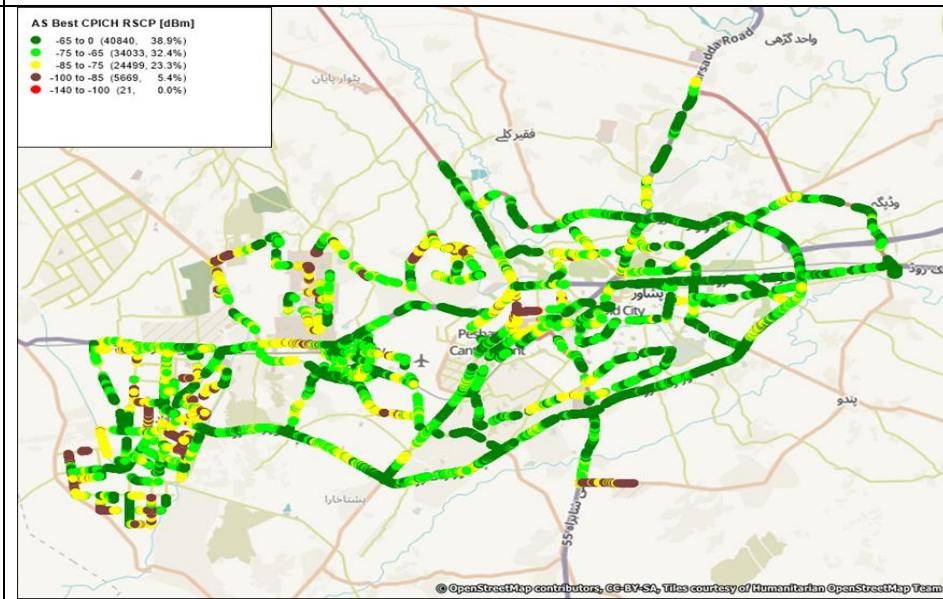


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

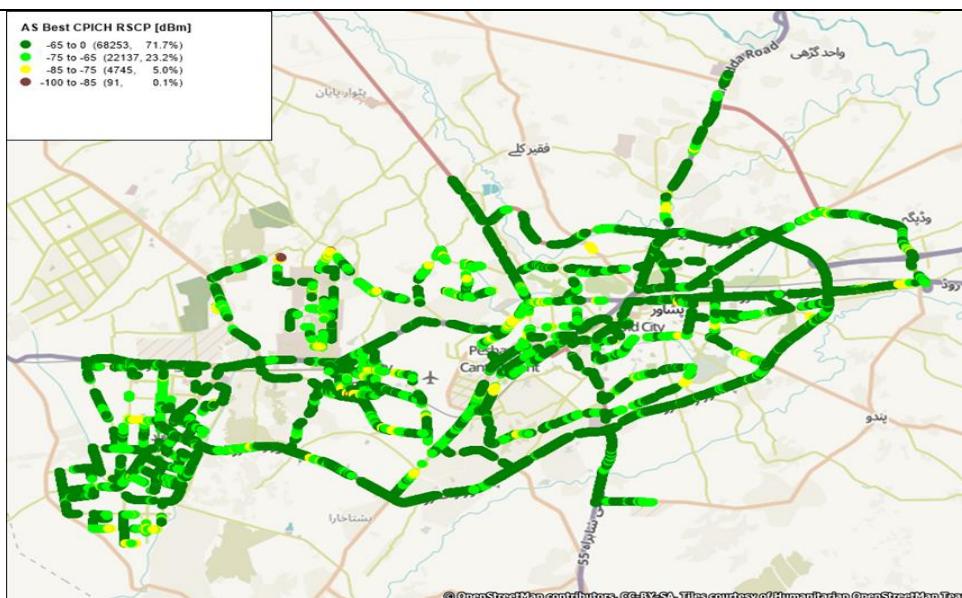
JAZZ 3G NETWORK COVERAGE – PESHAWAR



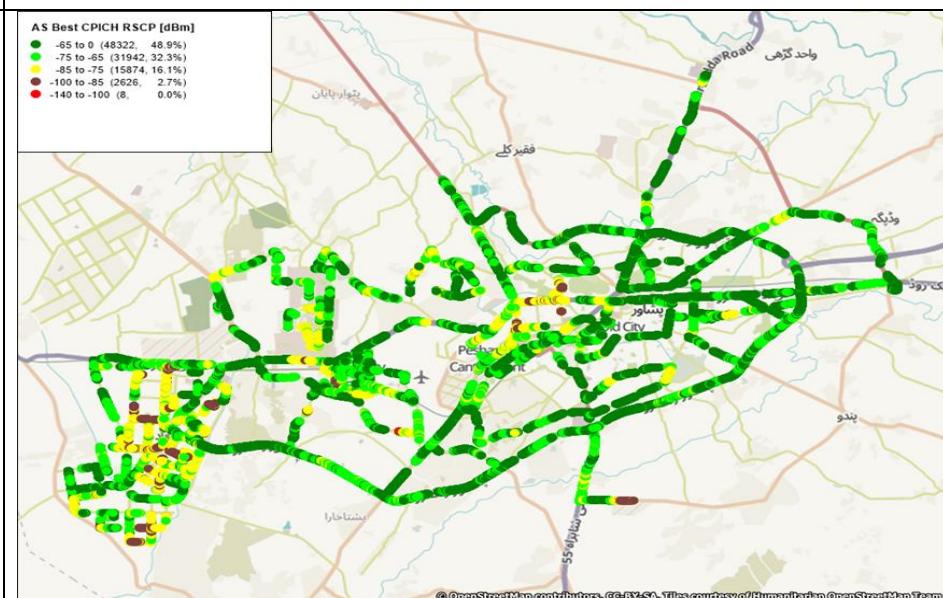
TELENOR 3G NETWORK COVERAGE – PESHAWAR



UFONE 3G NETWORK COVERAGE – PESHAWAR

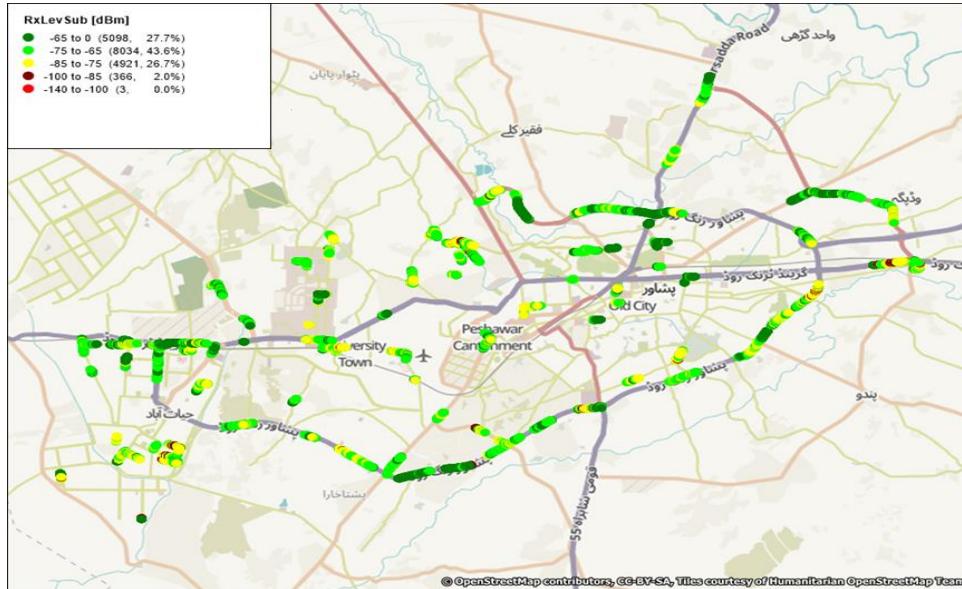


ZONG 3G NETWORK COVERAGE – PESHAWAR

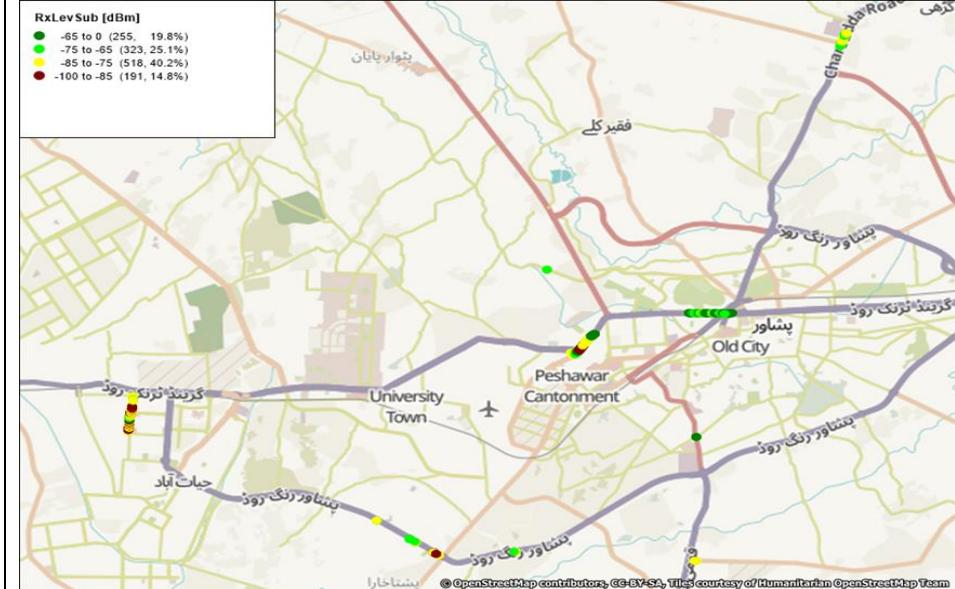


## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

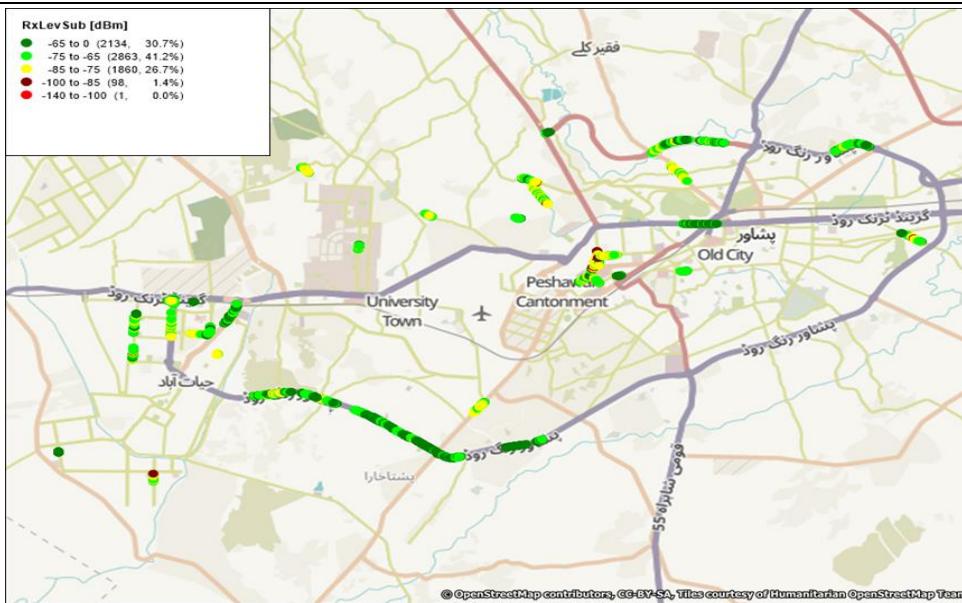
JAZZ 2G NETWORK COVERAGE – PESHAWAR



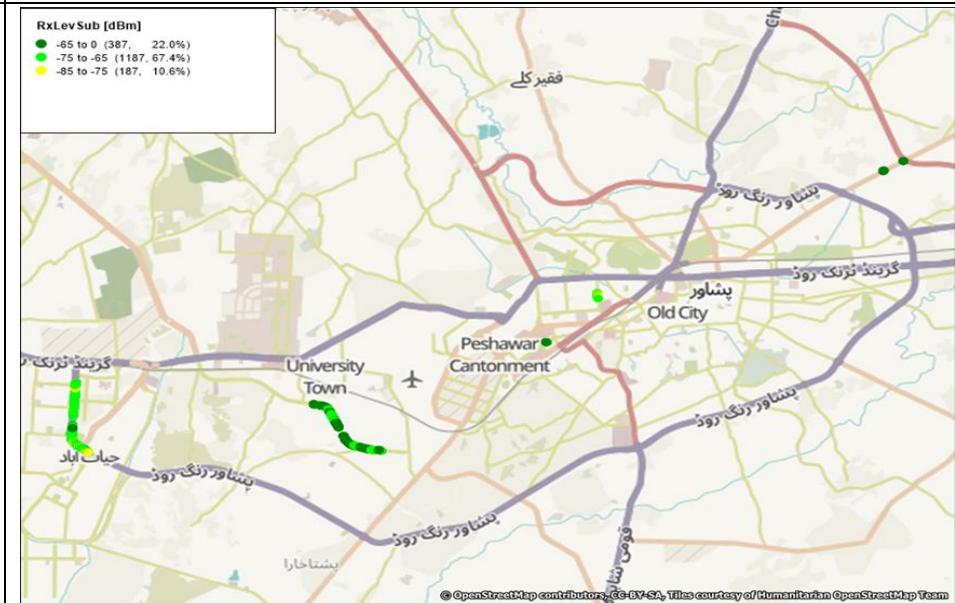
TELENOR 2G NETWORK COVERAGE – PESHAWAR



UFONE 2G NETWORK COVERAGE – PESHAWAR

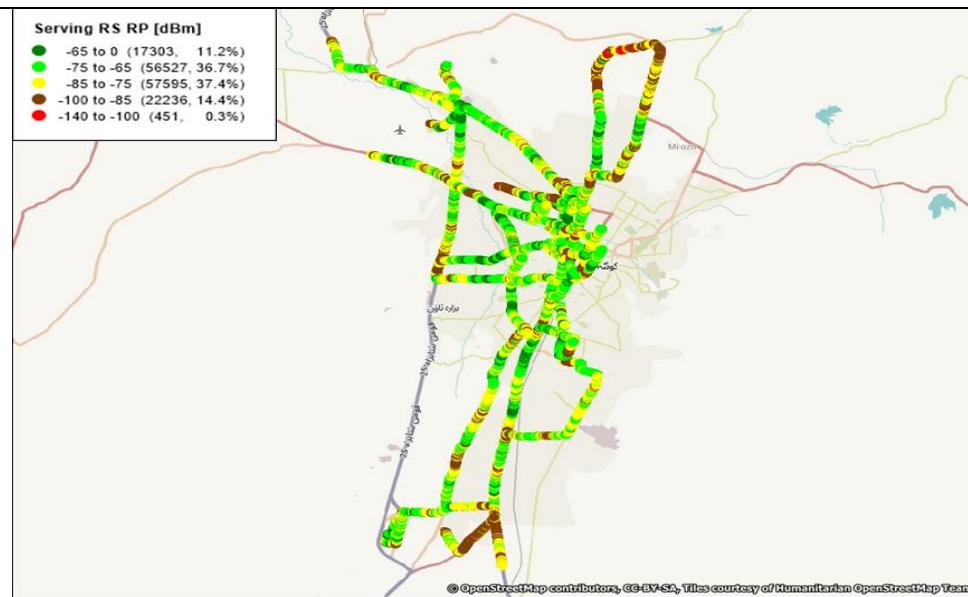


ZONG 2G NETWORK COVERAGE – PESHAWAR

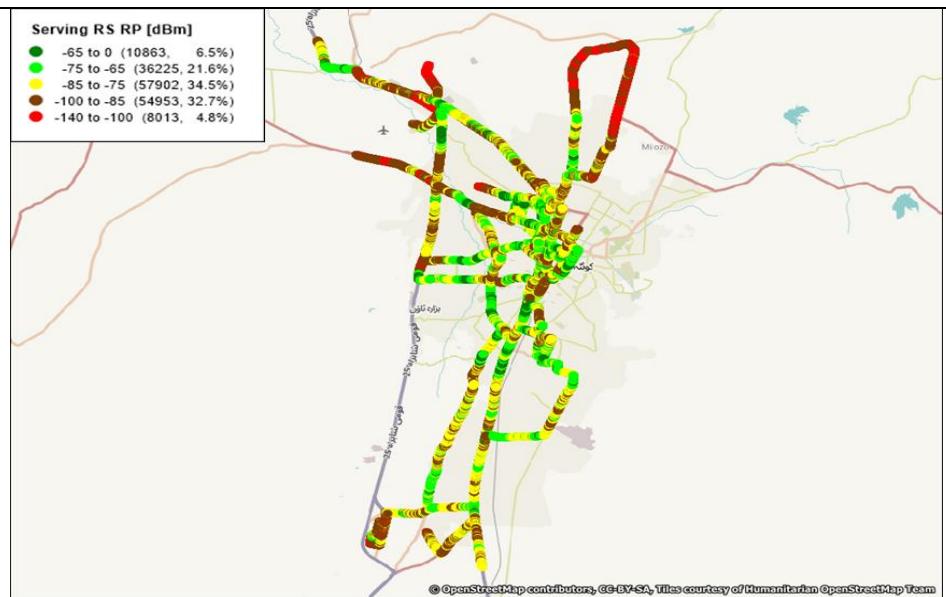


## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

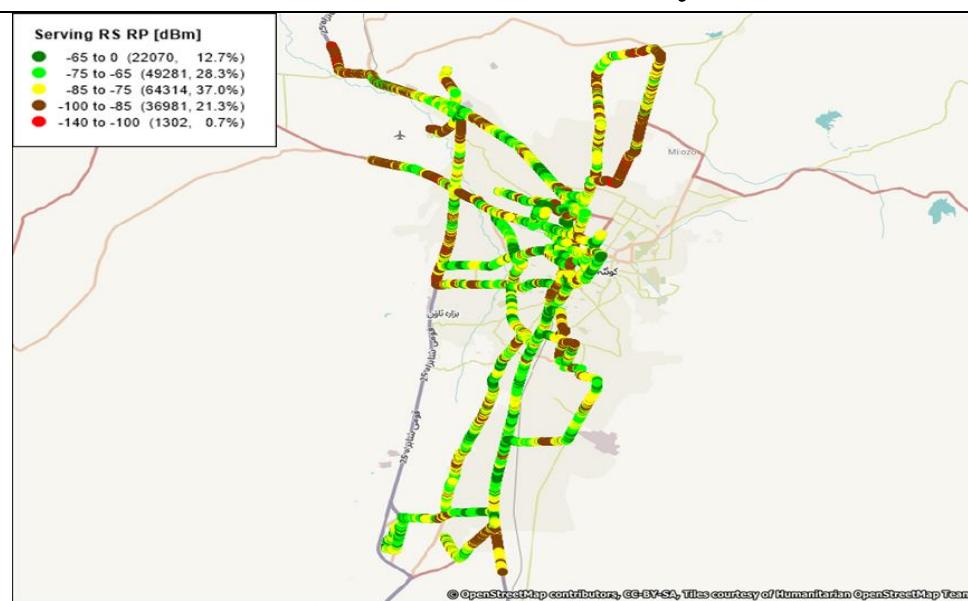
JAZZ 4G NETWORK COVERAGE – QUETTA



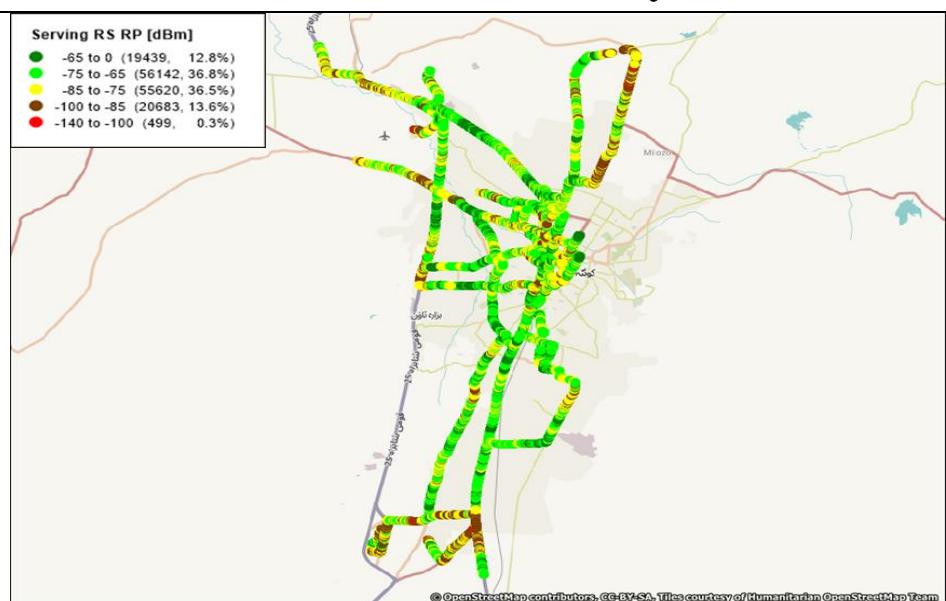
TELENOR 4G NETWORK COVERAGE – QUETTA



UFONE 4G NETWORK COVERAGE – QUETTA

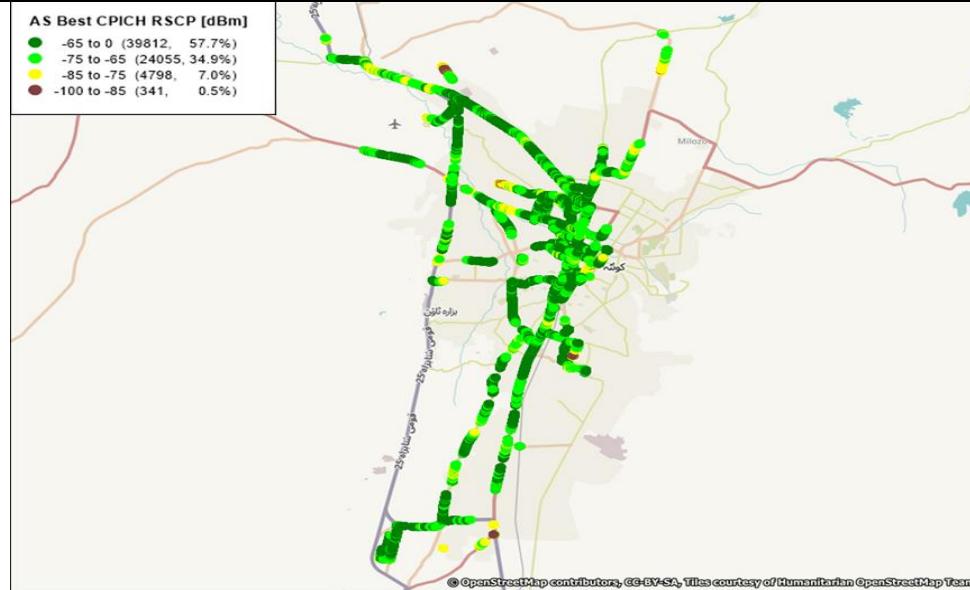


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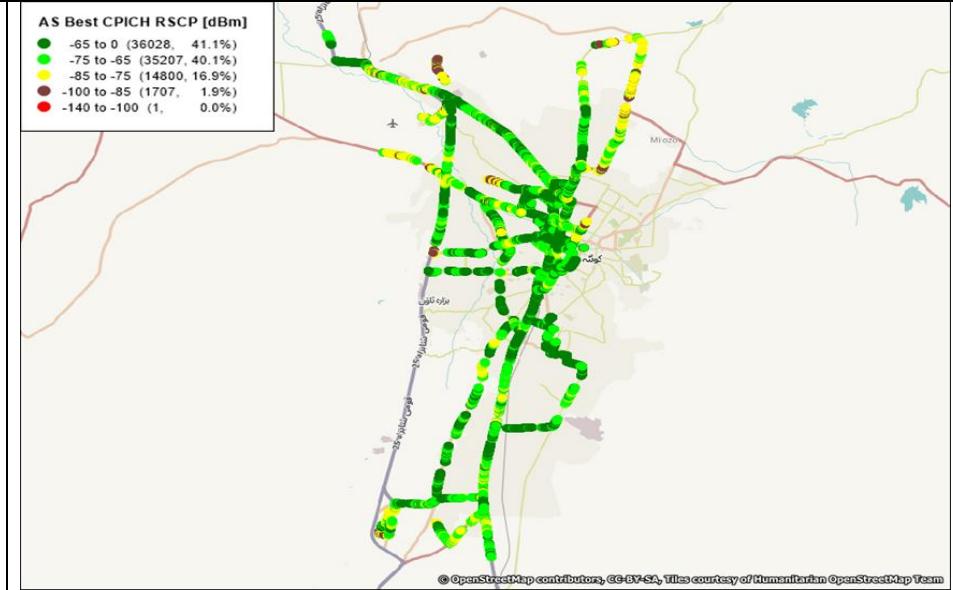


