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Title: Application of ICT Indicators in Network Planning

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**Application of ICT Indicators in
Network Planning**

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1. Application of the world telecommunication/ICT indicators to evaluate subscribers potential

Network planning is performed at different time scales:

- Long term network planning (Target network planning)

Target network planning is bases for preparing of comprehensive master plans - master plans are usually based on long term assessments.

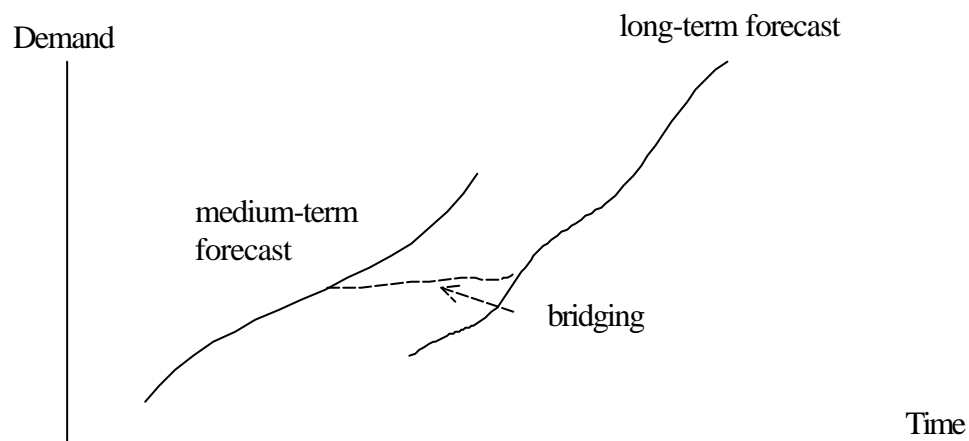
- Medium term network planning

To identify intermediate steps from present to target network.

- Short term network planning

Short-term plans can be made up on regional or local bases.

Bases for network planning is demand forecasting:



Usually demand forecasting is performed for each subset of potential customers, as area of a city, small town or village, group of buildings, etc.

Global evaluation of the overall potential of customers/subscribers in a country could give indication of the possible development of the telecom infrastructure and the corresponding network planning activities needed.

Below is shown an approach to such global evaluation of the overall subscribers potential in the fixed PSTN network based on the world telecommunication/ICT indicators.

Calculation of the subscribers potential

Calculation of the subscribers potential is based on the statistics for population, average house-hold size, average teledensity, teledensity per house-hold and percentage of residential lines .

Teledensity statistics for highly developed countries in Table 1 could serve as indication for the saturation level.

Table 1: Teledensity statistics for highly developed countries (from year 2000)

Country	Population (in thousands)	Teledensity [%]	Average house-hold size	Teledensity per house-hold [%]	Residential lines [%]
Australia	19,157	52,46	2,64	101,2	73,0
Canada	30,750	67,65	2,65	98,2	63,4
France	58,892	57,93	2,46	94,0	74,0
Germany	82,260	61,05	2,16	95,5	77,0
Italy	57,298	47,39	2,71	96,9	67,1
Japan	126,919	58,58	2,70	116,8	73,9
New Zealand	3,831	49,99	2,91	103,0	70,8
Republic of Korea	47,300	46,37	3,04	105,5	74,6
Spain	40,600	42,12	3,25	100,8	74,5
Sweden	8,881	68,20	2,22	98,7	65,3
Switzerland	7,204	72,67	2,02	99,6	68,0
United Kingdom	59,766	58,86	2,38	93,0	70,1
United States of America	275,130	69,97	2,58	94,1	65,8

From the teledensity per household in Table 1 is seen that teledensity per house-hold in the highly developed countries is around 100% ,i.e. one line per household could be considered as a saturation level for residential subscribers.

On that bases the potential of residential subscribers could be estimated from the population statistics if the household size is known.

Should be noted, that average household size in the highly developed countries according to Table 1 is from 2,0 to 3,4.

