

### **3 STUDY SAMPLE**

A sample representing the use of these services in the main urban agglomerations and major roads of Mainland Portugal was chosen for a proper assessment of the quality of Voice (GSM), Video-telephony (UMTS) and Network Coverage (GSM and WCDMA).

#### **3.1 TESTED AREAS**

This study aims to assess the quality of the services provided by mobile networks, as it is perceived by consumers. It would thus be desirable to conduct measurements in all locations where this type of communications is or could be provided, at the limit, considering the whole of Portugal's geographical area, including the interior of buildings. Understandably, making tests on all these locations is unfeasible.

However, the purpose is not to make exhaustive measures, but to collect an adequate sample that can be used as an indicator of the networks' overall performance. In this sense, locations where the service is more intensely used were chosen, i.e., the larger urban agglomerations and the major roads.

However, the exclusive adoption of this criterion would lead to an excessive concentration of measurements in the coastline's most densely populated areas, and therefore, besides this criterion, we decided to consider a geographical distribution of the locations, as a way to contemplate inland regions.

Thus, tests were made in all of the country's district capitals, the collection area was broadened to the greater Lisbon and Porto peripheral areas, and also to the major roads of Mainland Portugal.

The population of the urban agglomerations that make up the selected sample stands for 41.7% of the Portuguese population, according to the results of the last Census (2001).

Table 9 – Locations and their population.

Territory Unit	Residing Population	Present Population
Aveiro	73,136	76,415
Beja	35,659	37,001
Braga	163,981	165,048
Bragança	34,689	37,170
Castelo Branco	55,909	56,280
Coimbra	148,122	159,039
Évora	56,359	58,564
Faro	57,151	59,527
Guarda	43,759	44,593
Leiria	119,319	119,065
Portalegre	25,814	26,511
Santarém	63,418	63,106
Setúbal	113,480	112,227
Viana do Castelo	88,409	86,355
Vila Real	49,928	52,129
Viseu	93,259	93,041
<b>Total</b>	<b>1,222,392</b>	<b>1,246,071</b>
<b>Greater Porto</b>		
Porto	262,928	266,790
Gondomar	163,462	159,547
Maia	119,718	117,539
Matosinhos	166,275	162,671
Vila Nova de Gaia	287,597	280,466
<b>Total</b>	<b>999,980</b>	<b>987,013</b>
<b>Greater Lisbon</b>		
Lisbon	556,797	559,248
Amadora	174,788	169,507
Cascais	168,827	166,539
Loures	198,685	193,320
Oeiras	160,147	157,152
Sintra	363,556	351,976
Almada	159,550	156,746
Seixal	150,095	146,843
Odivelas	132,971	130,569
<b>Total</b>	<b>2,065,416</b>	<b>2,031,900</b>
<b>Total</b>	<b>4,287,788</b>	<b>4,264,984</b>

Source: INE - Instituto Nacional de Estatística

Table 10 – Major Roads

Major Roads	Approximate Length (Km)
Aveiro-Viseu-Vilar Formoso (A25)	200
Chaves-Vila Real-Figueira da Foz (A24 / IP3 / A14)	285
Lagos-Vila Real de S <sup>to</sup> . António-Faro-Lagos (A22 / EN125)	275
Lisbon-Algarve (A2)	245
Lisbon-Cascais-Sintra-Lisbon (A5 / IC19)	60
Lisbon-Évora-Elvas (A12 / A2 / A6)	215
Lisbon-Leiria-Aveiro (A8 / A17)	245
Lisbon-Porto (A1)	315
Maia-Guimarães-Braga-Esposende (A41 / A42 / A11)	120
Oeiras-Castelo Branco-Guarda (A9 / A10 / A1 / A23)	330
Porto-Bragança (A4 / IP4)	260
Porto-Braga-Valença-Viana do Castelo-Porto (A3 / A28)	230
Póvoa de Varzim-Vila Pouca de Aguiar (A7)	110
<b>Total</b>	<b>2,890</b>