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

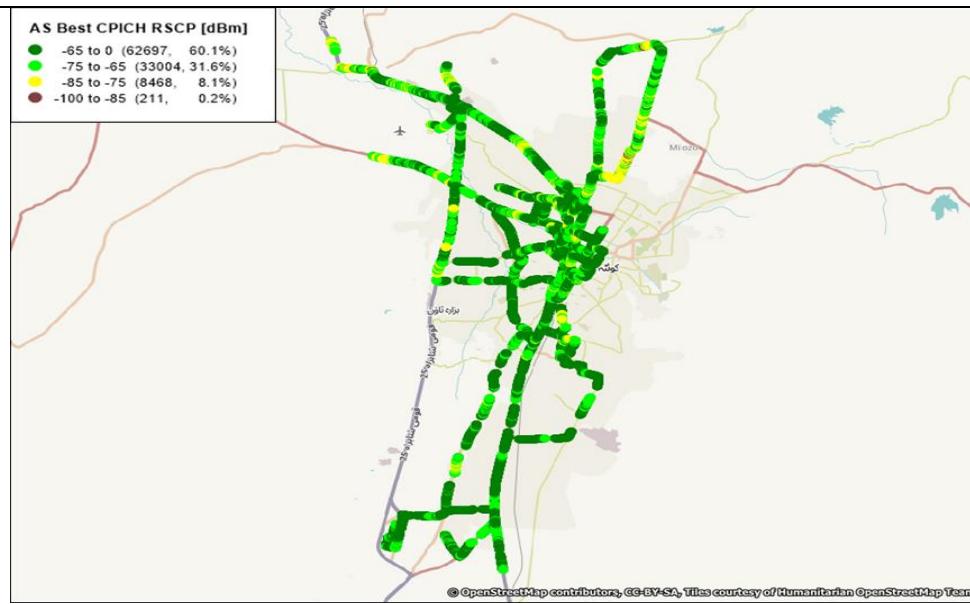
JAZZ 3G NETWORK COVERAGE – QUETTA



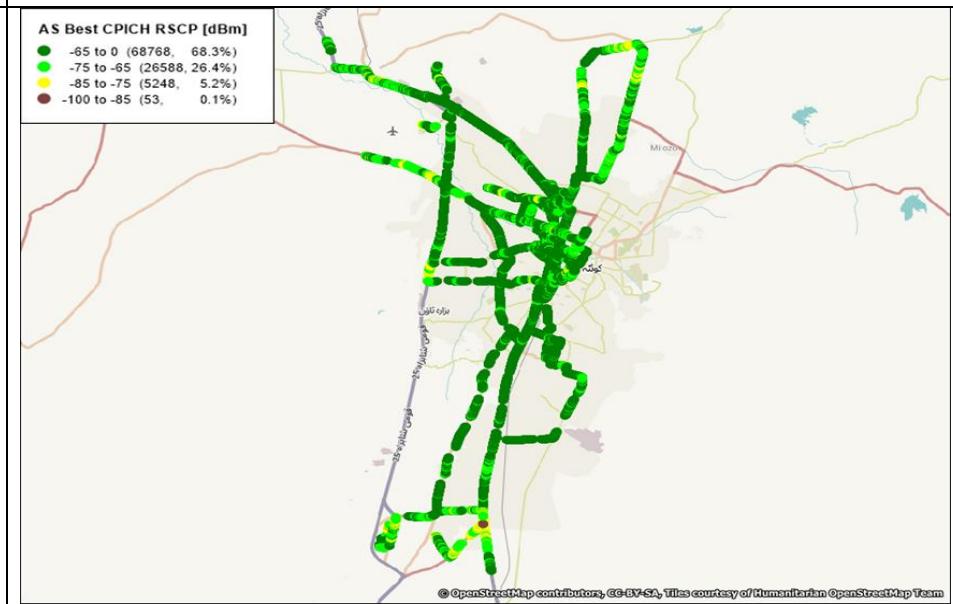
TELENOR 3G NETWORK COVERAGE – QUETTA



UFONE 3G NETWORK COVERAGE – QUETTA

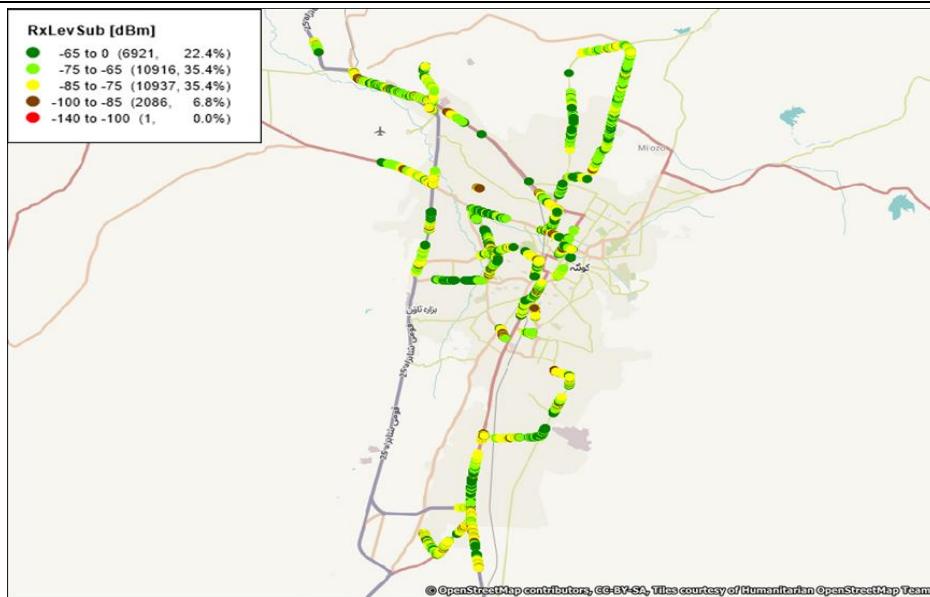


ZONG 3G NETWORK COVERAGE – QUETTA

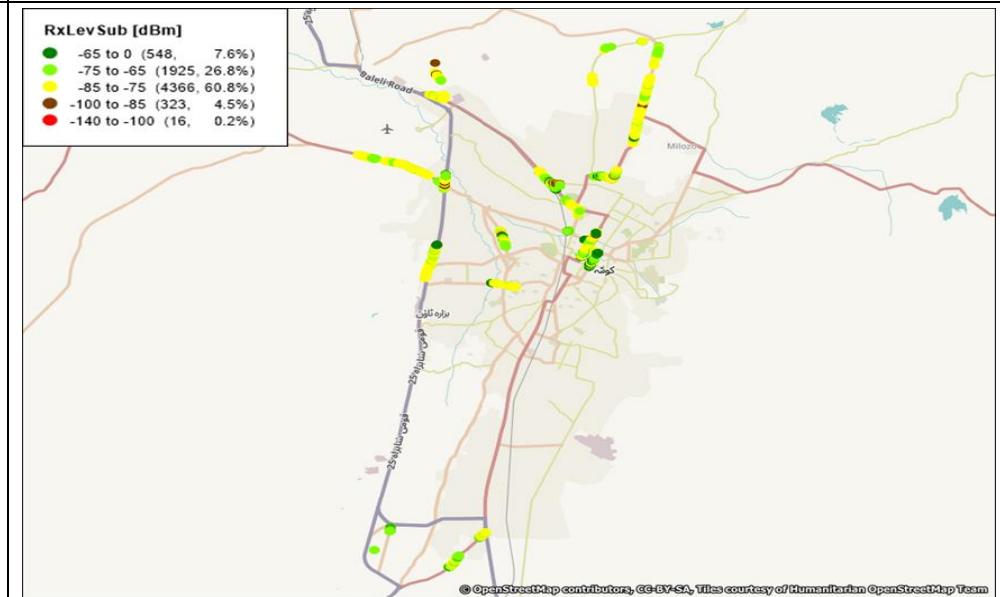


## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

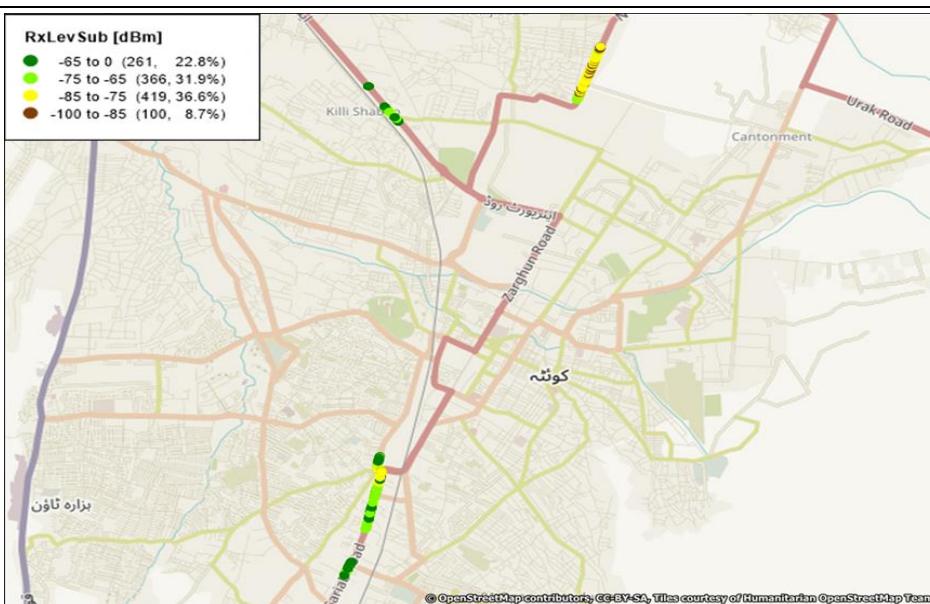
JAZZ 2G NETWORK COVERAGE – QUETTA



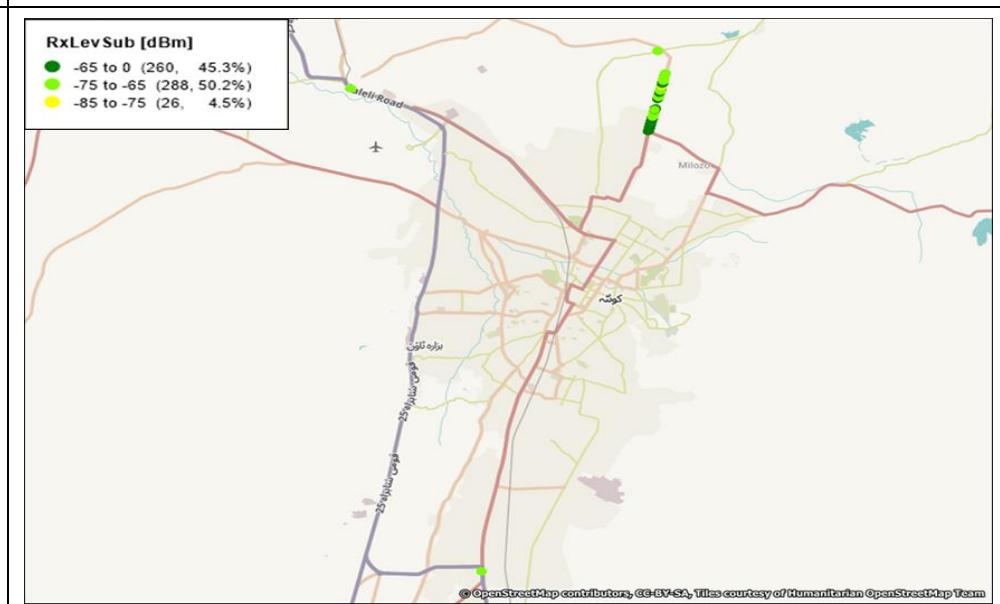
TELENOR 2G NETWORK COVERAGE – QUETTA



UFONE 2G NETWORK COVERAGE – QUETTA



ZONG 2G NETWORK COVERAGE – QUETTA

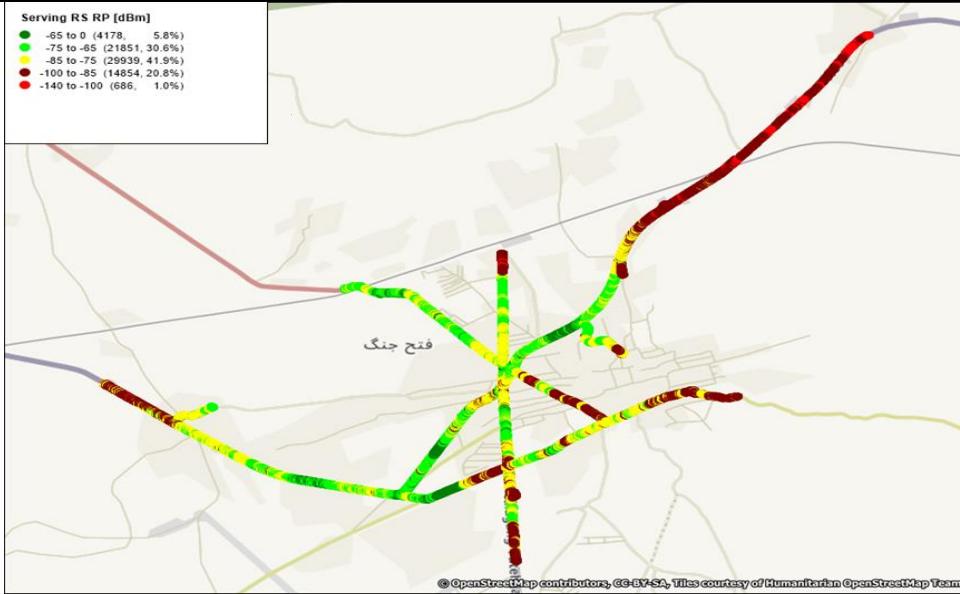


## **ANNEX – B**

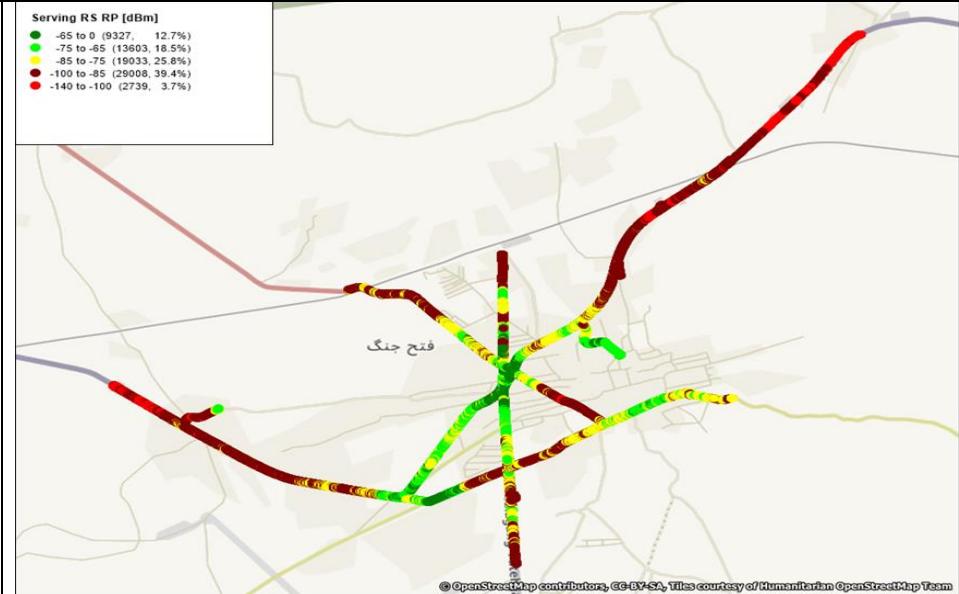
### **TOWNS**

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

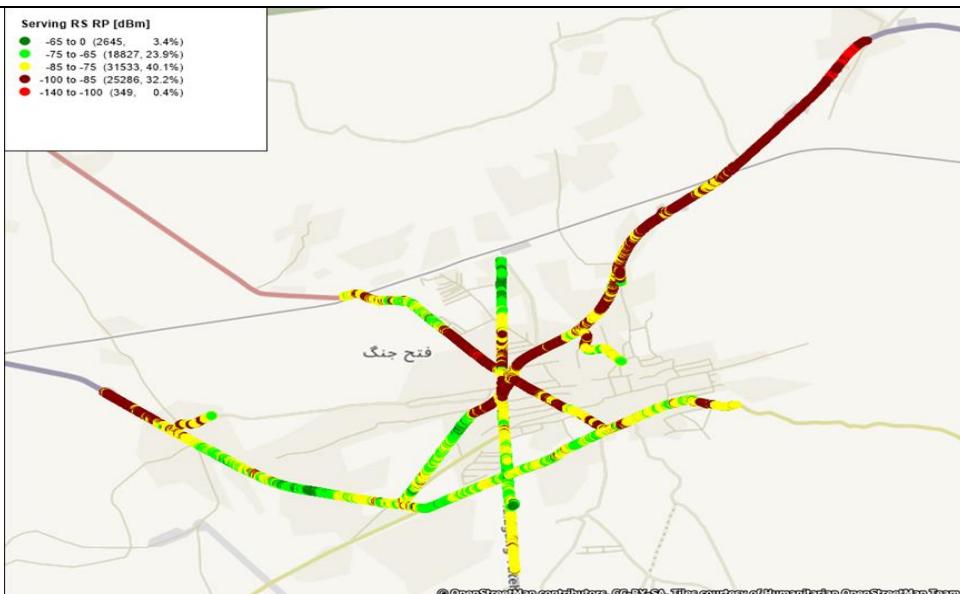
JAZZ 4G NETWORK COVERAGE – FATEH JANG



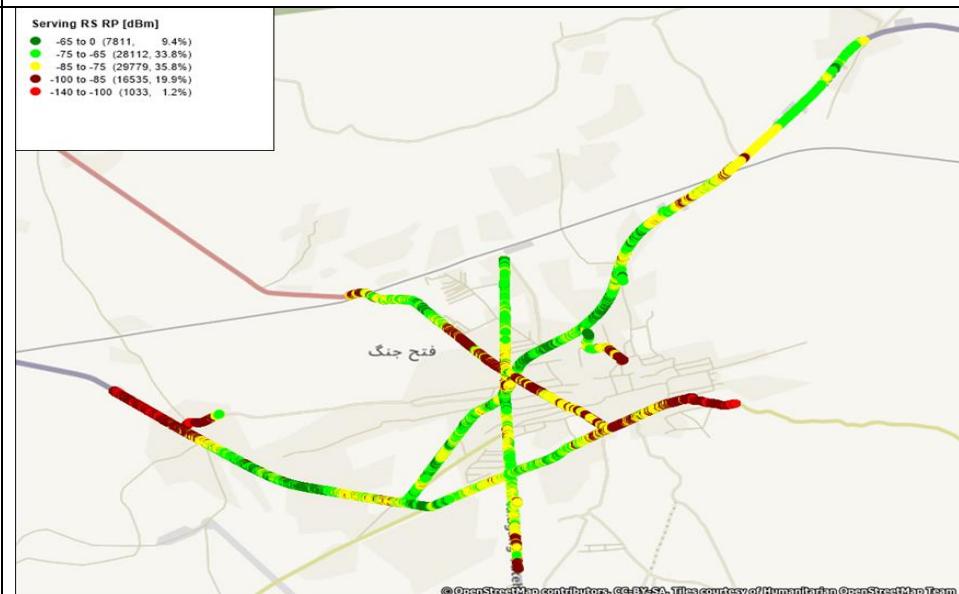
TELENOR 4G NETWORK COVERAGE – FATEH JANG



UFONE 4G NETWORK COVERAGE – FATEH JANG

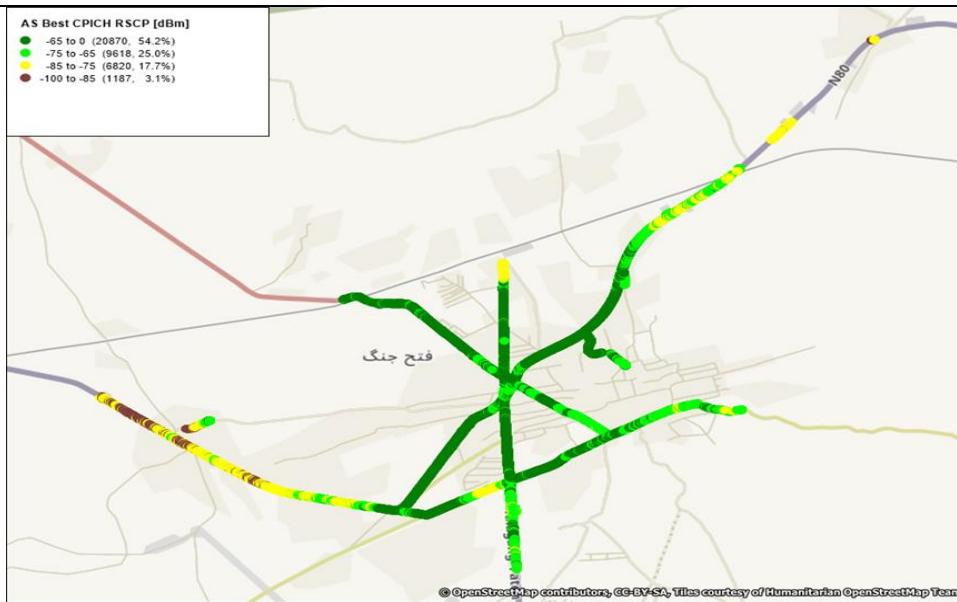


ZONG 4G NETWORK COVERAGE – FATEH JANG

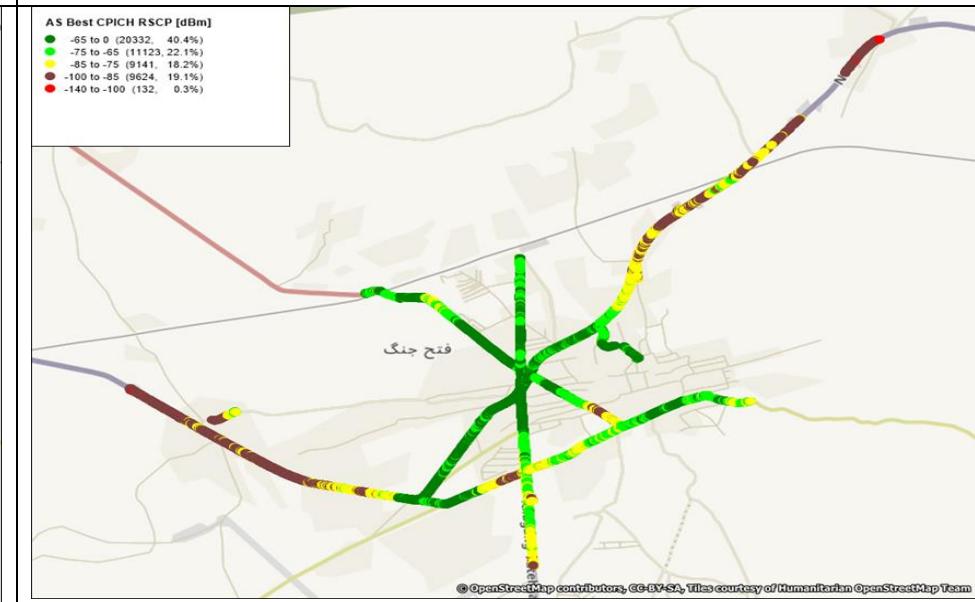


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

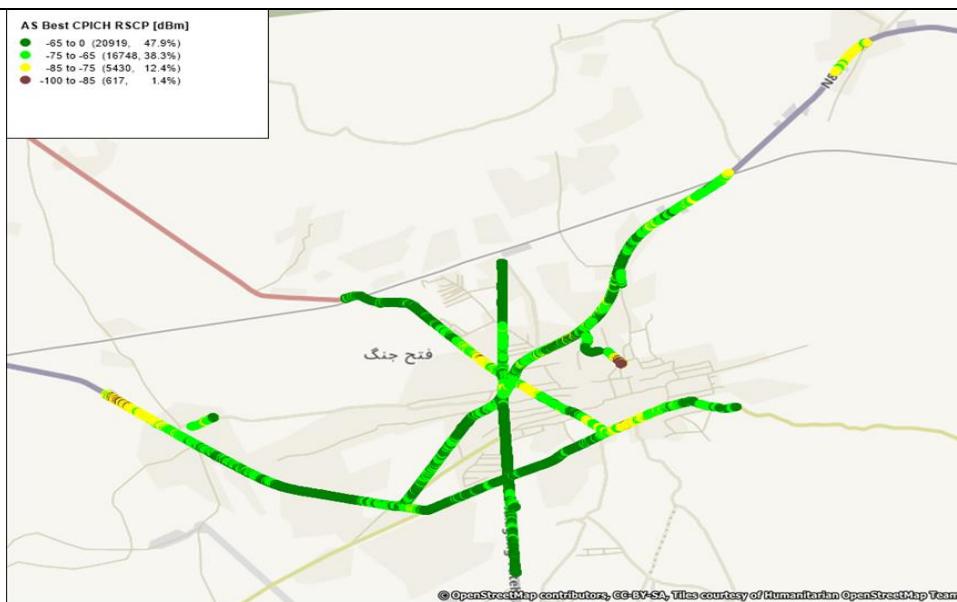
JAZZ 3G NETWORK COVERAGE – FATEH JANG



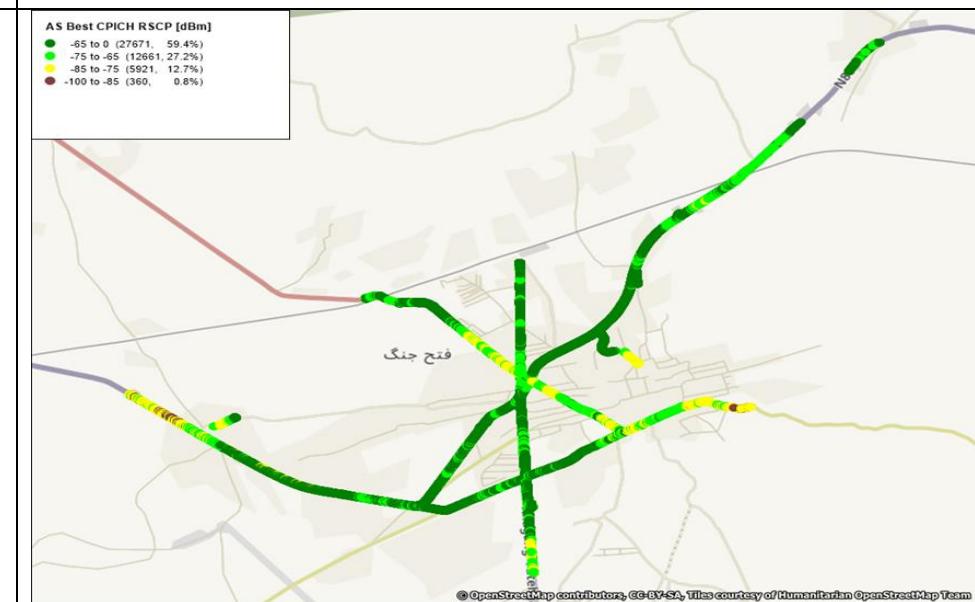
TELENOR 3G NETWORK COVERAGE – FATEH JANG