From the percentage of residential lines in Table 1 ratio residential to business subscribers could be calculated.

Average ratio residential to business subscribers for highly developed countries is approximately 3 to 1.

The potential of business subscribers could be estimated from the ratio residential to business subscribers.

A verification of this methodology for some of the highly developed countries in Table 1 gives:

Germany : 50 Million potential subscribers or 61 % potential teledensity

Switzerland : 4,7 Million potential subscribers or 67 % potential teledensity

United States : 135 Million potential subscribers or 50 % potential teledensity

The United States subscribers potential is underestimated, but it is explicable with the unique economic structure of the country.

Table 2 presents teledensity statistics for selection of different countries in the world.

It is to be noted that average household size for the selected countries is from 3,1 to 6,4, which is considerably higher than the highly developed countries.

Table 2: Teledensity statistics for different countries in the world (from year 2000)

Country	Population (in thousands)	Teledensity [%]	Average household size	Teledensity per household [%]
Argentina	37,032	21,32	3,71	68,7
Brazil	170,115	18,18	3,78	41,6
Bulgaria	8,225	35,04	2,83	84,6
China	1,295,330	11,18	3,72	33,9
India	1,012,396	3,20	5,44	-
Indonesia	212,029	3,14	4,34	11,3
Iran	63,661	14,90	4,59	56,1
Kenya	30,669	1,05	3,22	1,4
Mexico	98,881	12,47	4,60	42,0
Morocco	28,351	5,03	5,43	21,0
Pakistan	141,256	2,16	6,02	9,8
Peru	25,662	6,69	4,63	25,0
Philippines	76,499	4,00	5,01	14,0
Russia	146,934	21,83	2,83	48,7
South Africa	43,686	11,36	4,39	27,9
Sudan	31,095	1,24	6,07	5,7
Thailand	60,607	9,23	3,87	24,2
Turkey	65,700	28,0	4,56	97,0
Uganda	22,210	0,28	4,85	0,5

Calculation of the subscriber potential for some countries from Table 2, based on the above estimation, gives:

Brazil: 54,8 Million (34 %) potential teledensity

China: 447 Million (35 %) potential teledensity

Russia: 64 Million (43 %) potential teledensity

South Africa : 12,4 Million (29 %) potential teledensity

In Table 3 are shown statistics data for some least developed countries, sufficient for the estimation of the subscribers potential by the above methodology.

Table 3: Teledensity statistics for some LDCs (data from year 2000)

Country	Number of subscribers	Teledensity [%]	Average household size	Teledensity per household [%]
Angola	96,350	0,78	5,1	-
Eritrea	27,375 *	0,68	5,0	1,8
Ethiopia	194,494	0,30	4,2	0,7
Guinea	44,046	0,55	4,2	0,6
Lesotho	23,144 *	1,00	5,2	2,0
Malawi	41,362 *	0,37	7,9	1,2
Myanmar	229,320	0,48	5,0	-
Tanzania	150,141	0,45	5,5	1,0
Solomon Islands	7,860	1,95	7,1	2,0
	* only fixed subscribers			

Calculation of the subscriber potential for some countries from Table 3, based on the above estimation, gives:

Angola: 3,45 Million (26 %) potential teledensity

Myanmar: 13,1 Million (27 %) potential teledensity

Tanzania: 8,2 Million (23 %) potential teledensity

It should be noted that the main part of the subscribers potential is in the developing and the least developed countries, as far as the highly developed countries are already close to saturation.

If we take into consideration that the world population is growing at 1,33 per cent per year, mostly in the developing countries, the subscribers potential in these countries will even grow in the future.

This global estimation, even in an approximate way, demonstrates the enormous hidden potential for deployment of telecom services in the developing countries.

2. Application of the world telecommunication/ICT indicators to evaluate the impact of Cellular mobile development

The impact of the Cellular mobile development on the teledensity of the PSTN is based on the statistics for average PSTN teledensity, percentage of residential lines and Cellular mobile Teledensity.

Teledensity statistics for highly developed countries for two time points are used - data from year 1997 in Table 4 and data from year 2000 in Table 5.