### 3.2 SAMPLE SIZE

Table 11 – Sample, for the three analysed operators

	Hours of Measurement	Measurements in	Voice Calls	Video-telephony Calls	Coverage Measurements		
					GSM	WCDMA	
Urban Agglomerations	Aveiro	6 h 11	160	360	312	66,187	66,439
	Beja	6 h 11	110	360	312	66,548	66,511
	Braga	6 h 09	190	362	302	66,148	66,797
	Bragança	6 h 15	175	362	314	67,181	67,442
	Castelo Branco	6 h 17	118	369	320	68,272	68,323
	Coimbra	6 h 14	168	363	313	66,441	67,166
	Évora	6 h 09	125	360	310	66,338	66,600
	Faro	6 h 12	143	366	315	67,601	67,876
	Guarda	6 h 25	193	378	325	69,498	69,695
	Leiria	6 h 15	168	368	314	67,597	67,724
	Portalegre	6 h 03	97	352	302	65,299	65,633
	Santarém	6 h 16	143	366	315	67,678	67,838
	Setúbal	6 h 07	153	361	309	65,926	66,415
	Viana do Castelo	6 h 11	151	363	312	66,862	67,449
	Vila Real	6 h 11	154	363	313	67,094	67,108
	Viseu	6 h 14	168	365	316	67,616	67,877
	Greater Porto	18 h 08	490	1,068	919	195,816	197,068
Greater Lisbon	36 h 10	923	2,130	1,816	390,744	392,511	
<b>Total Urban Agglomerations</b>	<b>153 h 38</b>	<b>3,829</b>	<b>9,016</b>	<b>7,739</b>	<b>1,658,846</b>	<b>1,666,472</b>	
Major Roads	Aveiro-Viseu-Vilar Formoso (A25)	4 h 22	400	256	218	47,438	47,632
	Chaves-Vila Real-Figueira da Foz (A24 / IP3 / A14)	5 h 28	565	321	272	59,021	59,244
	Lagos-Vila Real de Sto. António-Faro-Lagos (A22 / EN125)	7 h 40	545	449	386	82,781	82,716
	Lisbon-Algarve (A2)	4 h 18	489	255	216	46,139	46,386
	Lisbon-Cascais-Sintra-Lisbon (A5 / IC19)	6 h 15	313	368	317	67,841	67,988
	Lisbon-Évora-Elvas (A12 / A2 / A6)	4 h 23	428	254	219	47,270	47,363
	Lisbon-Leiria-Aveiro (A8 / A17)	4 h 24	485	260	221	48,097	48,081
	Lisbon-Porto (A1)	5 h 50	625	340	295	63,093	63,496
	Maia-Guimarães-Braga-Esposende (A41 / A42 / A11)	2 h 15	234	129	110	24,135	24,221
	Oeiras-Castelo Branco-Guarda (A9 / A10 / A1 / A23)	6 h 44	654	393	333	71,641	71,883
	Porto-Bragança (A4 / IP4)	5 h 17	514	304	262	56,854	57,516
	Porto-Braga-Valença-Viana do Castelo-Porto (A3 / A28)	5 h 05	454	294	254	54,828	55,173
	Póvoa de Varzim-Vila Pouca de Aguiar (A7)	2 h 00	215	112	95	21,174	21,281
	<b>Total Major Roads</b>	<b>64 h 01</b>	<b>5,921</b>	<b>3,735</b>	<b>3,198</b>	<b>690,312</b>	<b>692,980</b>
<b>Total</b>	<b>217 h 39</b>	<b>9,750</b>	<b>12,751</b>	<b>10,937</b>	<b>2,349,158</b>	<b>2,359,452</b>	

### 3.3 DATA COLLECTION CONDITIONS

Field work took place during normal working day periods from October 18 to November 11.

In the Greater Lisbon and Greater Porto regions, measurement sessions were made from 8h00 to 12h00 and from 16h00 to 20h00. In the remaining urban agglomerations, measurement sessions were made during normal working periods.

On each major road, data collection was made in two series of runs, except for the A5/IC19 route, where several runs were made along one day (6h15).