UFONE 3G NETWORK COVERAGE – FATEH JANG

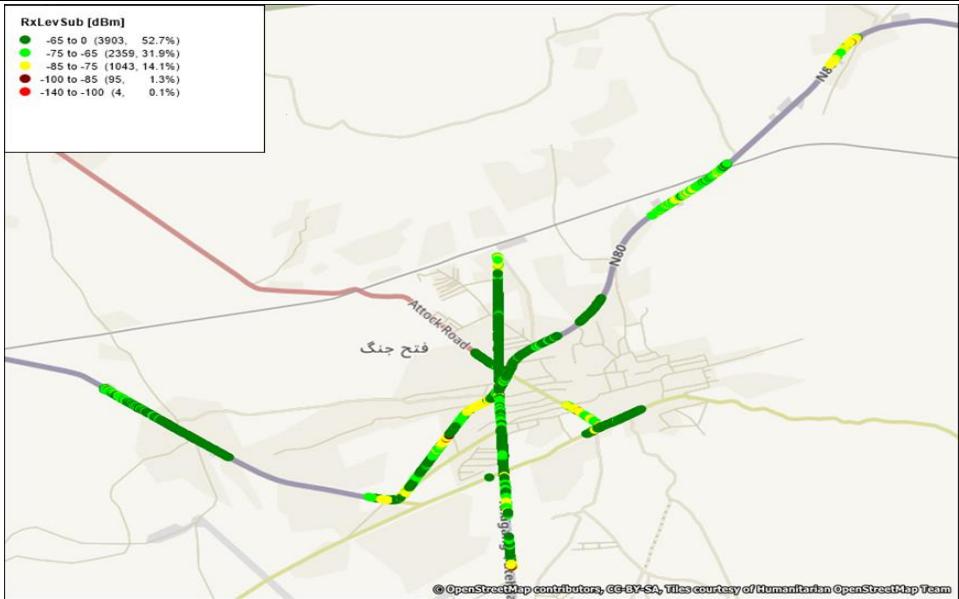


ZONG 3G NETWORK COVERAGE – FATEH JANG



## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

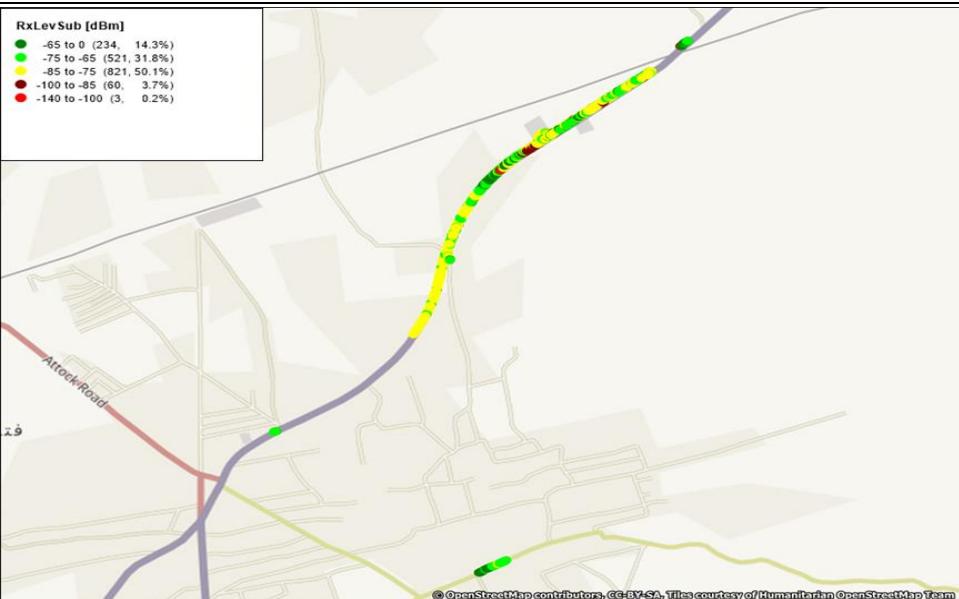
JAZZ 2G NETWORK COVERAGE – FATEH JANG



TELENOR 2G NETWORK COVERAGE – FATEH JANG

NOFallback TO 2G NETWORK

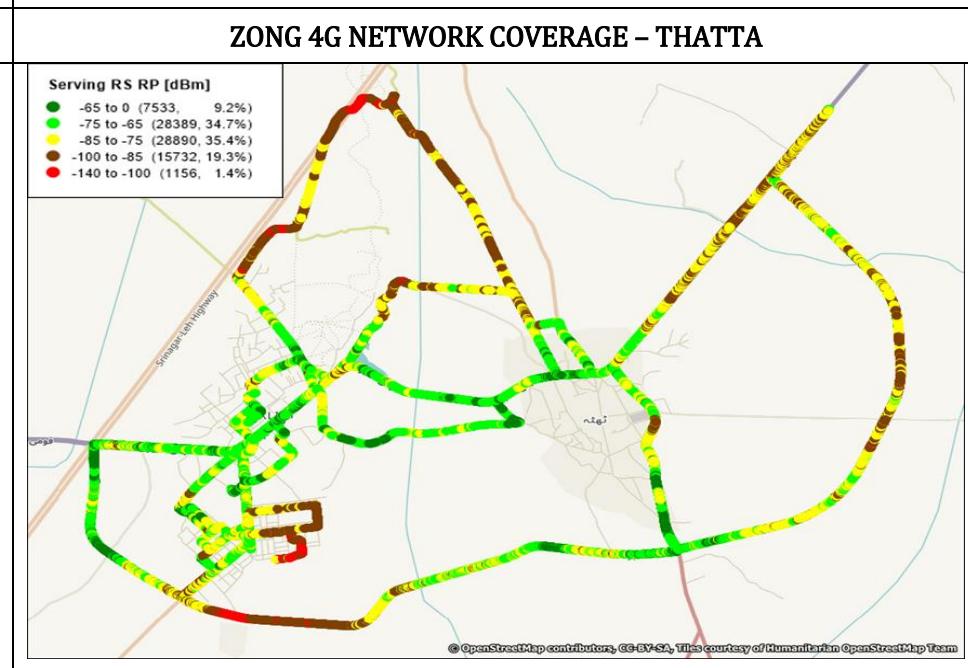
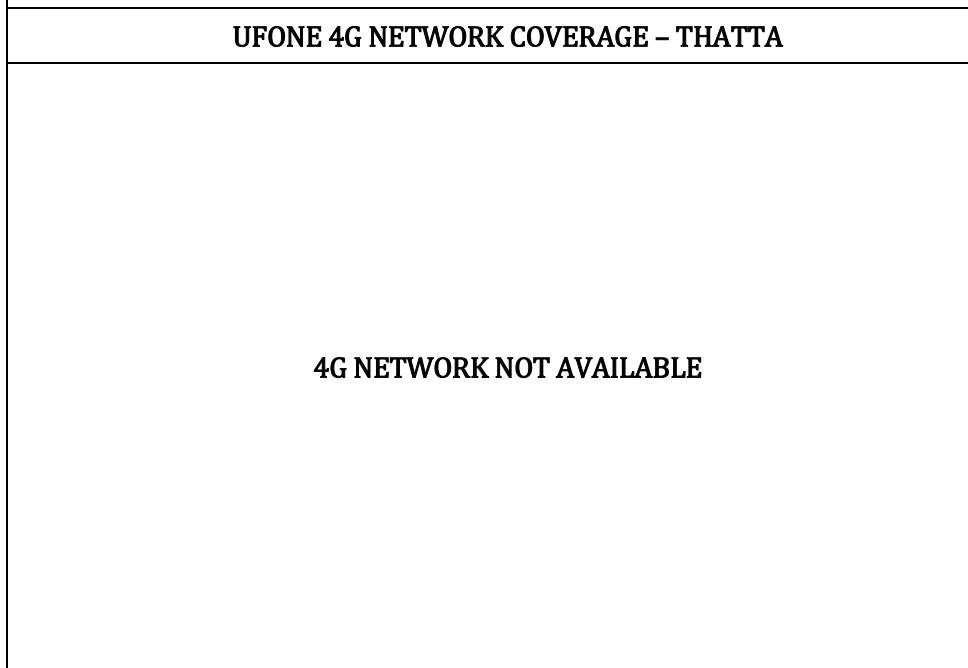
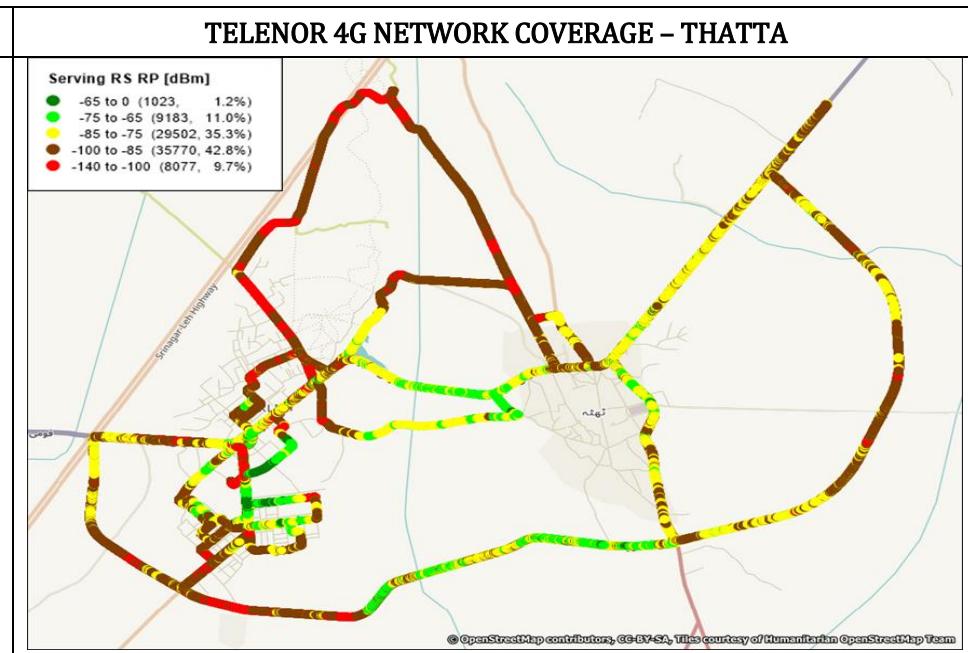
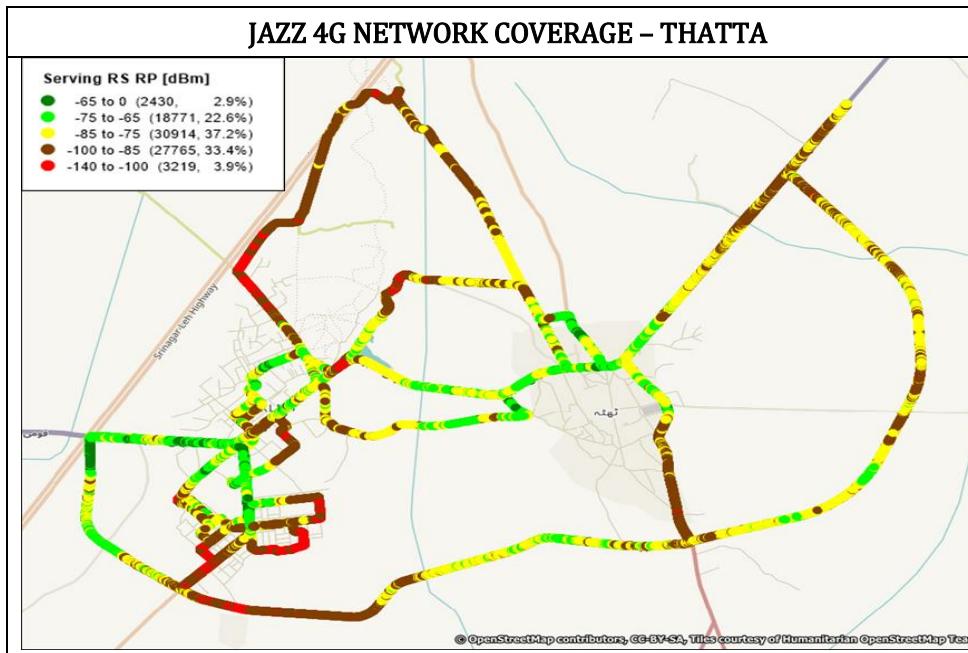
UFONE 2G NETWORK COVERAGE – FATEH JANG



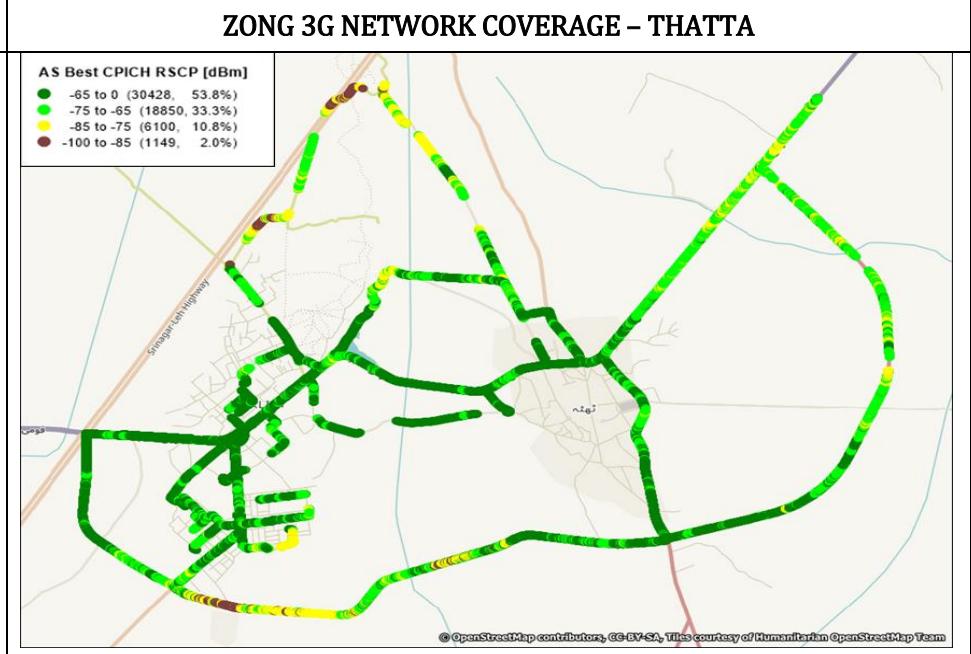
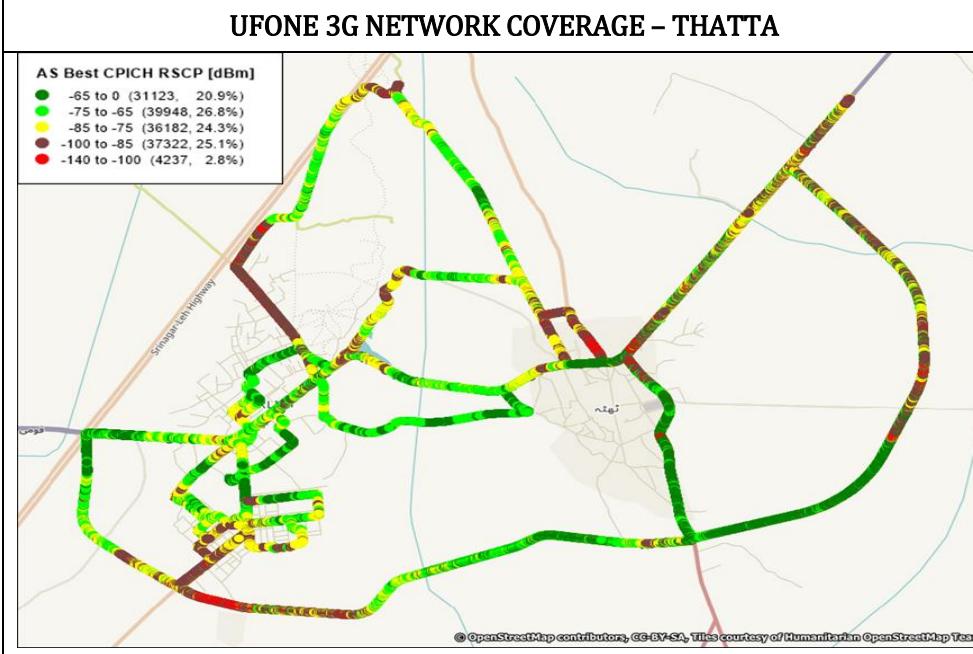
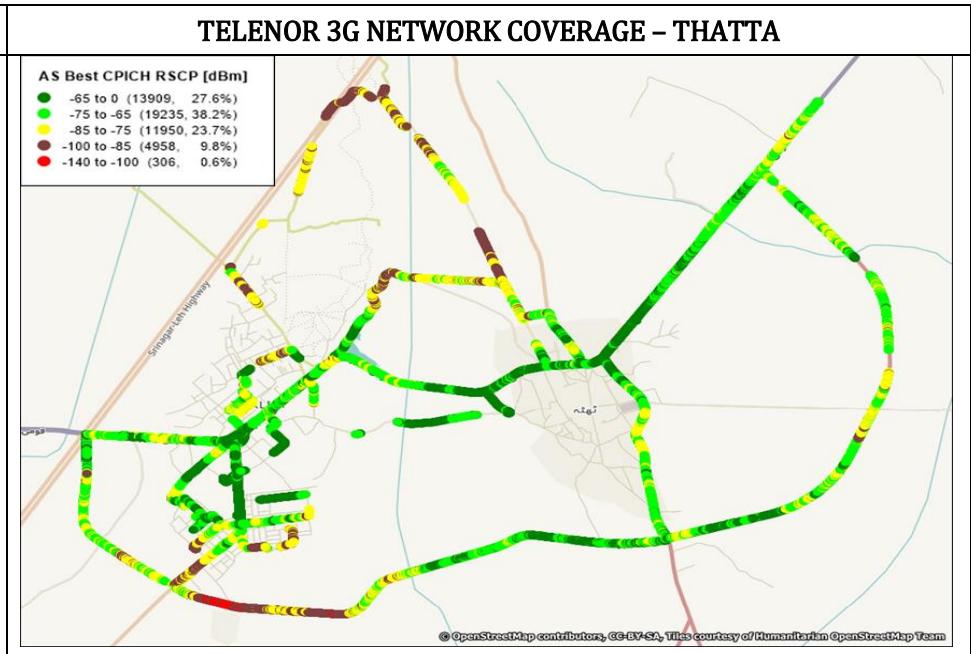
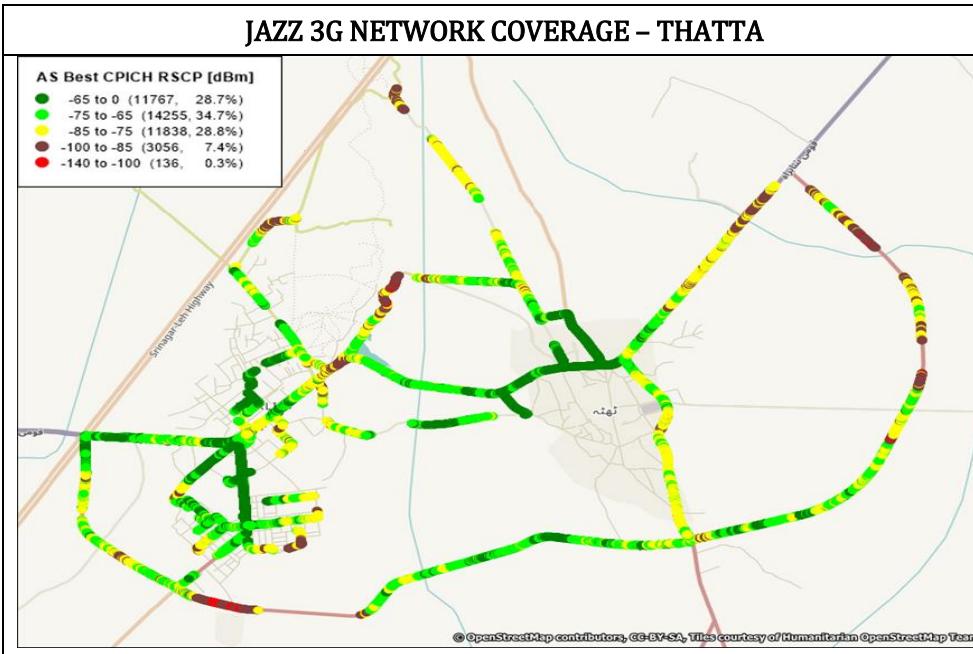
ZONG 2G NETWORK COVERAGE – FATEH JANG

NOFallback TO 2G NETWORK

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

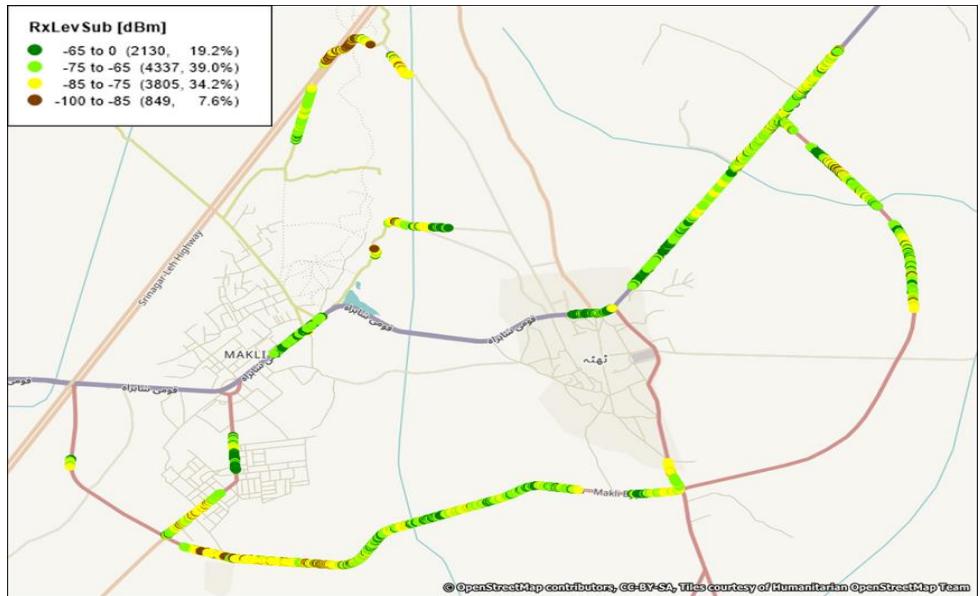


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)



## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

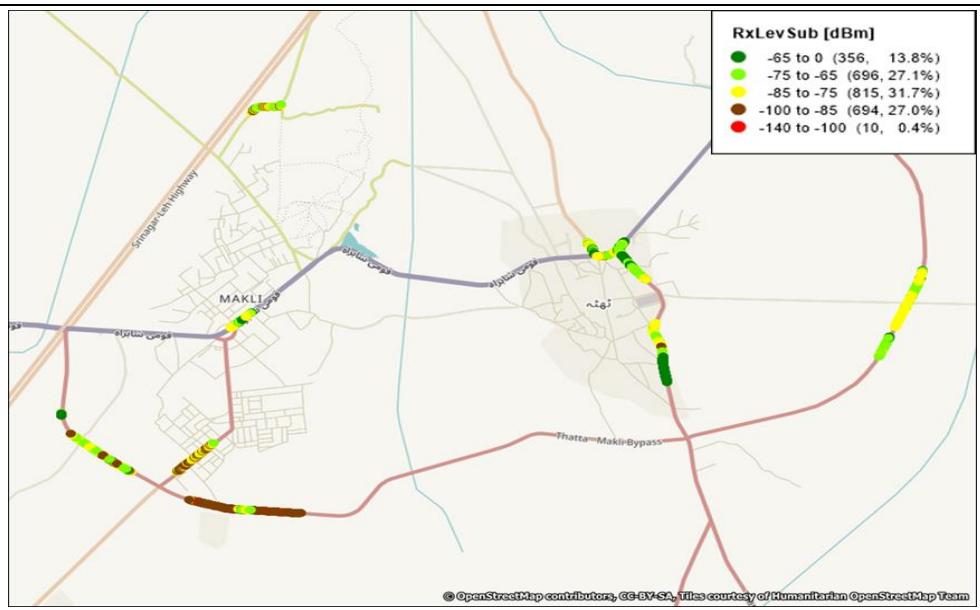
JAZZ 2G NETWORK COVERAGE – THATTA



TELENOR 2G NETWORK COVERAGE – THATTA

NO FALBACK TO 2G NETWORK

UFONE 2G NETWORK COVERAGE – THATTA

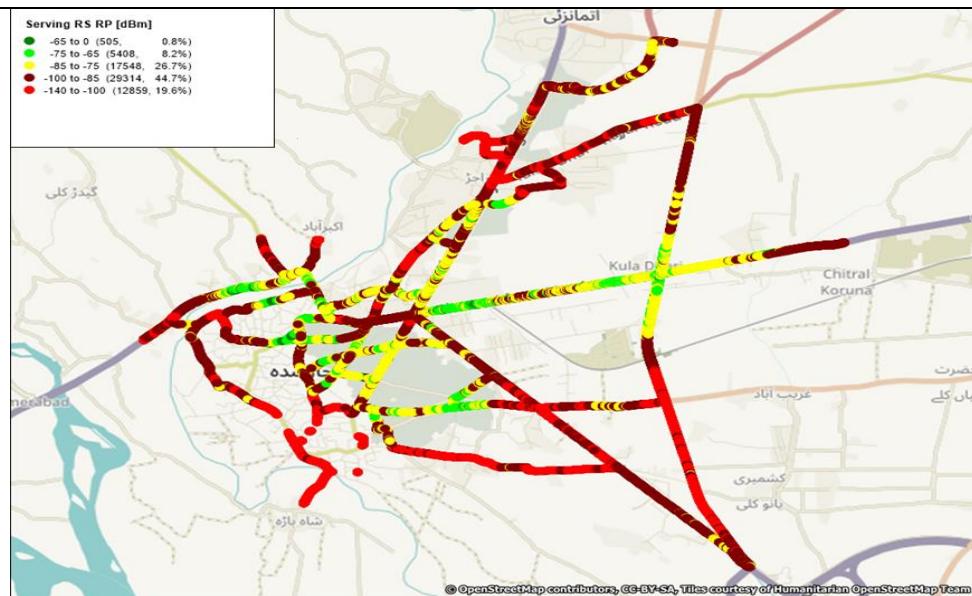


ZONG 2G NETWORK COVERAGE – THATTA

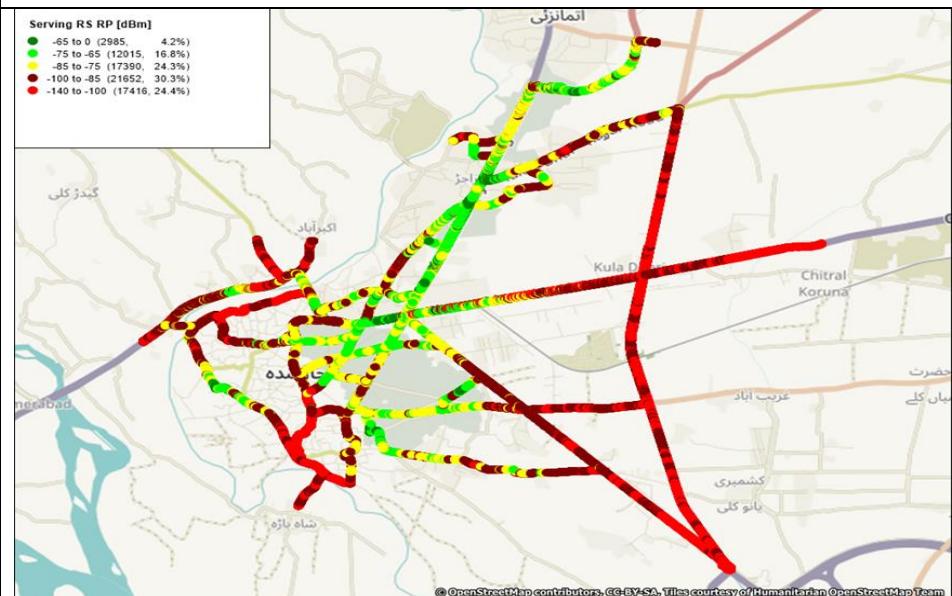
NO FALBACK TO 2G NETWORK

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

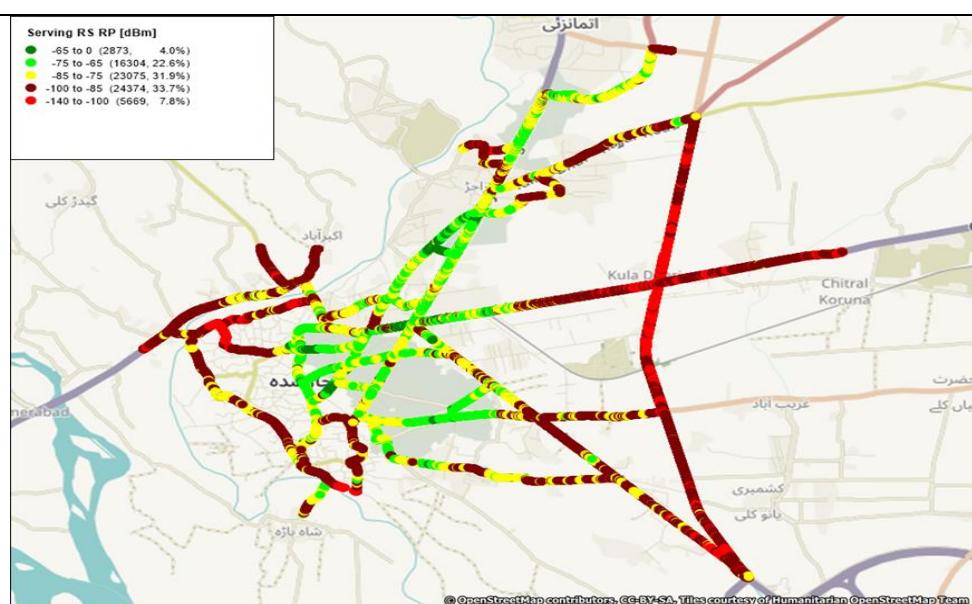
JAZZ 4G NETWORK COVERAGE – CHARSADDA



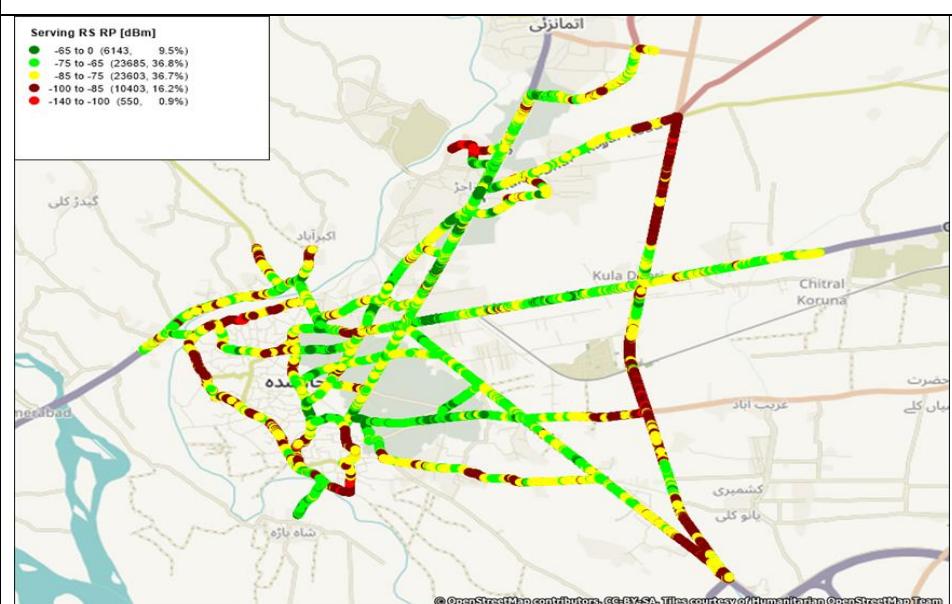
TELENOR 4G NETWORK COVERAGE – CHARSADDA



UFONE 4G NETWORK COVERAGE – CHARSADDA

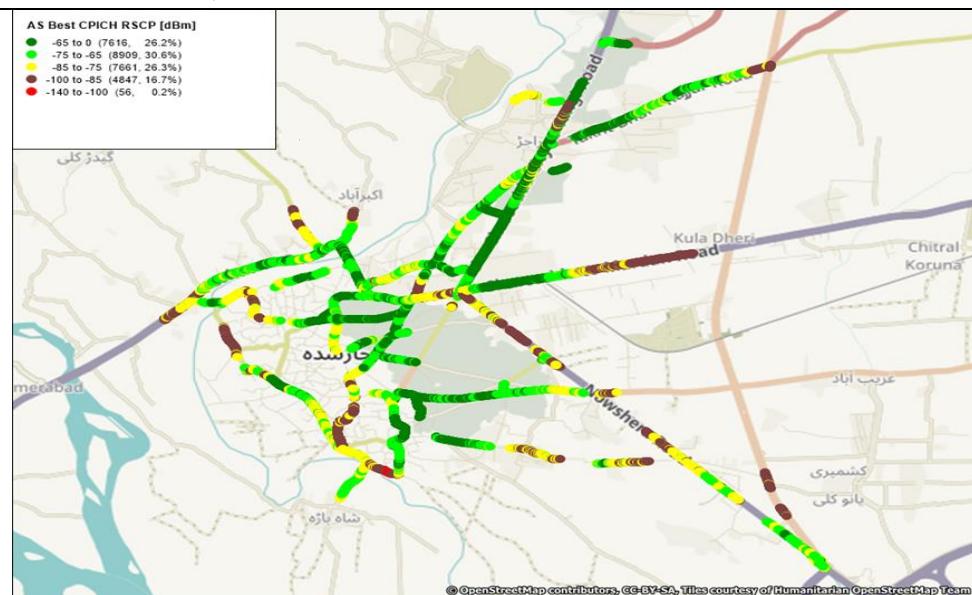


ZONG 4G NETWORK COVERAGE – CHARSADDA

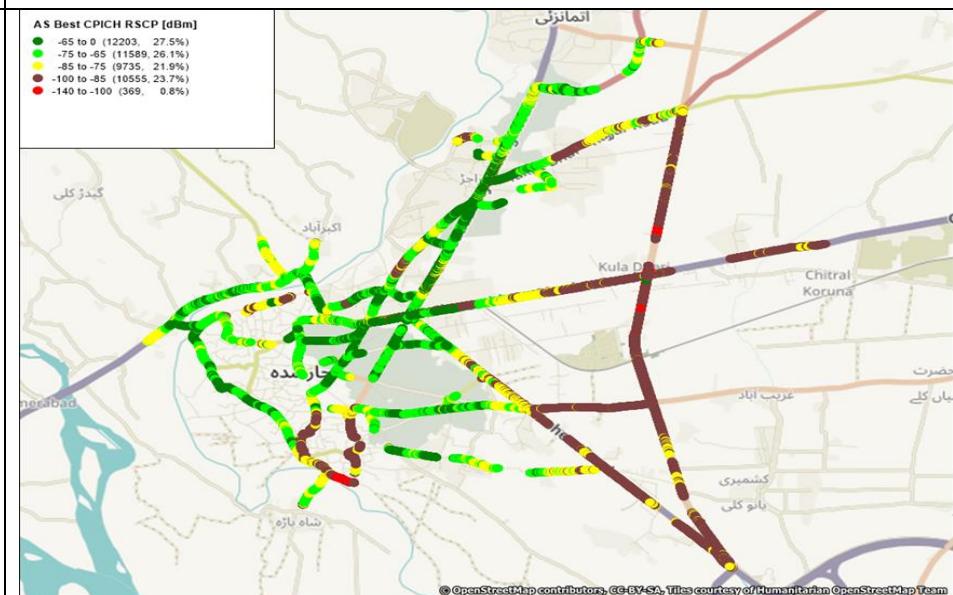


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

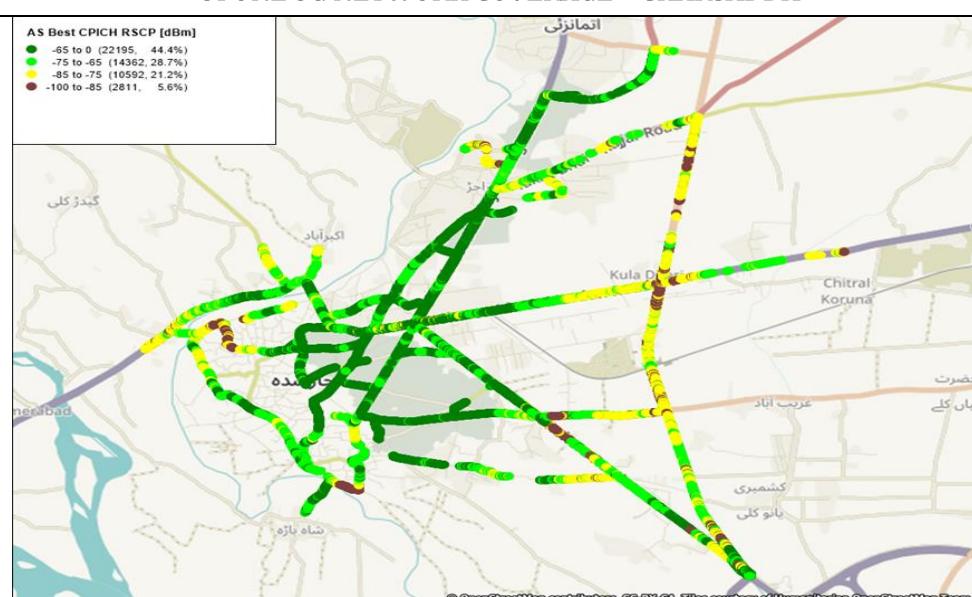
JAZZ 3G NETWORK COVERAGE – CHARSADDA



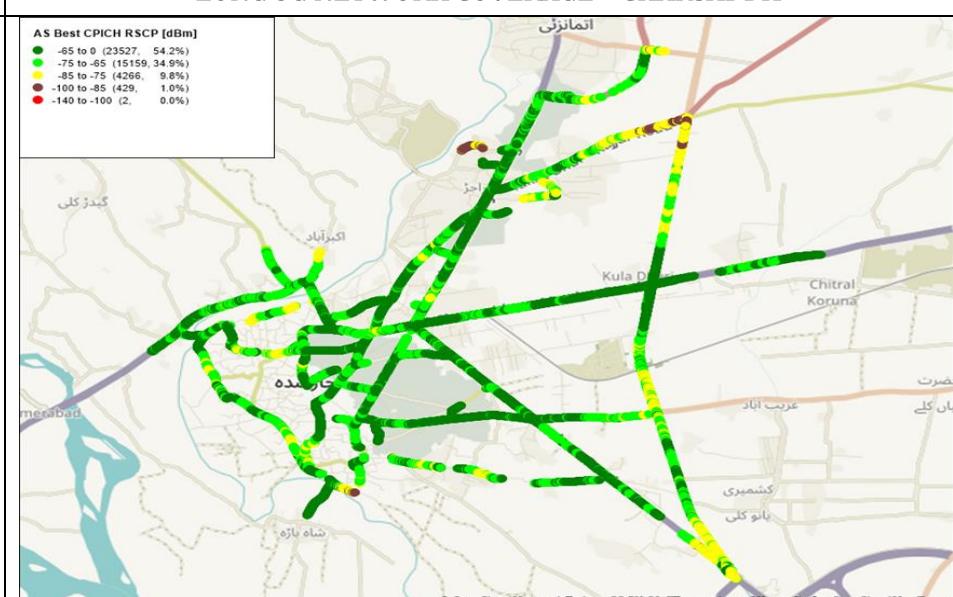
TELENOR 3G NETWORK COVERAGE – CHARSADDA



UFONE 3G NETWORK COVERAGE – CHARSADDA

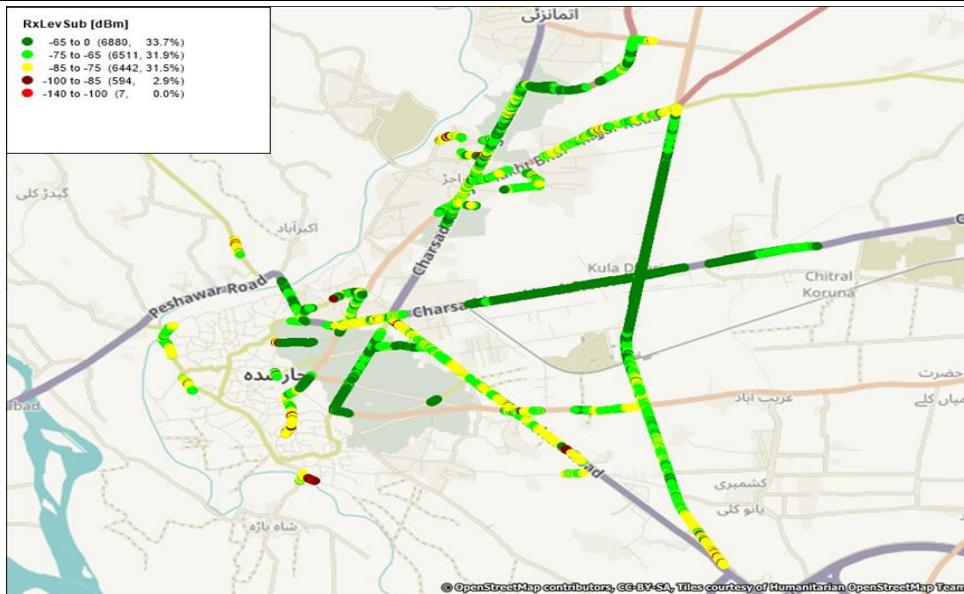


ZONG 3G NETWORK COVERAGE – CHARSADDA

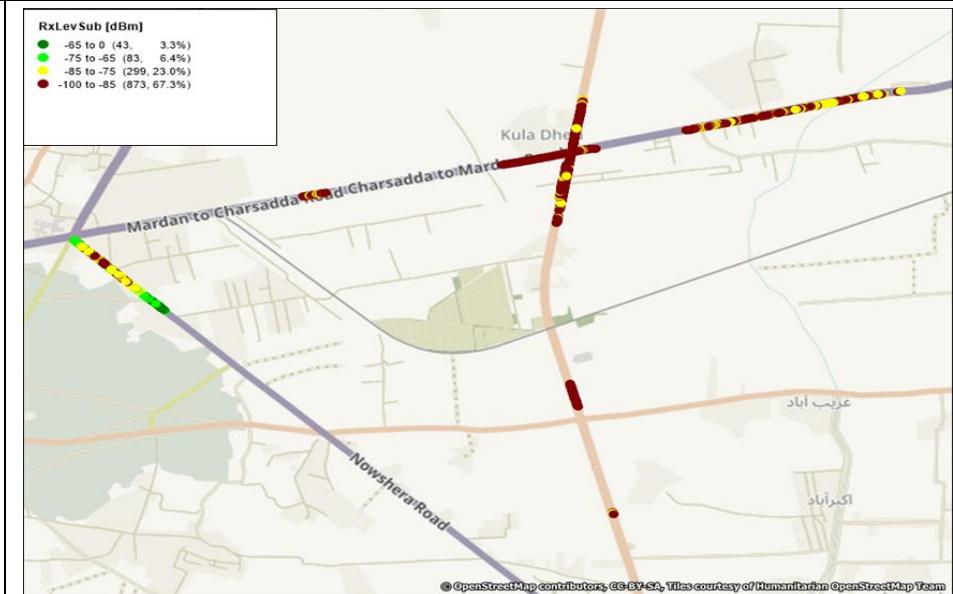


## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

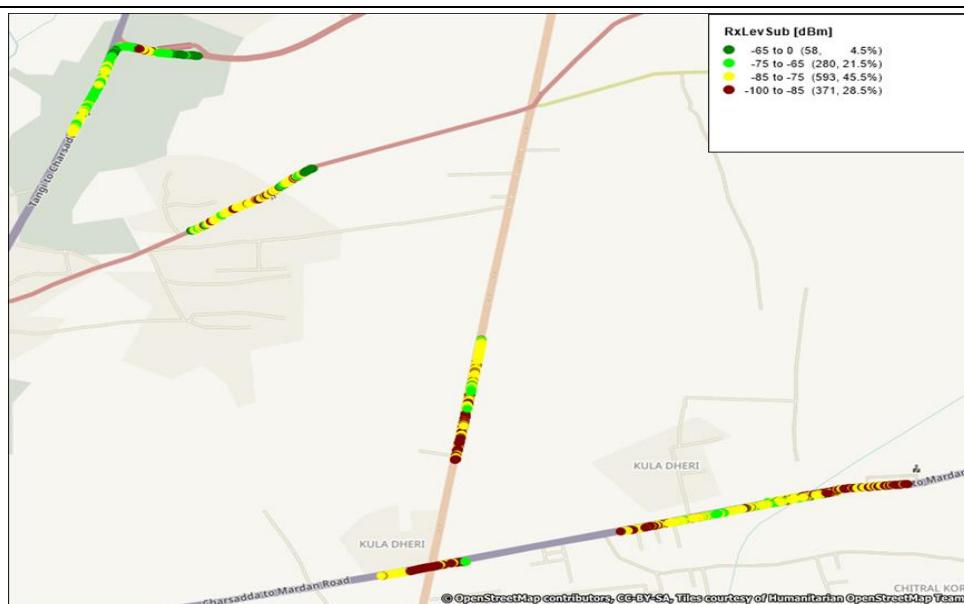
JAZZ 2G NETWORK COVERAGE – CHARSADDA