Table 4: Teledensity statistics for highly developed countries (data from year 1997)

Country	Population (in thousands)	PSTN Teledensity [%]	Residential lines [%]	Cellular mobile Teledensity [%]
Australia	18,532	50,45	72,0	24,71
Canada	30,287	60,95	67,4	14,23
France	58,607	57,5	74,0	9,99
Germany	82,207	54,98	75,8	10,09
Italy	57,520	44,68	76,5	20,46
Japan	126,166	47,86	70,0	30,33
New Zealand	3,789	48,57	77,0	14,94
Republic of Korea	46,000	44,4	78,3	14,96
Spain	39,323	40,32	74,9	11,03
Sweden	8,848	67,93	75,6	35,82
Switzerland	7,094	66,09	74,3	14,72
United Kingdom	59,028	54,0	73,4	14,98
United States of America	274,028	64,37	66,5	20,65

The impact of Cellular mobile on residential teledensity is demonstrated with the case of Italy:

Year 1997: average PSTN teledensity **44,68 %** , residential lines **76,5 %**
cellular mobile teledensity **20,46 %**

Year 2000: average PSTN teledensity **47,39 %** , residential lines **67,1 %**
cellular mobile teledensity **73,73 %**

Conclusion is that influence of Cellular mobile penetration consists of decreasing of residential lines – even with increasing of average PSTN teledensity.

Table 5: Teledensity statistics for highly developed countries (data from year 2000)

Country	Population (in thousands)	PSTN Teledensity [%]	Residential lines [%]	Cellular mobile Teledensity [%]
Australia	19,157	52,46	73,0	44,69
Canada	30,750	67,65	63,4	28,46
France	58,892	57,93	74,0	49,33
Germany	82,260	61,05	77,0	58,60
Italy	57,298	47,39	67,1	73,73
Japan	126,919	58,58	73,9	52,62
New Zealand	3,831	49,99	70,8	56,33
Republic of Korea	47,300	46,37	74,6	26,82
Spain	40,600	42,12	74,5	60,93
Sweden	8,881	68,20	65,3	71,72
Switzerland	7,204	72,67	68,0	64,39
United Kingdom	59,766	58,86	70,1	72,70
United States of America	275,130	69,97	65,8	39,79

Table 6 shows statistics for the compound annual network growth of the telephone lines and the mobile subscribers for 2000-2001.

Table 6: Statistics for Network growth (compound annual growth rate in %)

	New telephone lines added 2000-2001	New mobile subscribers added 2000-2001
Low Income	8,3	72,4
Lower Middle Income	17,2	70,5
Upper Middle Income	7,4	27,8
High Income	0,3	14,8
Africa	7,6	51,0
Americas	2,1	21,2
Asia	12,4	38,4
Europe	2,4	20,0
Oceania	0,2	26,7
WORLD	6,0	26,7

It is seen that even the highly developed countries experience considerable growth of the mobile subscribers (14,8%), especially in comparison to the growth of the telephone lines (0,3|%).

3. Application of the world telecommunication/ICT indicators to evaluate rural network development

Rural network development has to be evaluated in connection with the evolution of the PSTN telecom network towards the next generation network (NGN).

Present situation could be seen from the telecom indicators in tables 7 and 8 :

- Low and Middle Income countries – big gap between large cities and rural areas telecom development
- Central and East European and CIS countries - still plenty of analogue equipment mostly in rural areas

Table 7: Teledensity statistics for Largest cities

	Population as % of total	Large city teledensity [%]	Rest of country teledensity [%]	Overall teledensity [%]
Low Income	6,0	9,26	2,15	2,54
Lower Middle Income	5,8	24,84	7,30	8,77
Upper Middle Income	16,1	30,77	21,10	22,94
High Income	10,8	57,49	54,83	55,21
Africa	12	6,42	1,39	1,99
Americas	13,6	34,8	21,72	11,39
Asia	4,8	25,97	6,94	7,84
Europe	10,9	48,24	30,19	31,98
Oceania	17,8	45,97	36,77	38,38
WORLD	7,7	17,4	25,25	9,20

Traditionally there is low profit for the telecom operator in these areas, i.e. no business interest for development.