TELENOR 2G NETWORK COVERAGE – CHARSADDA



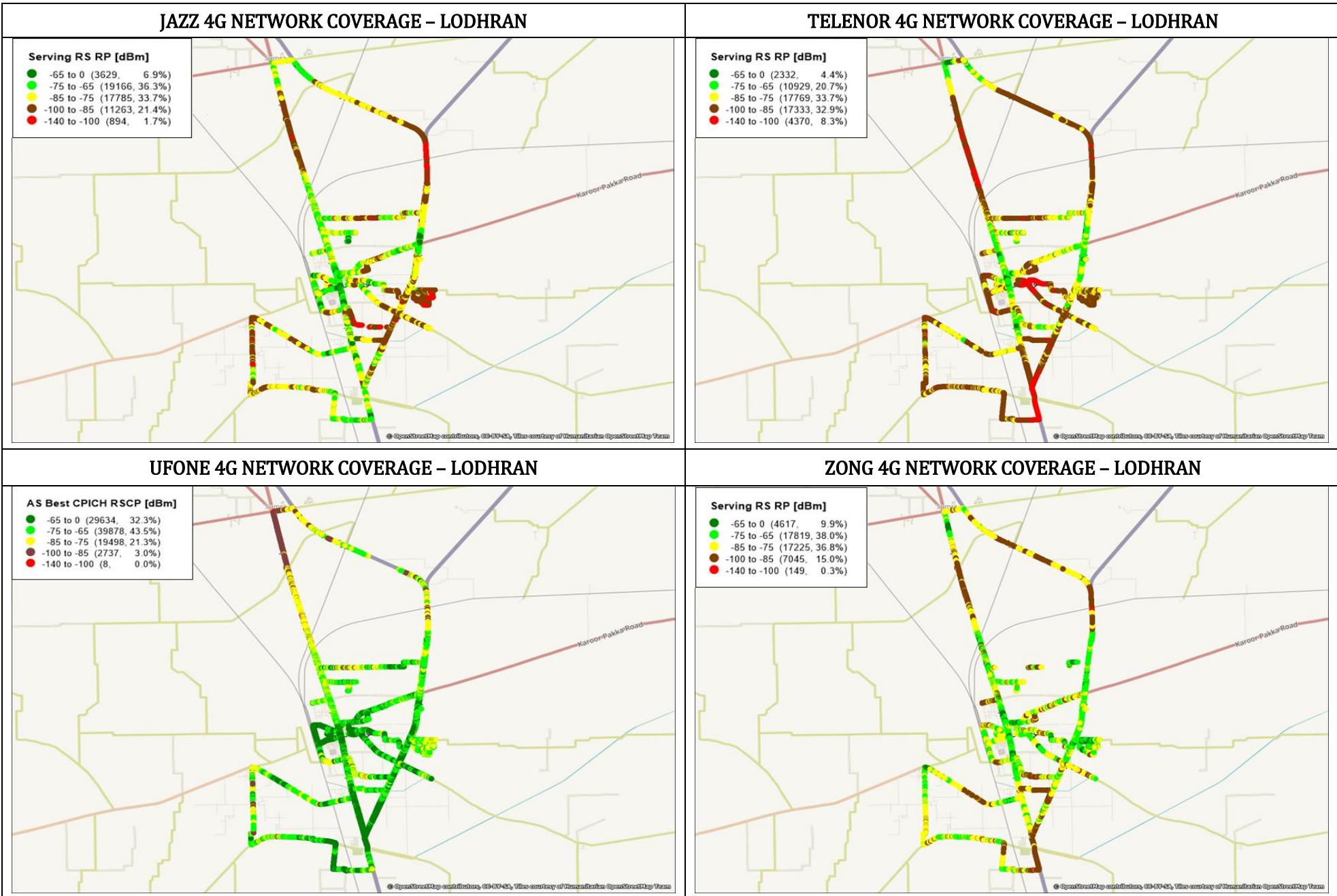
UFONE 2G NETWORK COVERAGE – CHARSADDA



ZONG 2G NETWORK COVERAGE – CHARSADDA

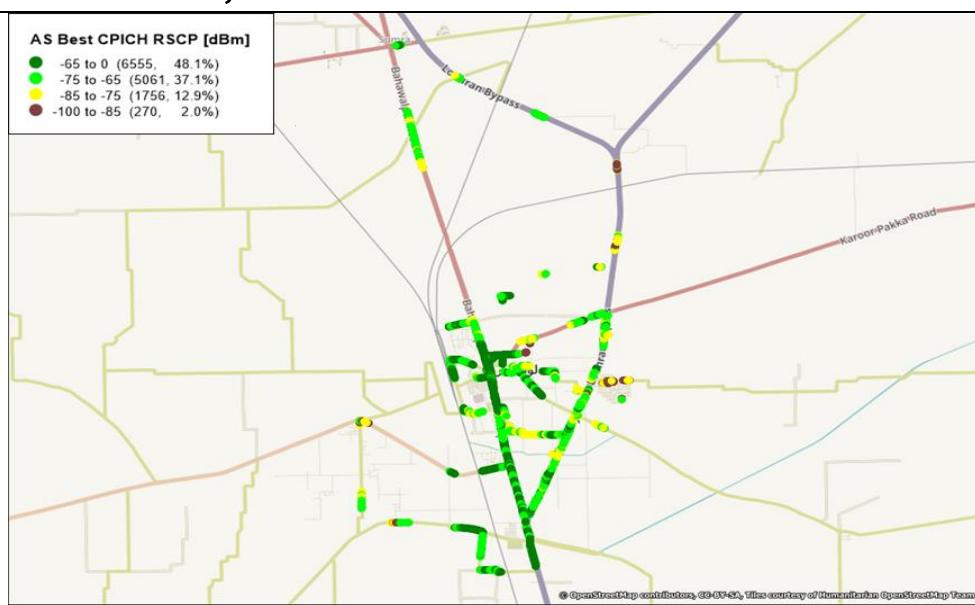


## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

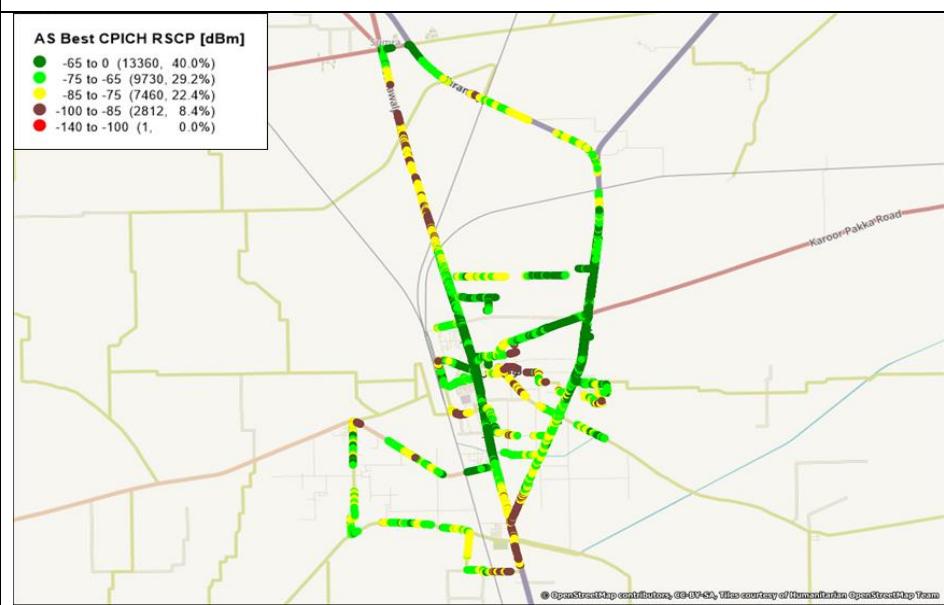


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

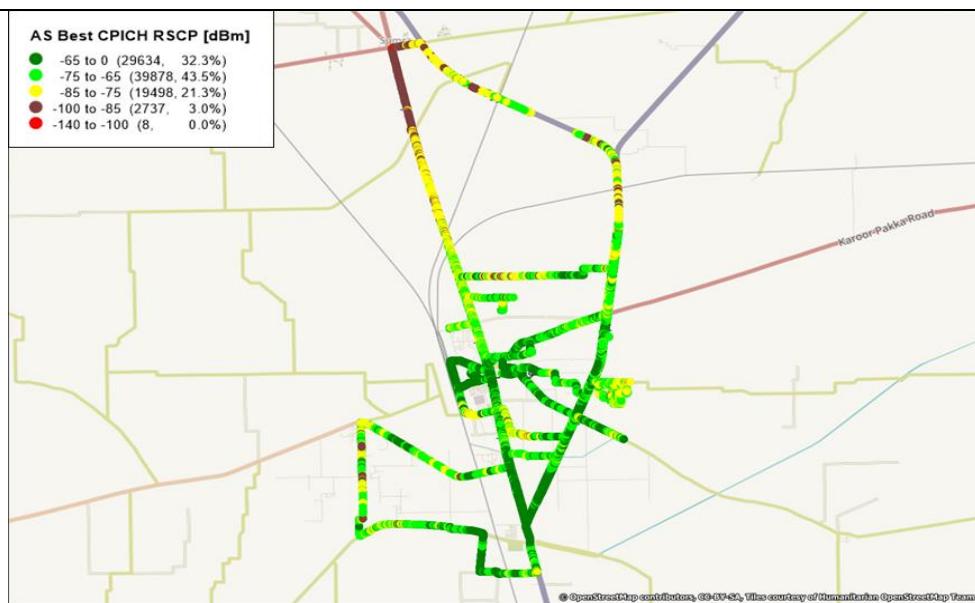
JAZZ 3G NETWORK COVERAGE – LODHRAN



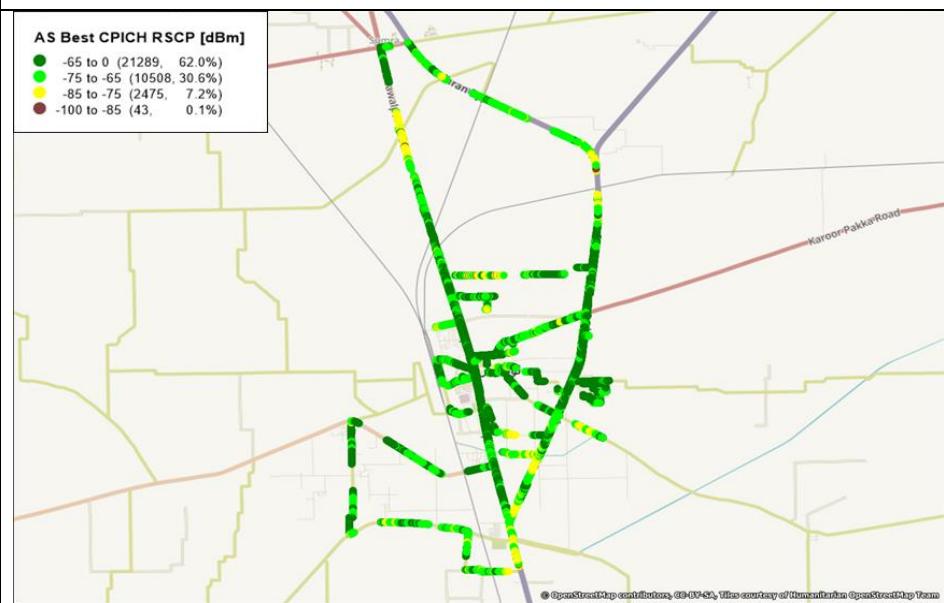
TELENOR 3G NETWORK COVERAGE – LODHRAN



UFONE 3G NETWORK COVERAGE – LODHRAN

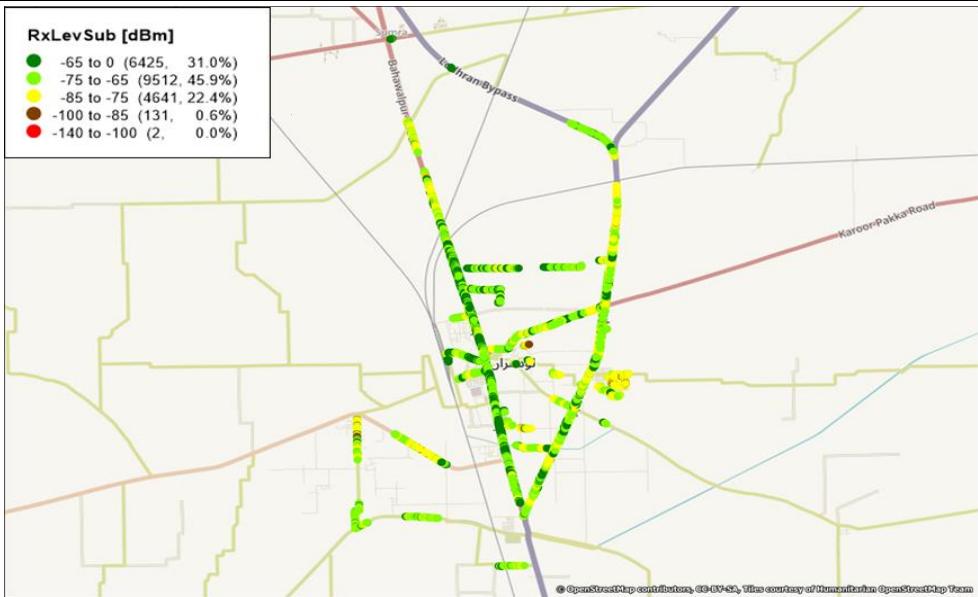


ZONG 3G NETWORK COVERAGE – LODHRAN



## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

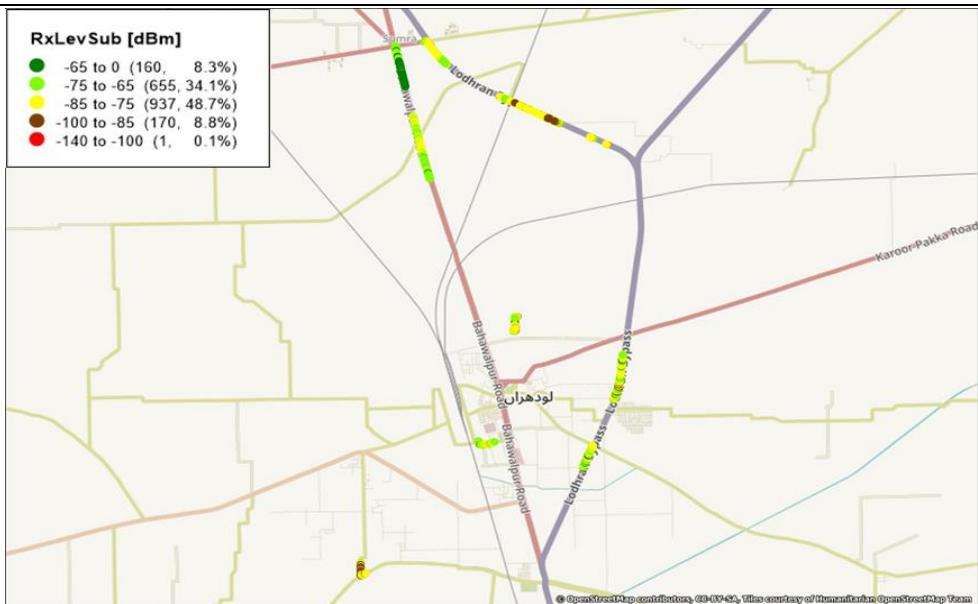
JAZZ 2G NETWORK COVERAGE – LODHRAN



TELENOR 2G NETWORK COVERAGE – LODHRAN

NOFallback TO 2G NETWORK

UFONE 2G NETWORK COVERAGE – LODHRAN



ZONG 2G NETWORK COVERAGE – LODHRAN

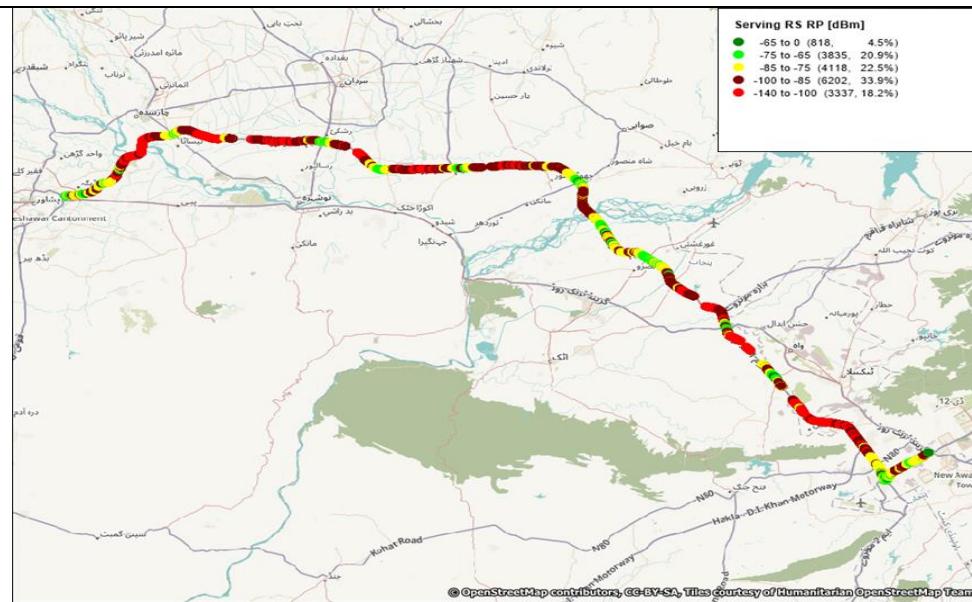
NOFallback TO 2G NETWORK

## **ANNEX – C**

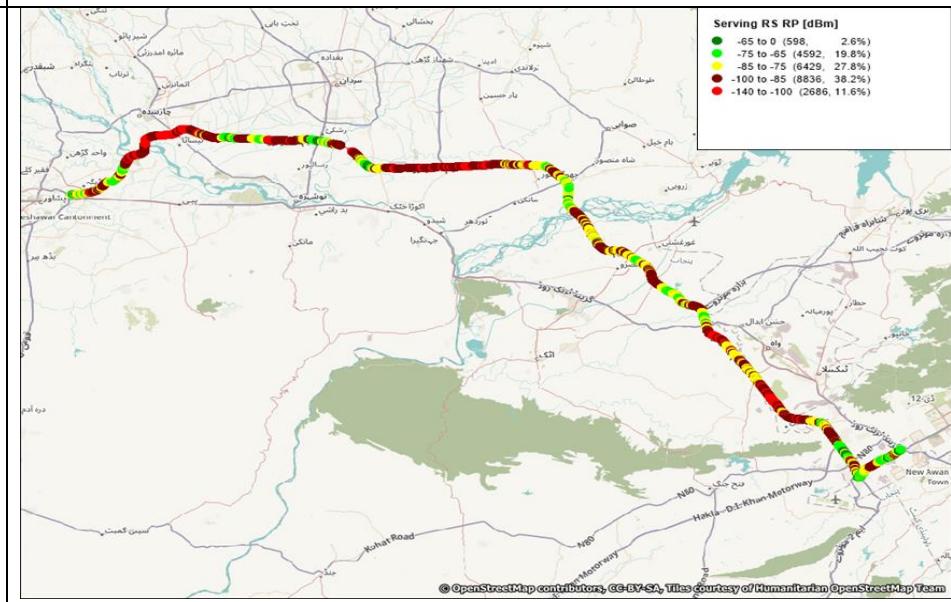
# **MOTORWAYS / HIGHWAYS**

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

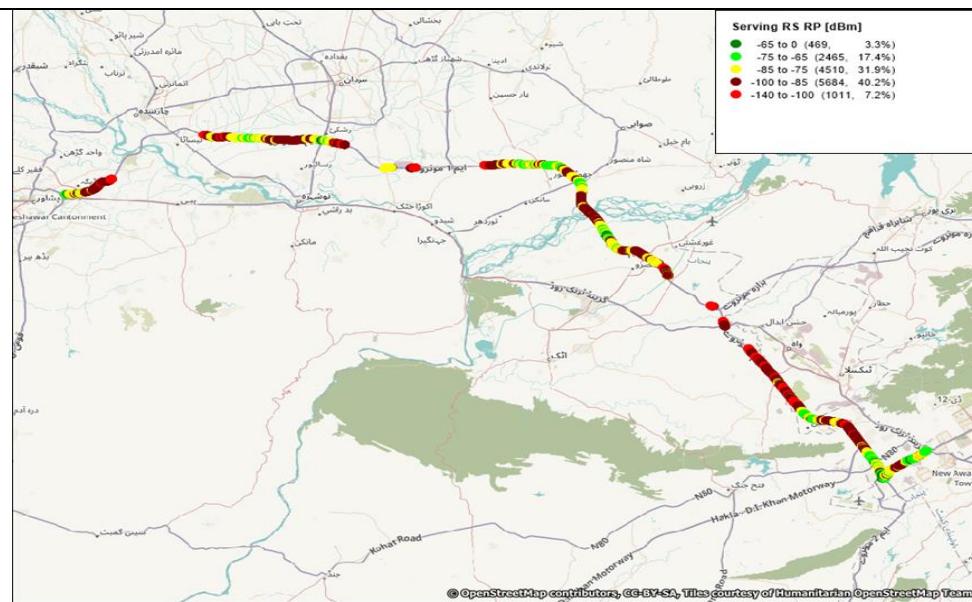
JAZZ 4G NETWORK COVERAGE – M1 MOTORWAY



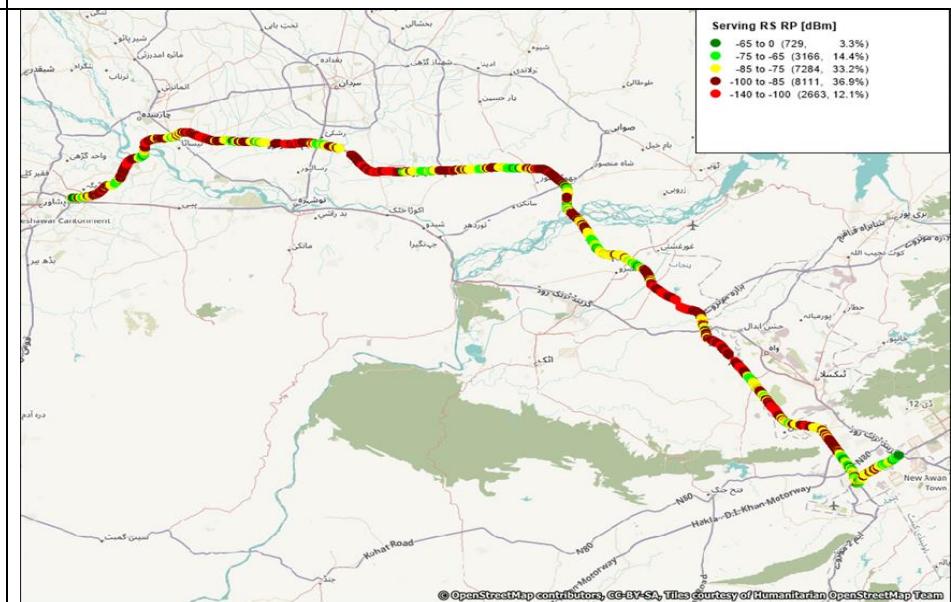
TELENO 4G NETWORK COVERAGE – M1 MOTORWAY



UFONE 4G NETWORK COVERAGE – M1 MOTORWAY

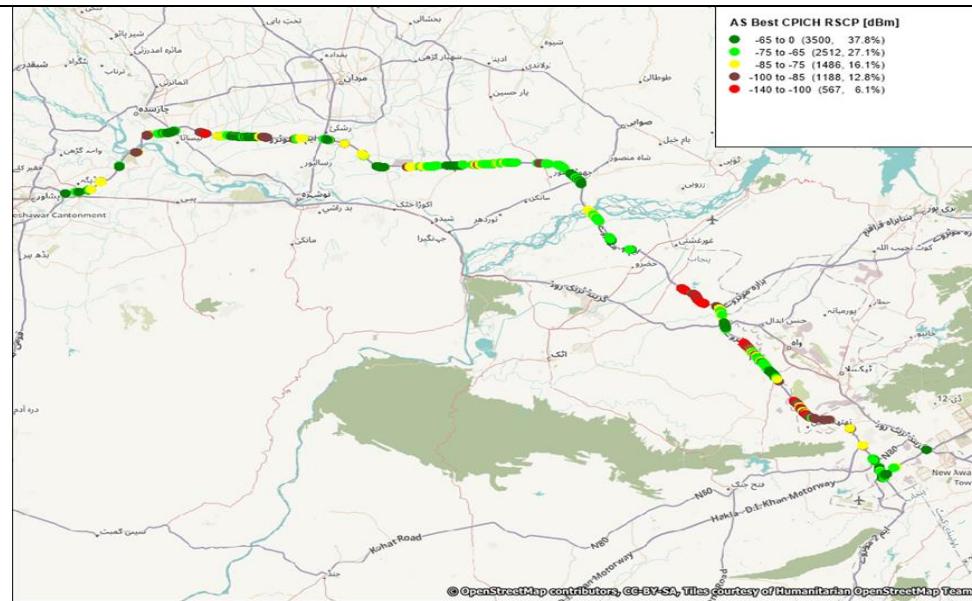


ZONG 4G NETWORK COVERAGE – M1 MOTORWAY

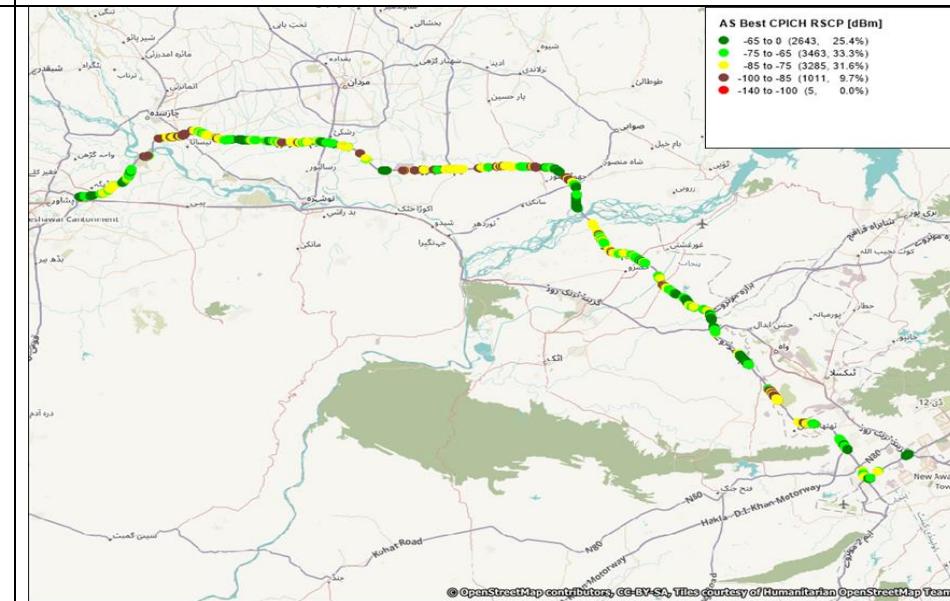


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

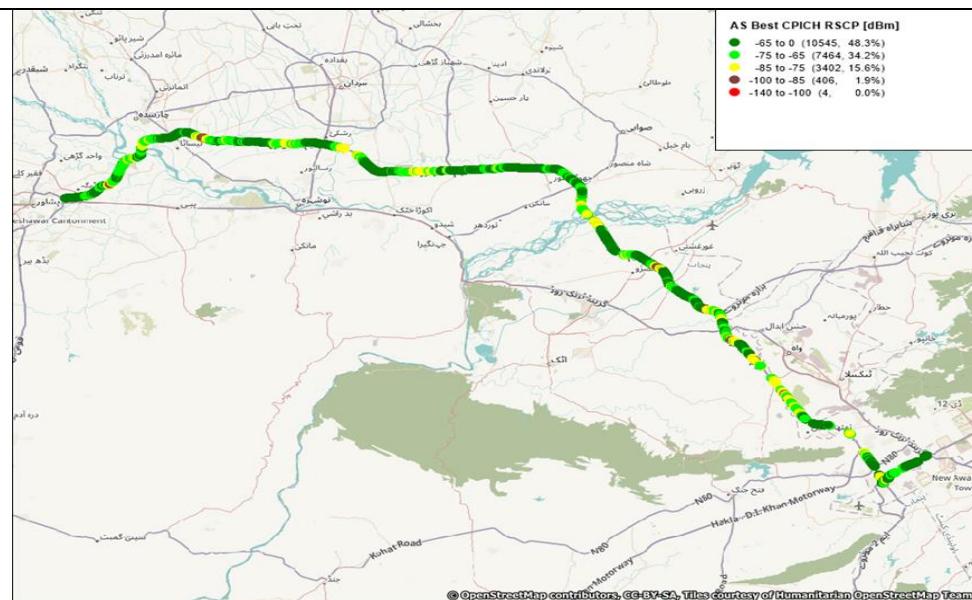
JAZZ 3G NETWORK COVERAGE – M1 MOTORWAY



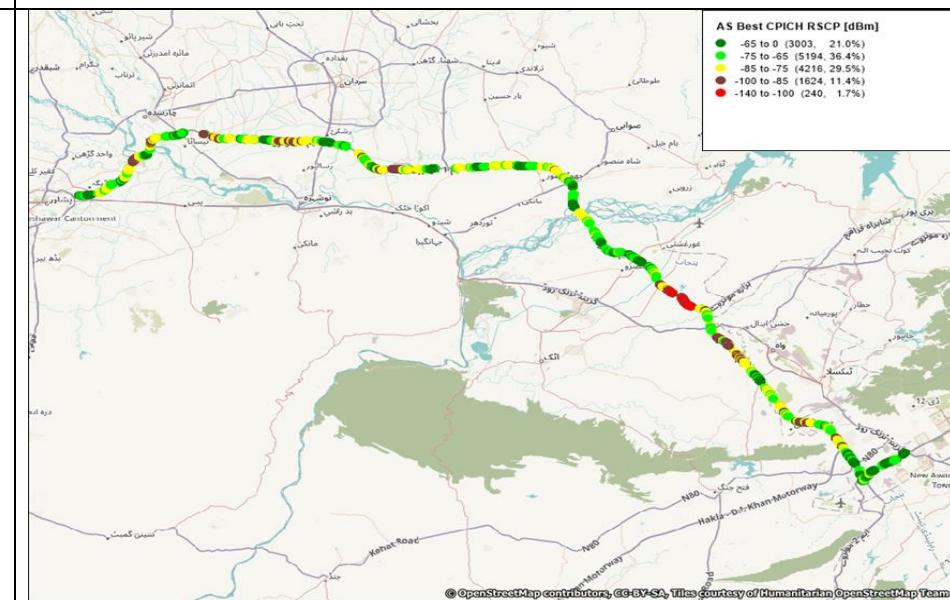
TELENOR 3G NETWORK COVERAGE – M1 MOTORWAY



UFONE 3G NETWORK COVERAGE – M1 MOTORWAY

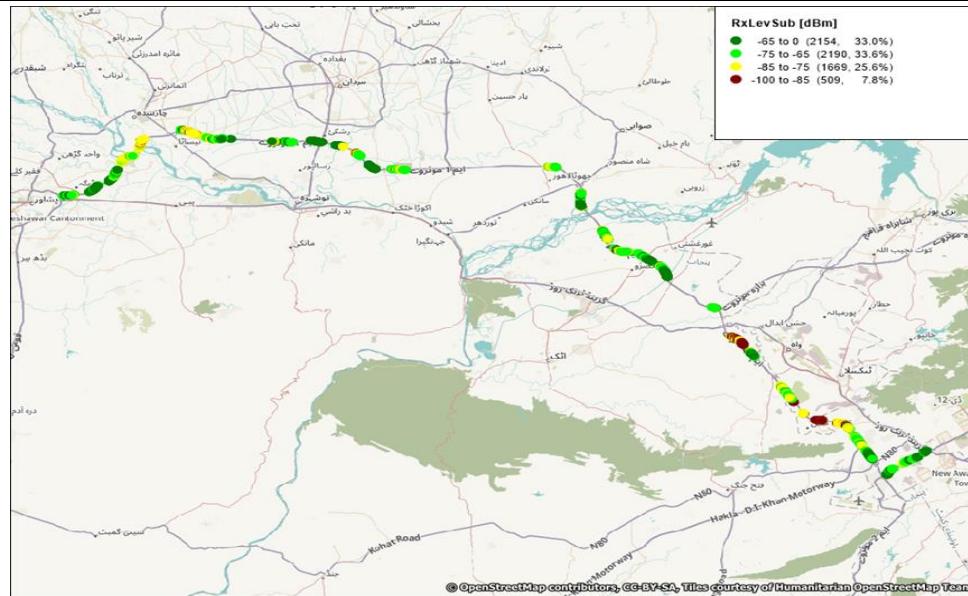


ZONG 3G NETWORK COVERAGE – M1 MOTORWAY

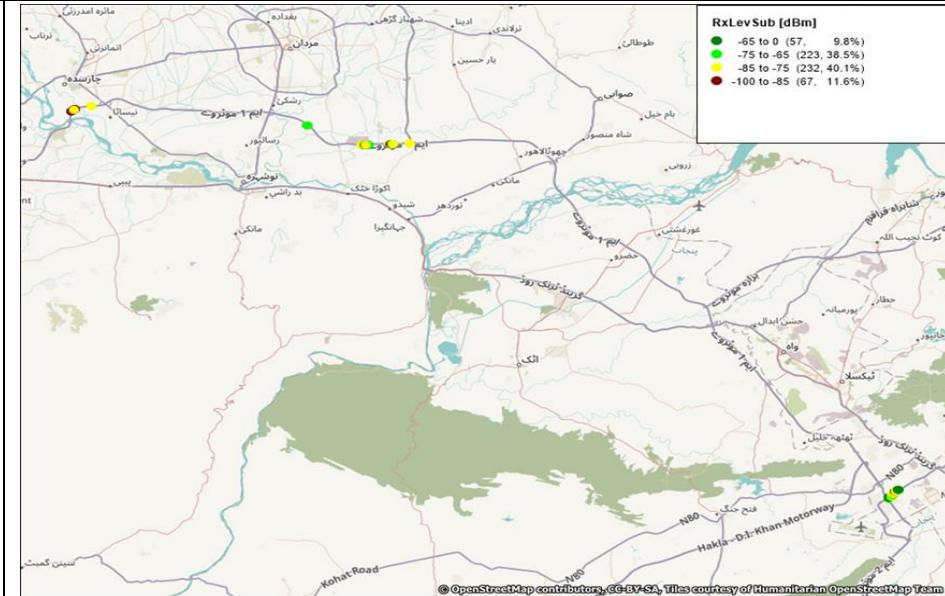


## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

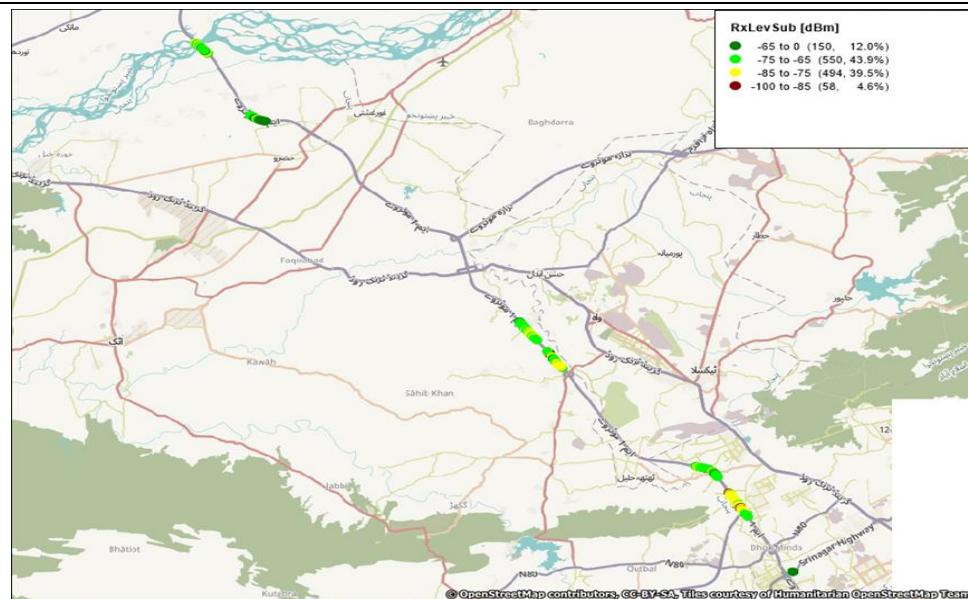
JAZZ 2G NETWORK COVERAGE – M1 MOTORWAY



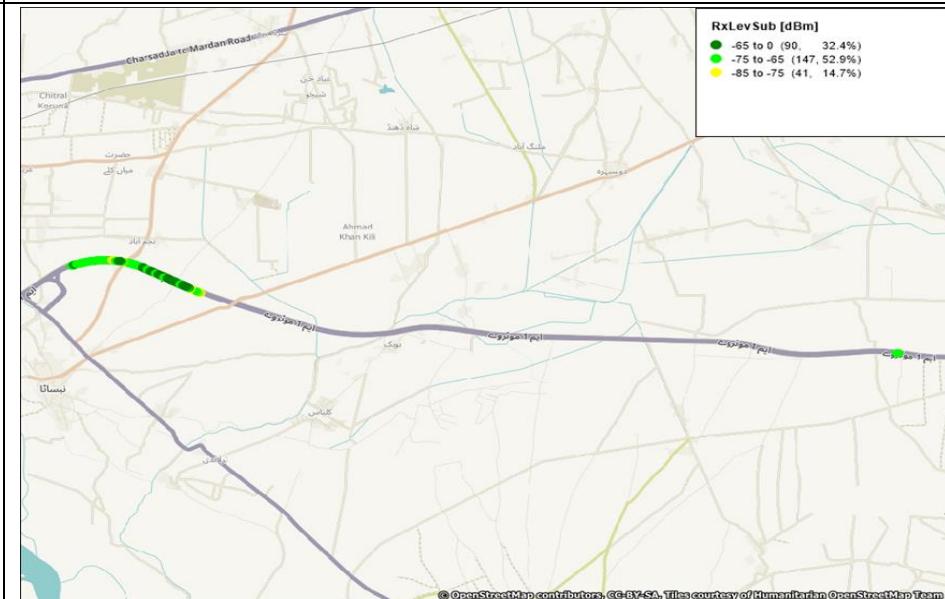
TELENO 2G NETWORK COVERAGE – M1 MOTORWAY



UFONE 2G NETWORK COVERAGE – M1 MOTORWAY

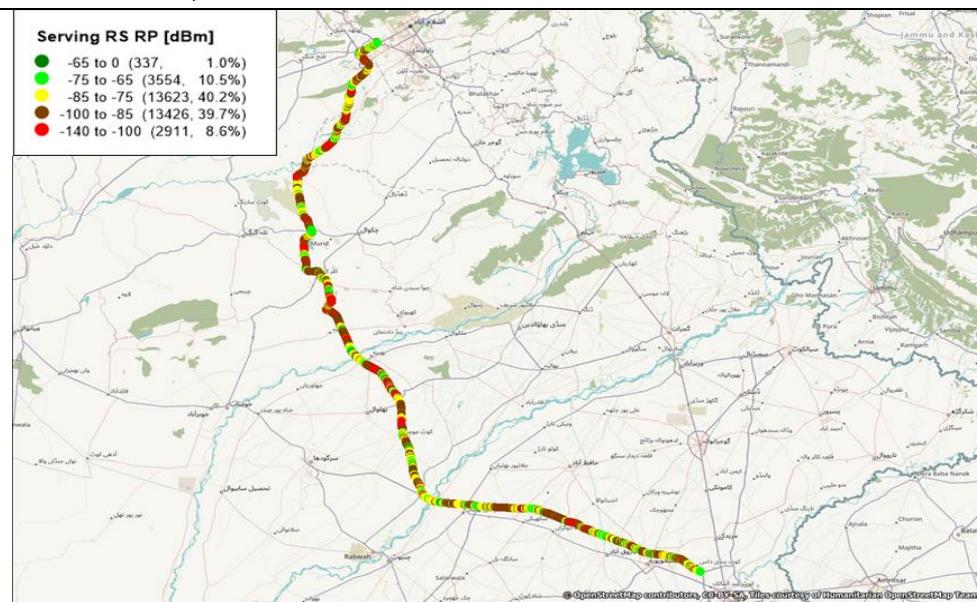


ZONG 2G NETWORK COVERAGE – M1 MOTORWAY

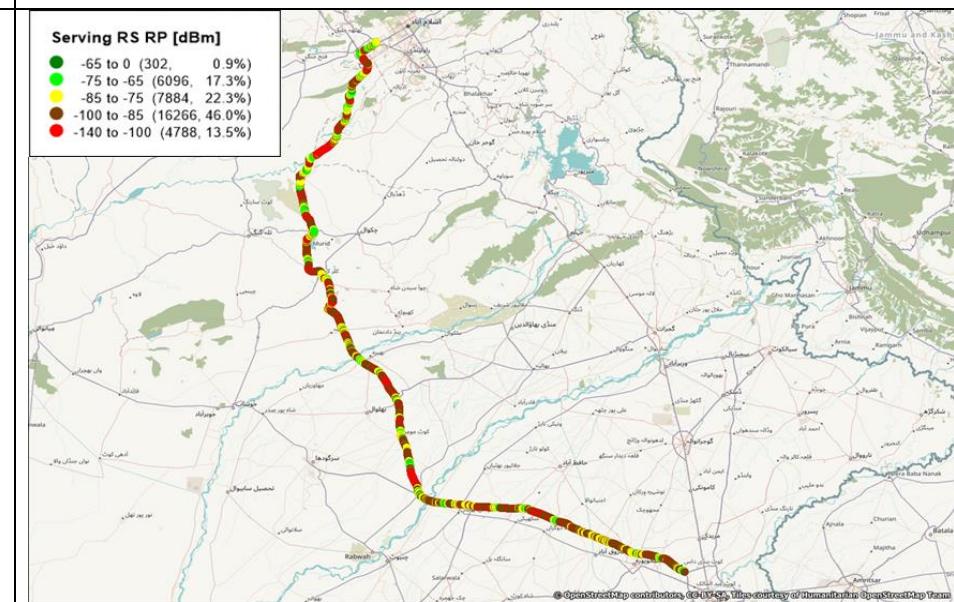


## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

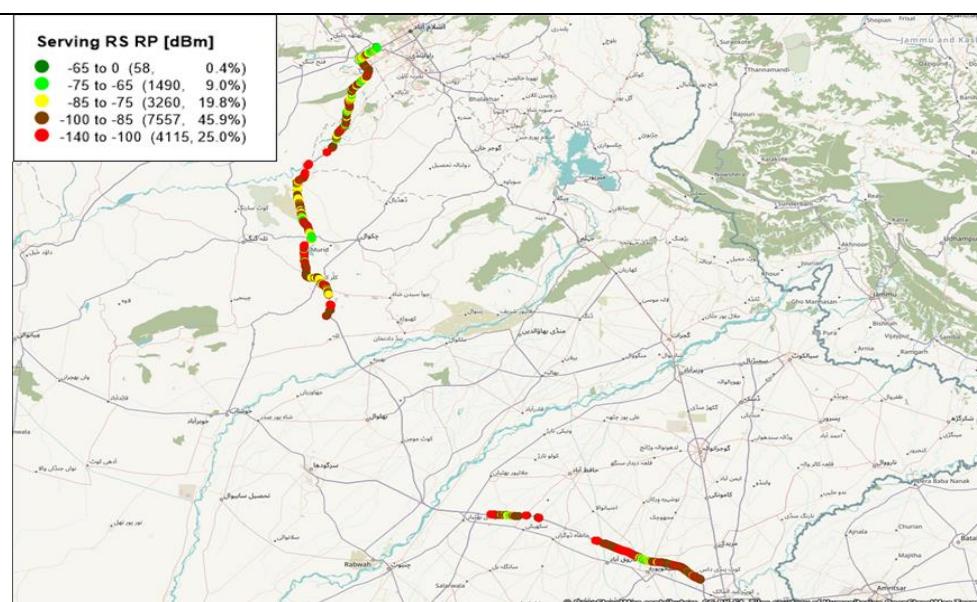
JAZZ 4G NETWORK COVERAGE – M2 MOTORWAY



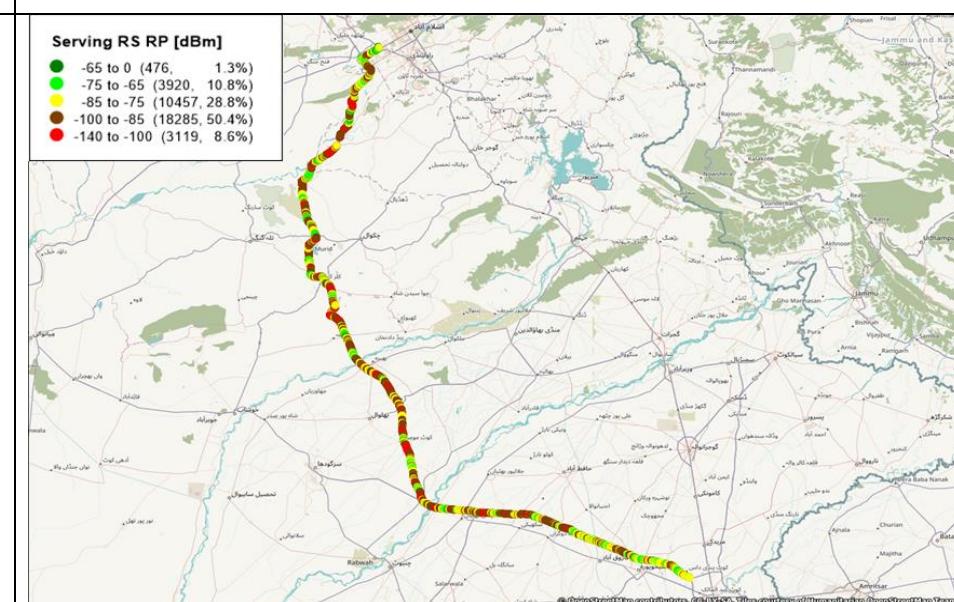
TELENOR 4G NETWORK COVERAGE – M2 MOTORWAY