From another hand there is very important social function of the telecom network in such areas, i.e. development is expected to be forced and supported by administrations and regulators.

Table 8: Telecom indicators for Central and East European and CIS countries

Country	Population	GDP	PSTN				Internet	PCs
	Total (M) 2001	Per capita (US\$) 2000	Main lines (thousands) 2001	Density 2001	Digital (%) 2000	Residential (%) 2000	Users for 10'000 inhabitants 2001	For 100 inhabitants 2001
Armenia	3,79	544	529,3	13,97	20,9	90,3	142,05	0,79
Azerbaijan	7,78	490	865,5	11,13	30,4	88,7	32,13	...
Moldova	4,39	294	676,1	15,40	34,0	86,5	136,67	1,59
Tajikistan	6,13	178	223,0	3,63	7,5	79,0	5,22	...
Ukraine	50,30	608	10 669,6	21,21	7,9	82,4	119,29	1,83
Uzbekistan	25,26	676	1 663,0	6,58	33,8	84,2	59,39	...
Albania	3,97	940	197,5	4,97	78,9	91,0	25,19	0,76
White Russia	10,25	814	2 857,9	27,88	35,8	83,7	411,87	...
Bosnia	4,07	1 178	450,1	11,07	41,6	83,2	110,65	...
Bulgaria	8,11	1 473	2 913,9	35,94	12,0	88,2	746,27	4,43
Kazakhstan	16,09	973	1 834,2	11,31	29,3	88,8	61,64	...
Latvia	2,35	2 930	724,8	30,83	52,2	81,7	723,10	15,31
Lithuania	3,68	3 042	1 151,7	31,29	46,5	84,2	679,16	7,06
Rumania	22,39	1 636	4 094,0	18,28	54,8	88,2	446,63	3,57
Russia	146,76	1 709	35 700,0	24,33	27,1	79,0	293,00	4,97
Macedonia	2,04	1 705	538,5	26,35	71,2	88,5	342,47	...
Turkmenistan	4,84	582	387,6	8,02	20,4	80,3	16,55	...
Yugoslavia	10,68	1 067	2 443,9	22,88	53,0	88,5	561,80	2,34
Croatia	4,66	4 253	1 700,0	36,52	76,0	82,6	558,91	8,59
Czech Republic	10,27	4 931	3 846,0	37,43	85,7	68,8	1 362,66	12,14
Estonia	1,43	3 455	503,6	35,21	71,2	80,1	3 004,59	17,48
Hungary	9,97	4 561	3 730,0	37,40	85,8	86,6	1 484,01	10,03
Poland	38,63	4 078	11 400,0	29,51	77,6	76,7	983,72	8,54
Slovak Republic	5,40	3 540	1 556,3	28,80	70,0	74,2	1 203,26	14,81

Important indicator to justify the evolution towards the next generation network is the application of the Information technology as Internet users and penetration with home PCs.

Table 9: Density statistics for Information technology

	Internet hosts per 10000 inhabitants	Internet users per 10000 inhabitants	PCs per 100 inhabitants
Low Income	0,98	62,21	0,59
Lower Middle Income	4,32	264,94	2,45
Upper Middle Income	78,69	992,66	8,24
High Income	1 484,20	3 992,87	37,31
Africa	3,38	84,89	1,06
Americas	1 332,97	2 164,28	26,57
Asia	28,73	433,97	2,18
Europe	191,47	1 804,54	17,94
Oceania	885,26	2 771,59	39,91
WORLD	232,66	820,81	7,74

It is easily seen that there is a big gap between the highly developed countries and the rest of the world.

What could not be seen from the statistics is the expected very uneven distribution of the information technology between large cities and rural areas.

In any case conclusion could be that the evolution towards the next generation network in the rural areas have to be considered very carefully.

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