UFONE 4G NETWORK COVERAGE – M2 MOTORWAY

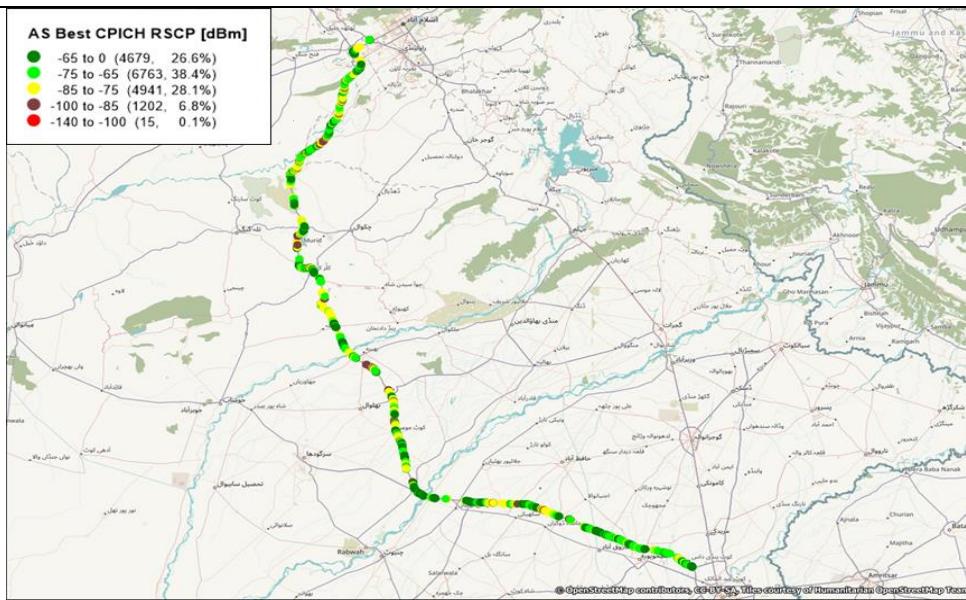


ZONG 4G NETWORK COVERAGE – M2 MOTORWAY

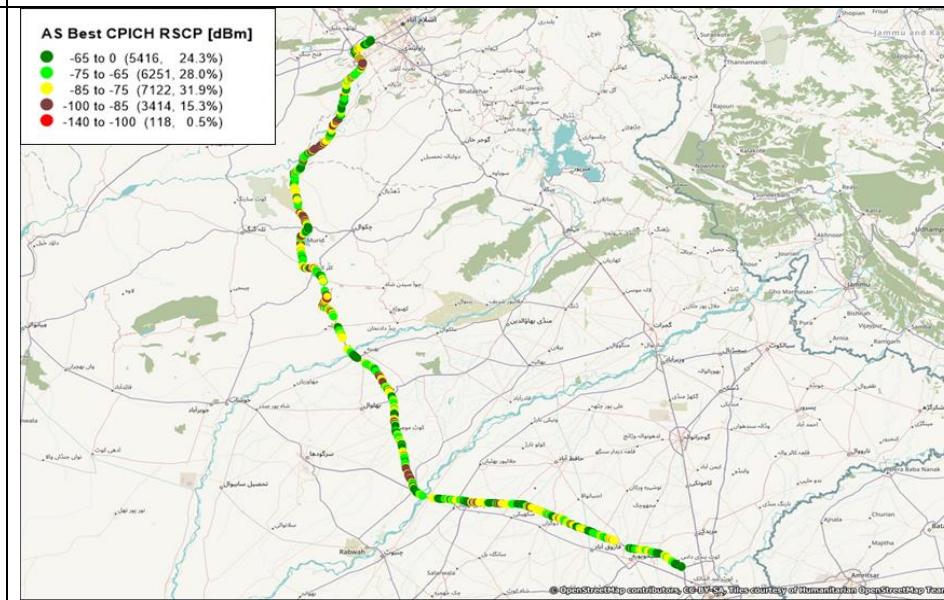


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

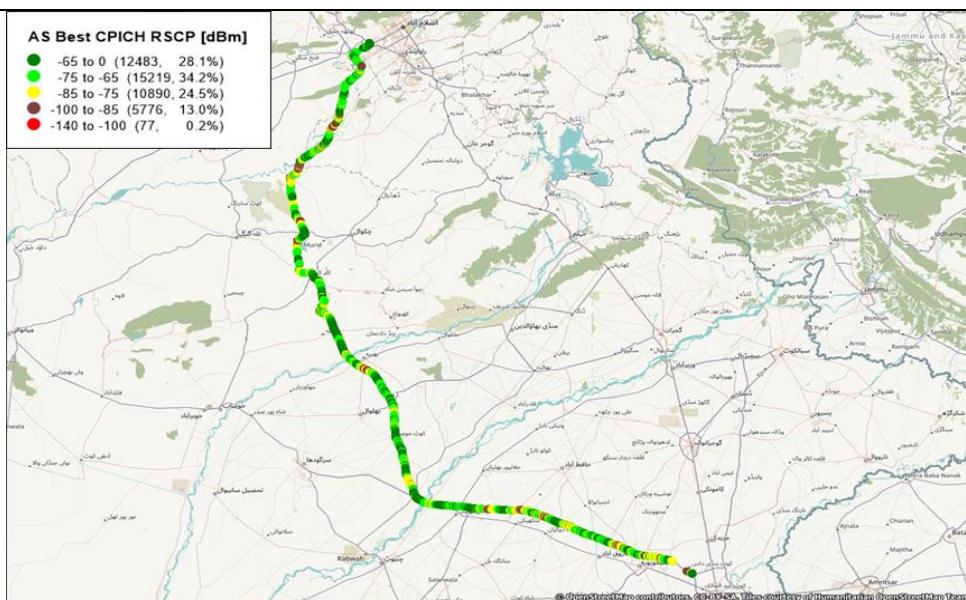
JAZZ 3G NETWORK COVERAGE – M2 MOTORWAY



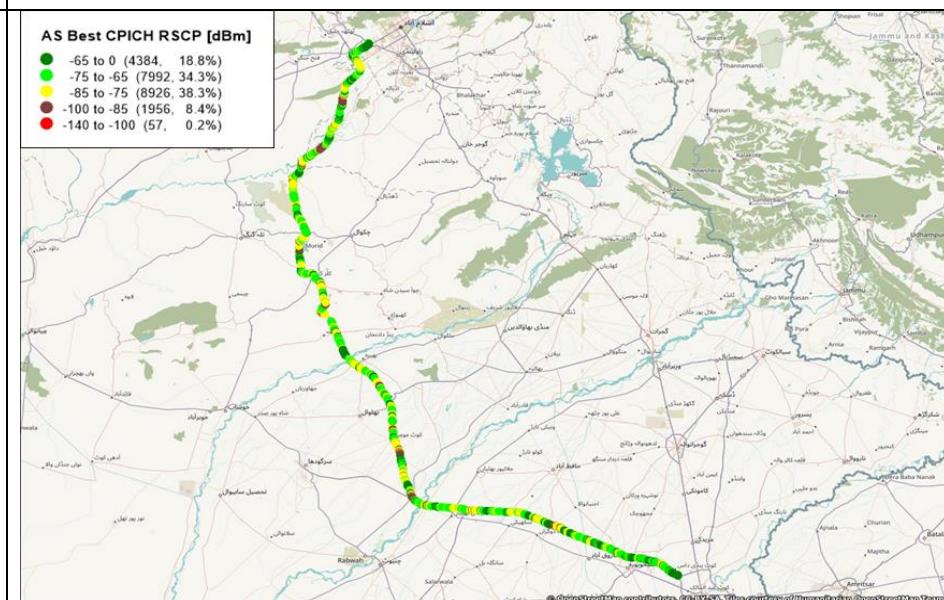
TELENOR 3G NETWORK COVERAGE – M2 MOTORWAY



UFONE 3G NETWORK COVERAGE – M2 MOTORWAY

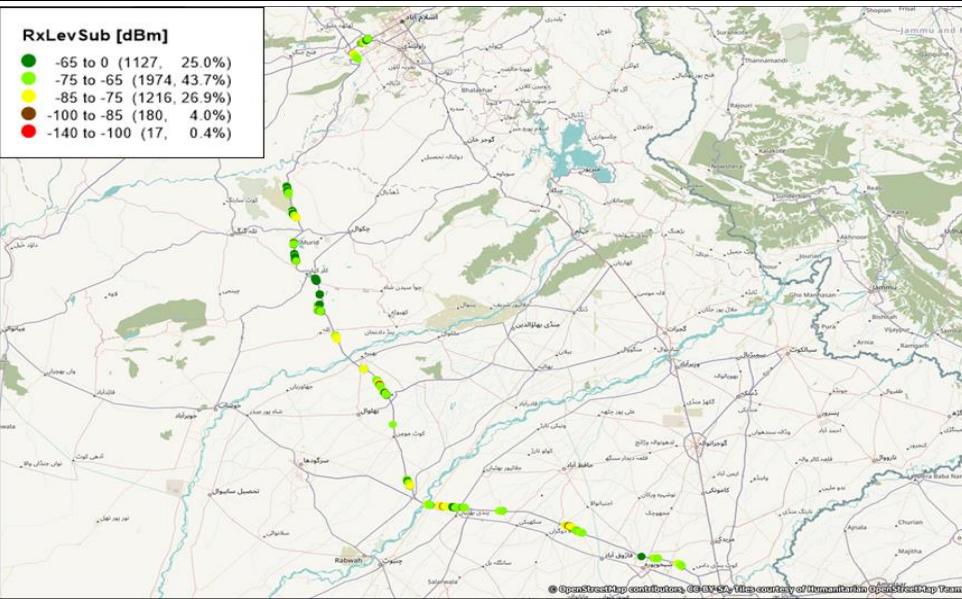


ZONG 3G NETWORK COVERAGE – M2 MOTORWAY

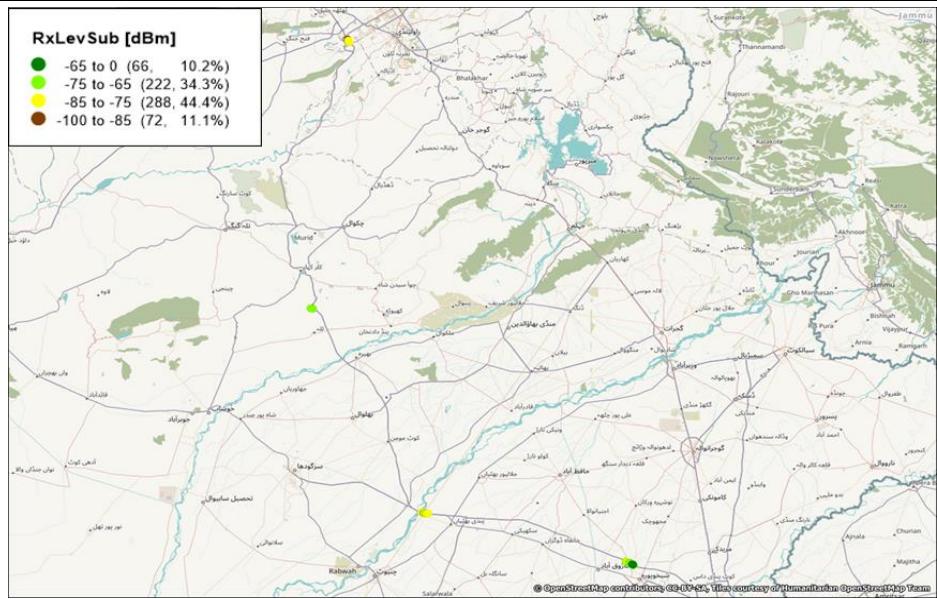


## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

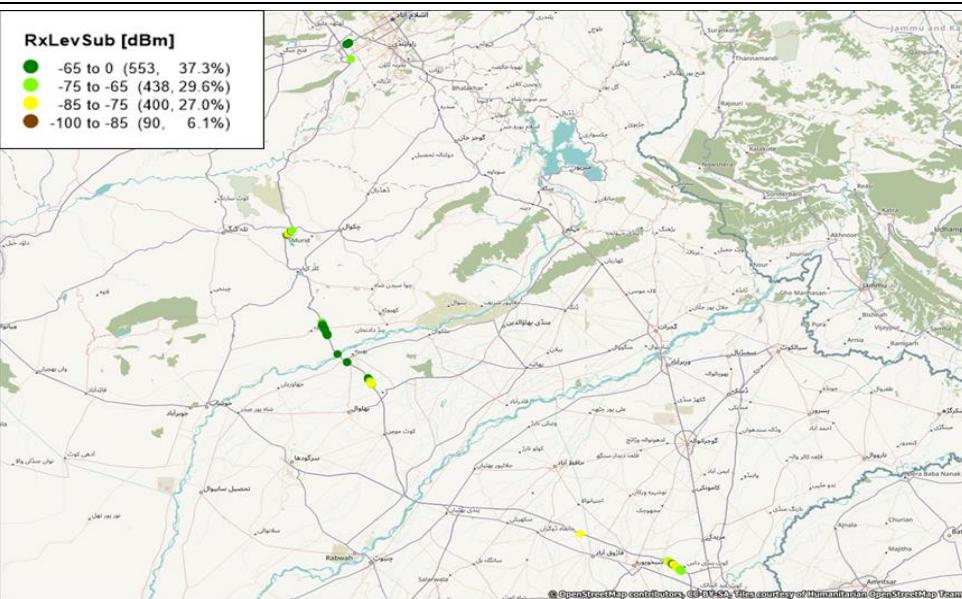
JAZZ 2G NETWORK COVERAGE – M2 MOTORWAY



TELENOR 2G NETWORK COVERAGE – M2 MOTORWAY



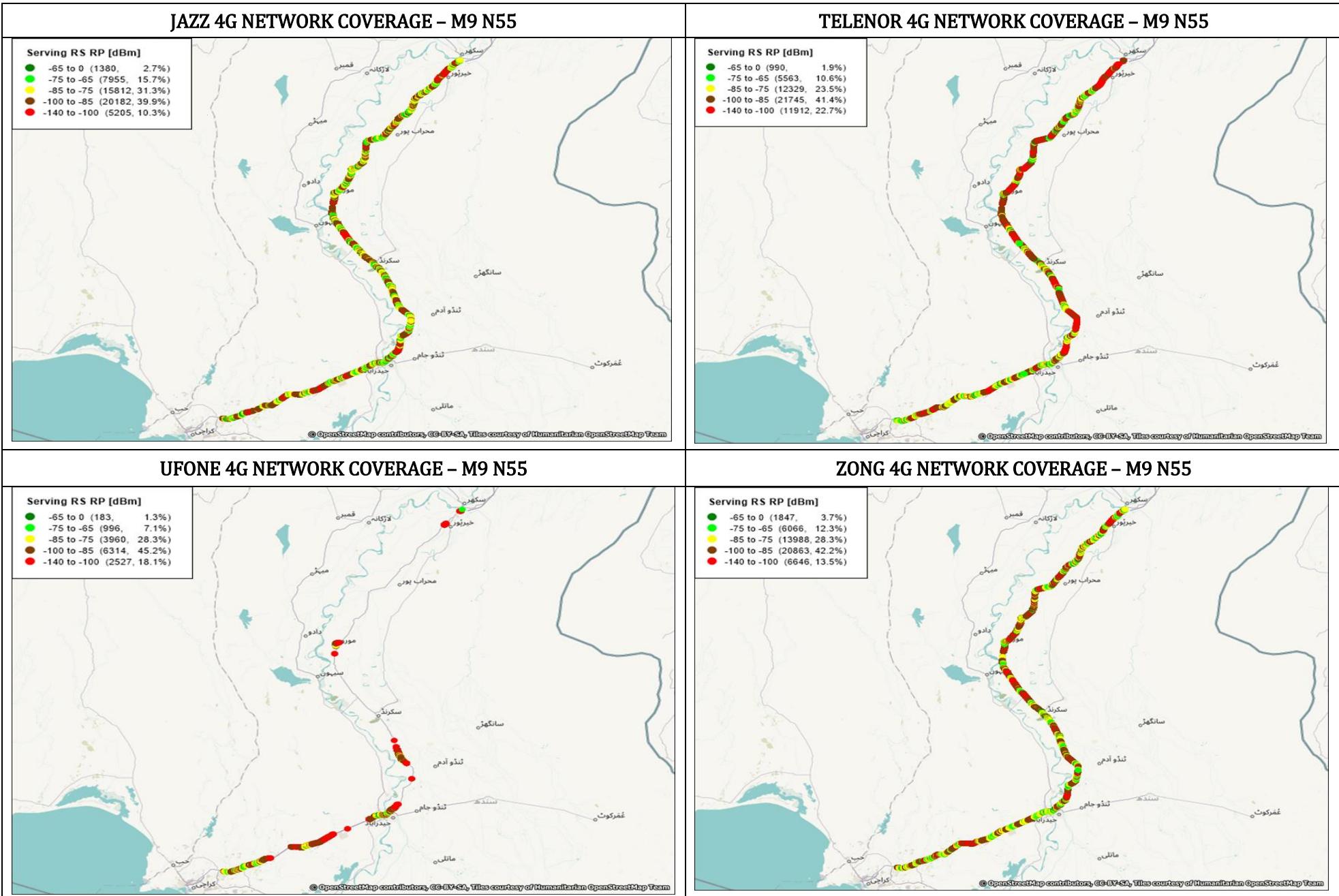
UFONE 2G NETWORK COVERAGE – M2 MOTORWAY



ZONG 2G NETWORK COVERAGE – M2 MOTORWAY

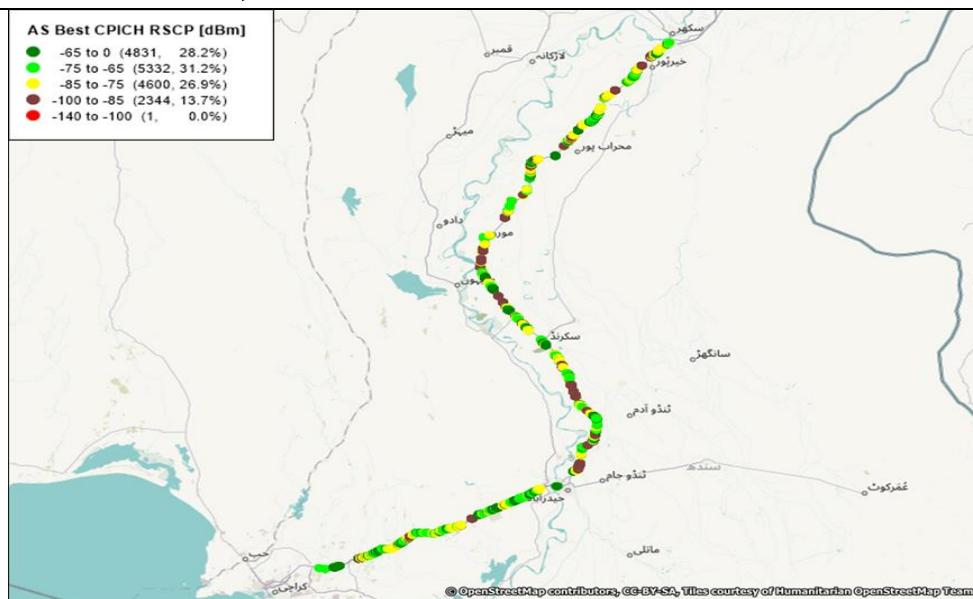
NO FALBACK TO 2G NETWORK

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

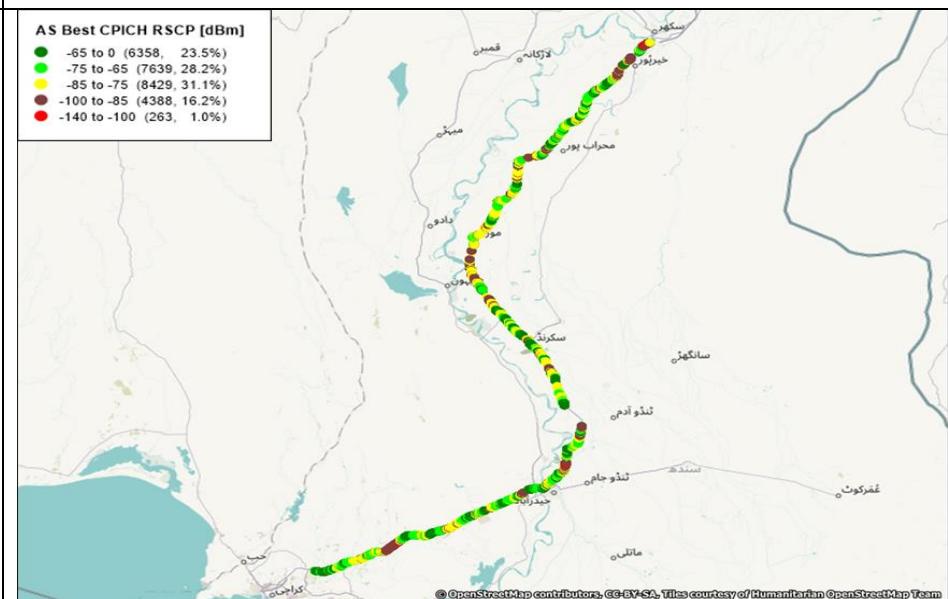


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

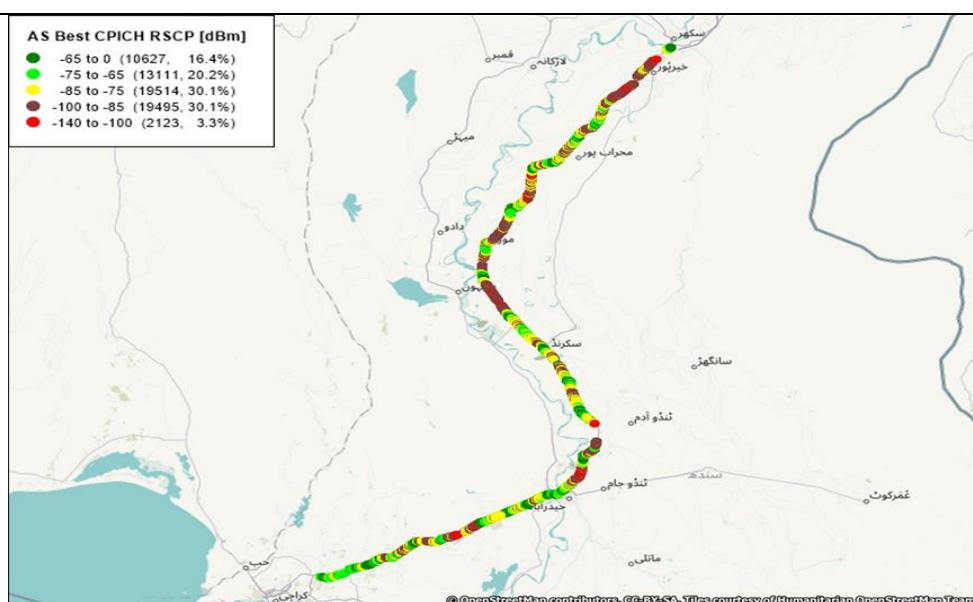
JAZZ 3G NETWORK COVERAGE – M9 N55



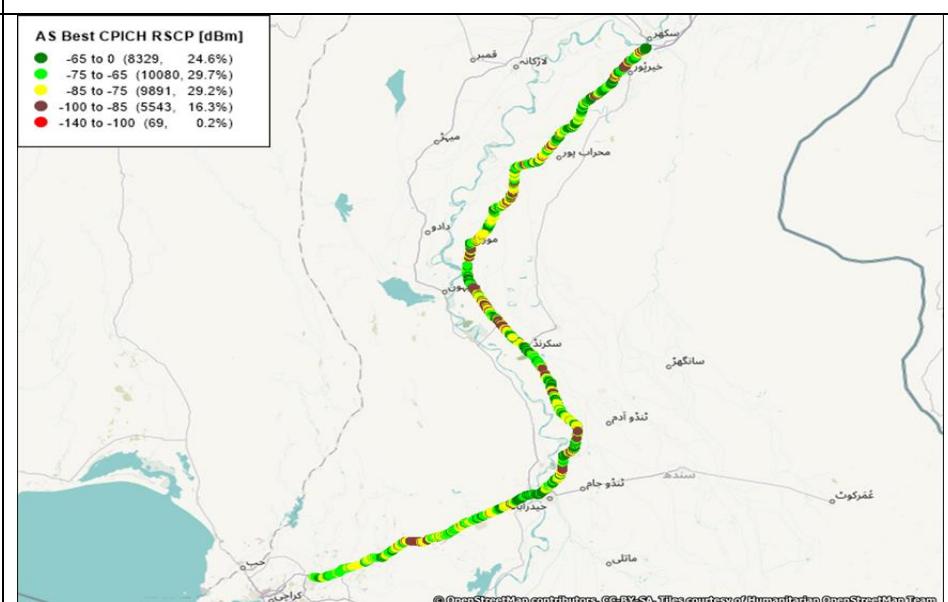
TELENOR 3G NETWORK COVERAGE – M9 N55



UFONE 3G NETWORK COVERAGE – M9 N55

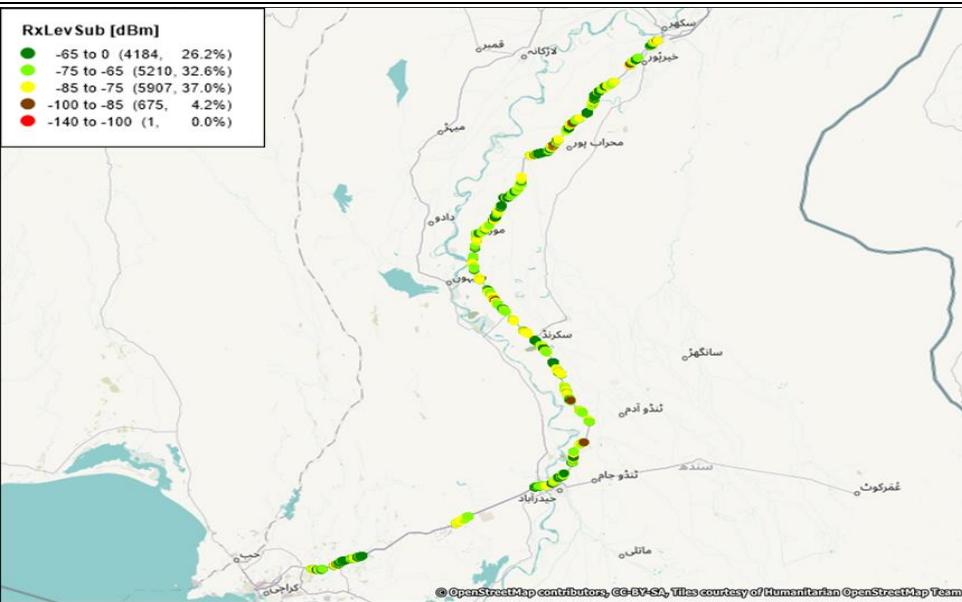


ZONG 3G NETWORK COVERAGE – M9 N55

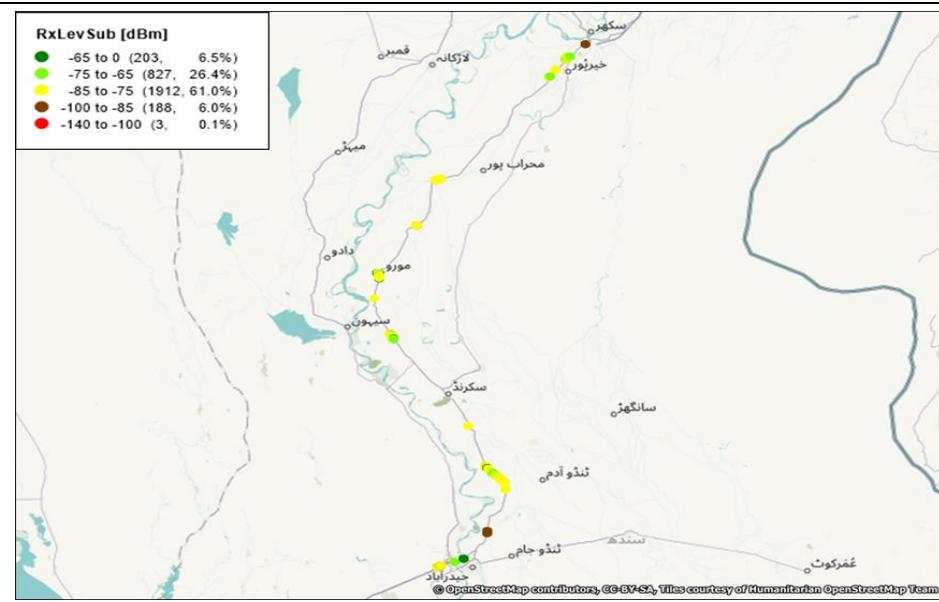


## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

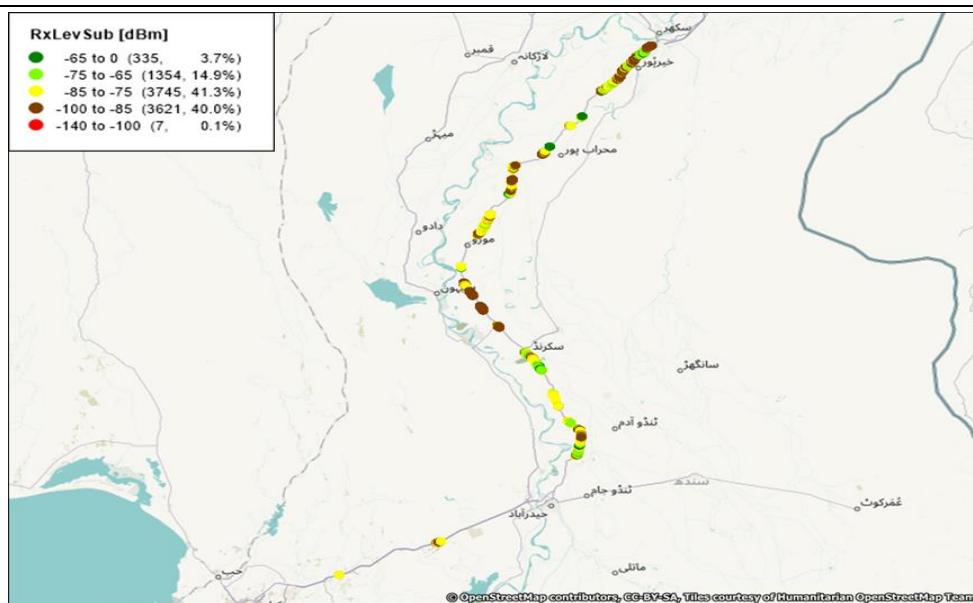
JAZZ 2G NETWORK COVERAGE – M9 N55



TELENOR 2G NETWORK COVERAGE – M9 N55



UFONE 2G NETWORK COVERAGE – M9 N55

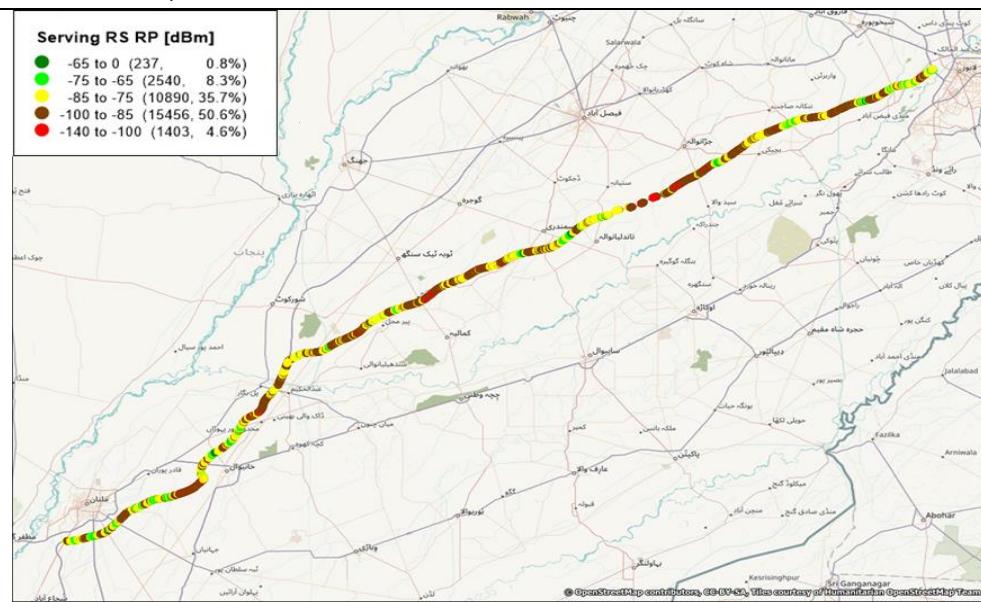


ZONG 2G NETWORK COVERAGE – M9 N55

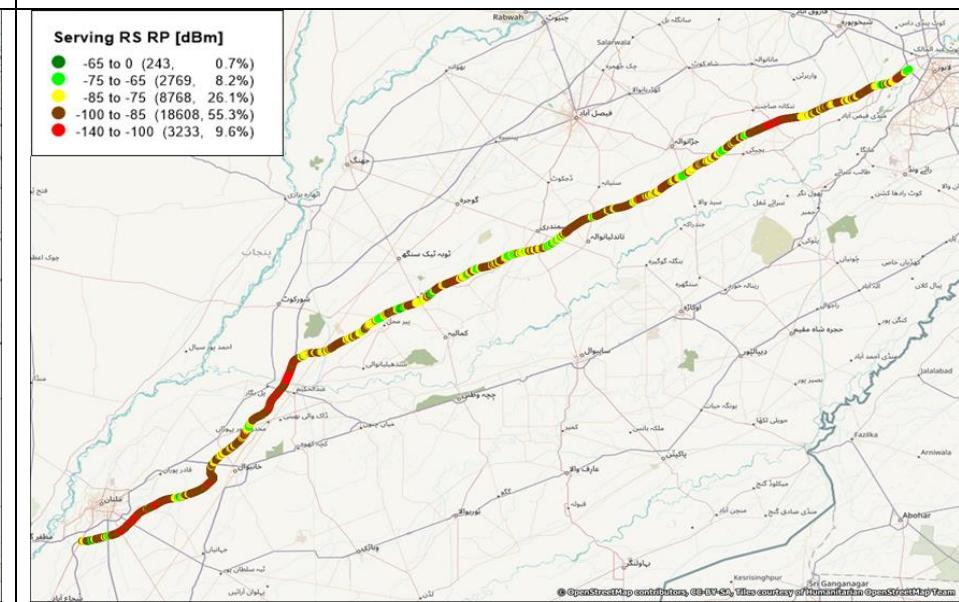
NO FALBACK TO 2G NETWORK

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

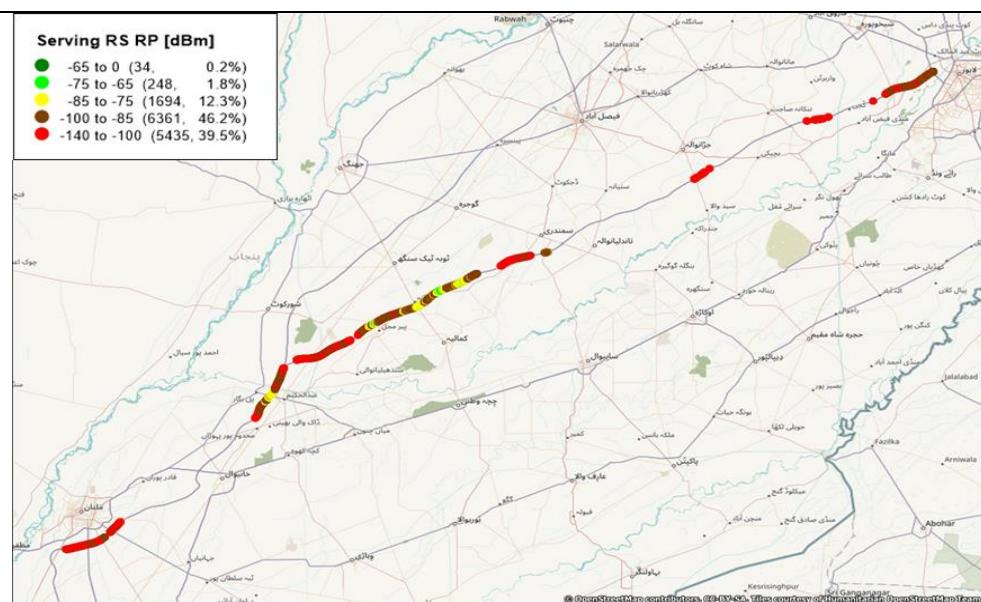
JAZZ 4G NETWORK COVERAGE – M3 M4 MOTORWAY



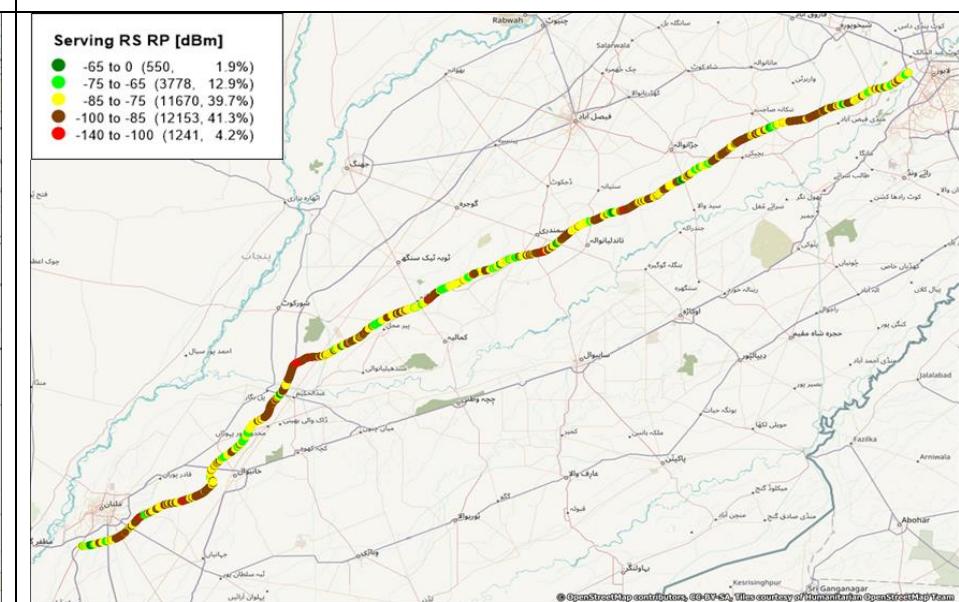
TELENOR 4G NETWORK COVERAGE – M3 M4 MOTORWAY



UFONE 4G NETWORK COVERAGE – M3 M4 MOTORWAY

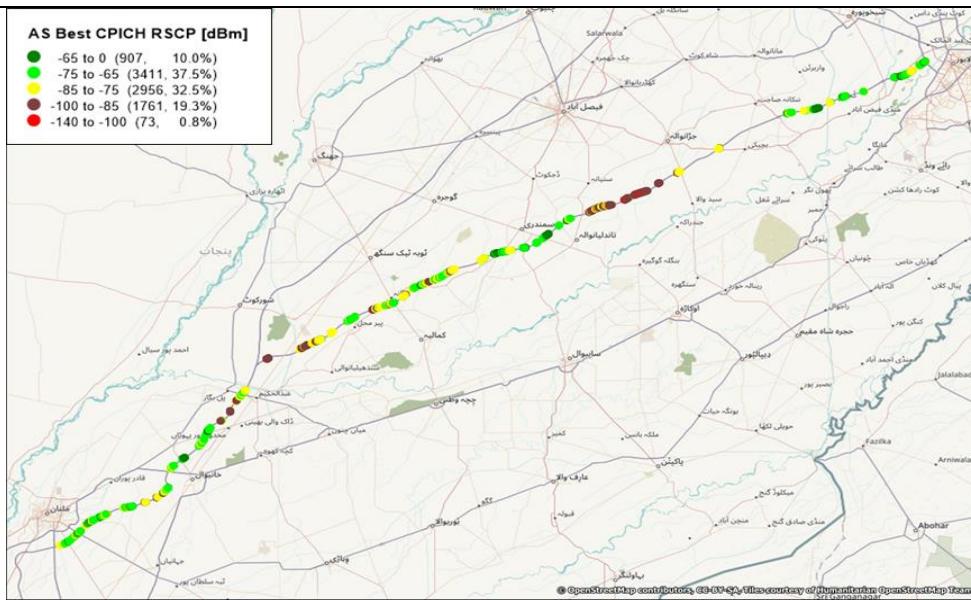


ZONG 4G NETWORK COVERAGE – M3 M4 MOTORWAY

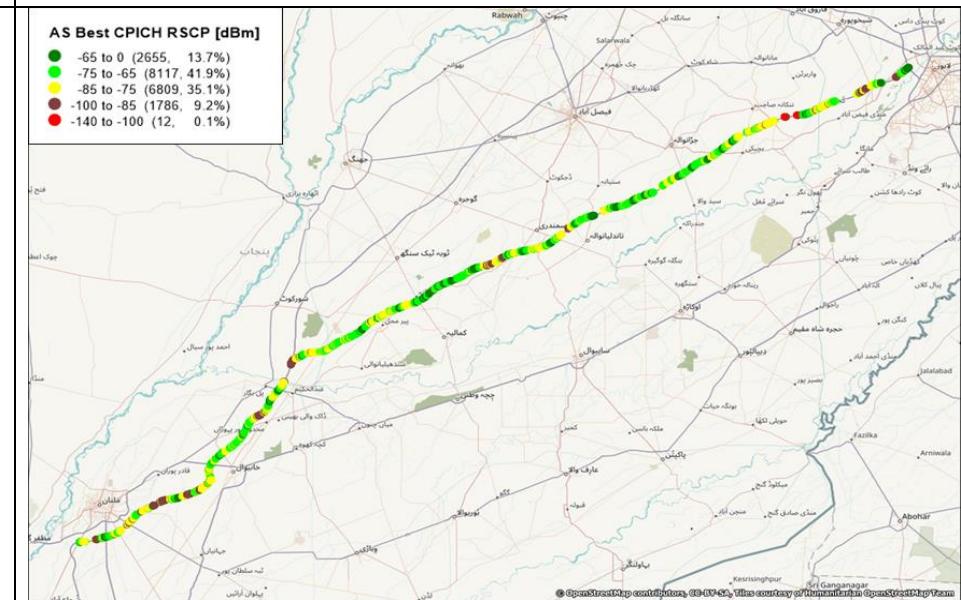


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

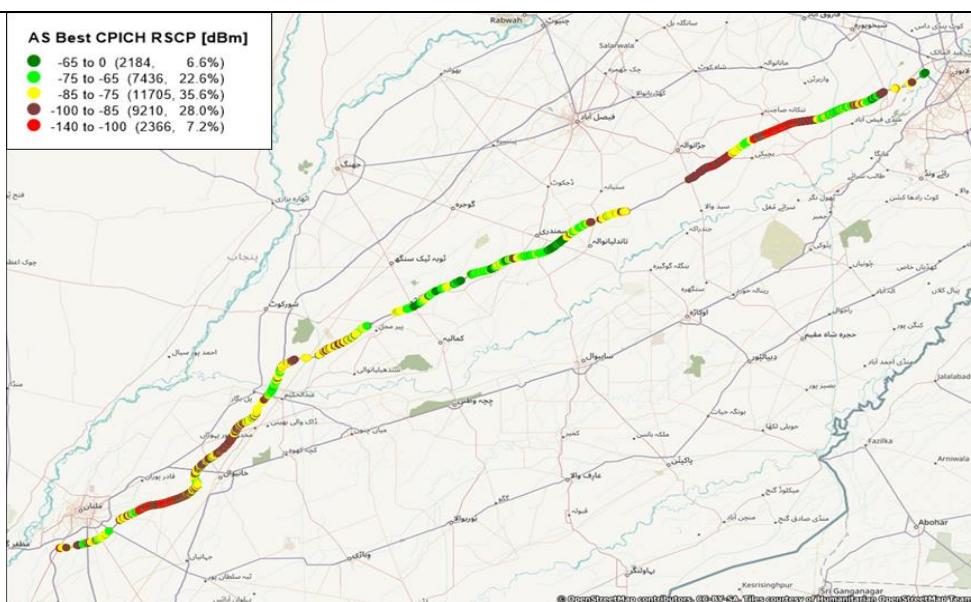
JAZZ 3G NETWORK COVERAGE – M3 M4 MOTORWAY



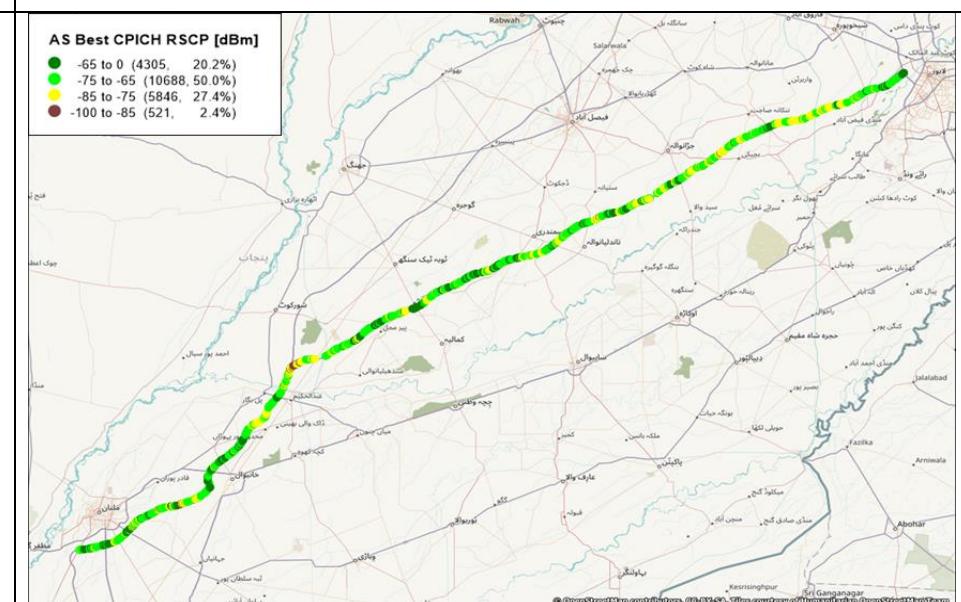
TELENOR 3G NETWORK COVERAGE – M3 M4 MOTORWAY



UFONE 3G NETWORK COVERAGE – M3 M4 MOTORWAY

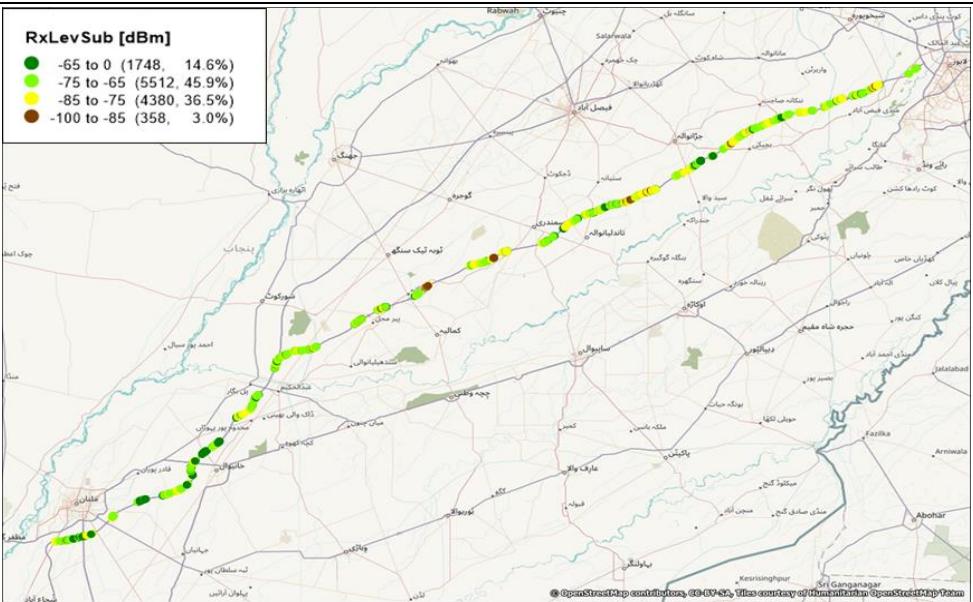


ZONG 3G NETWORK COVERAGE – M3 M4 MOTORWAY

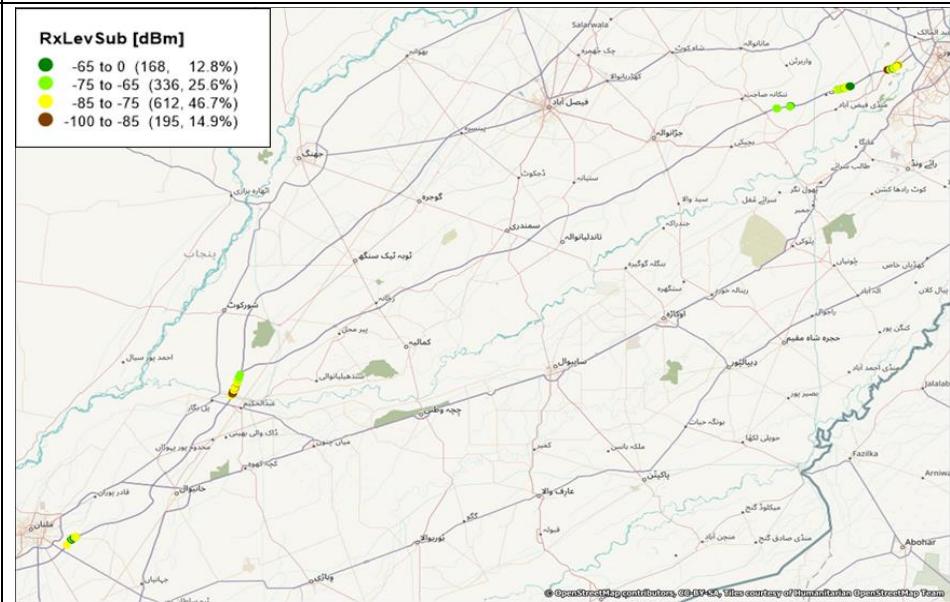


## 2G MOBILE COVERAGE – SIGNAL STRENGTH (RX LEVEL)

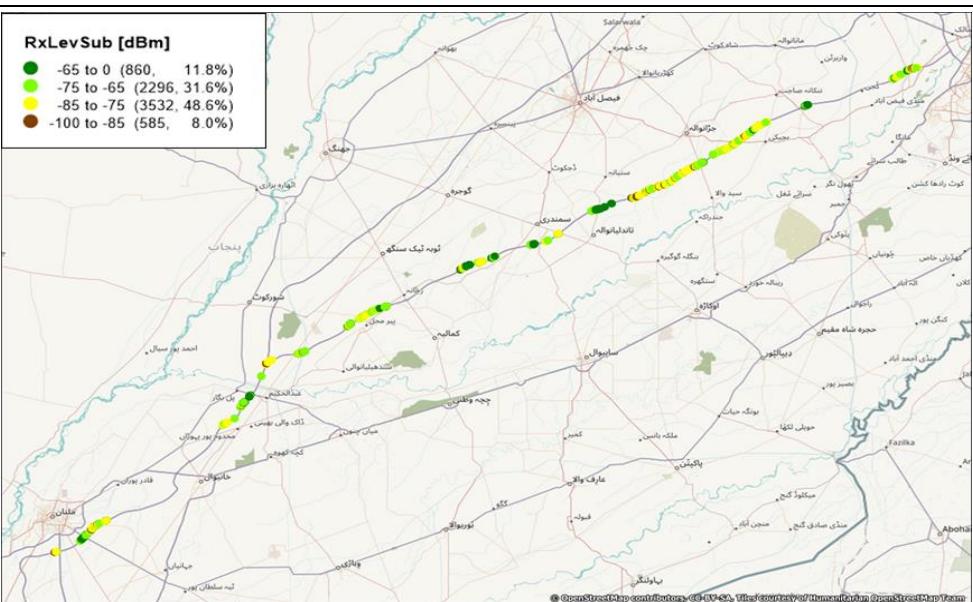
JAZZ 2G NETWORK COVERAGE – M3 M4 MOTORWAY



TELENOR 2G NETWORK COVERAGE – M3 M4 MOTORWAY



UFONE 2G NETWORK COVERAGE – M3 M4 MOTORWAY



ZONG 2G NETWORK COVERAGE – M3 M4 MOTORWAY

NO FALBACK TO 2G NETWORK