ITU/BDT Regional Seminar on
Broadband Wireless Access (BWA)
for rural and remote areas for Africa

Session 6b_27

Planning of Broadband Wireless Access for Rural and Remote Areas

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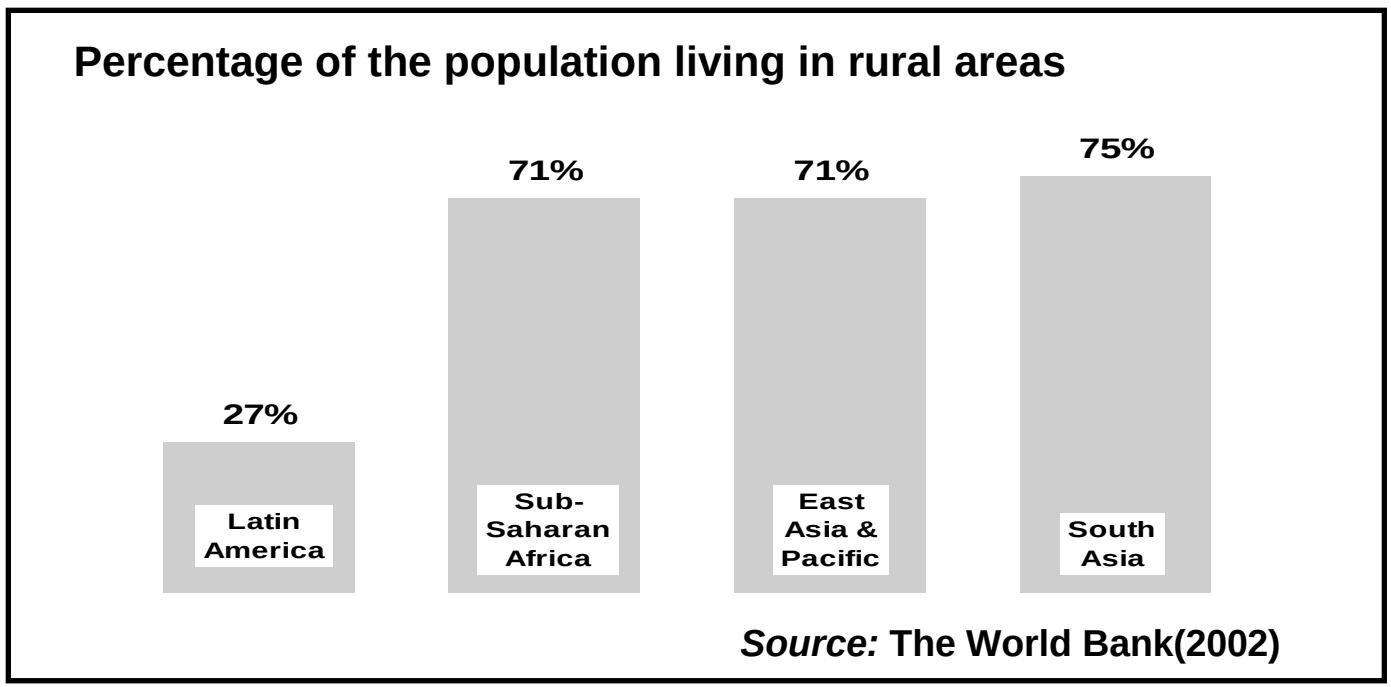
Presentation : motivation and content:

Rural and remote areas telecom case :

- **usually not interesting from business point of view**
- **telecom development should be supported by government**



Rural population and teledensity

1 : 4,3

1 : 3,4

1 : 1,5

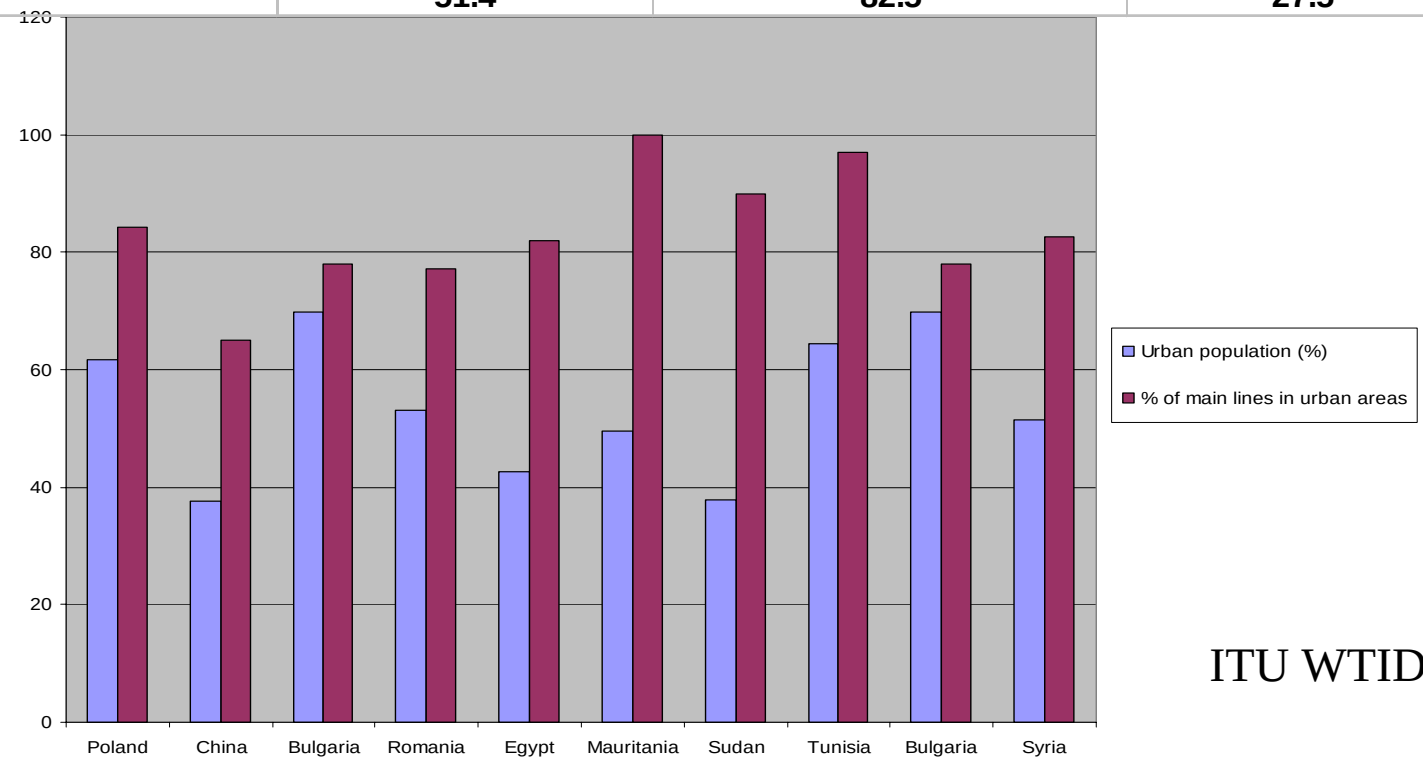
1 : 1,05

	Population of large cities as %	Large city teledensity [%]	Rural areas teledensity [%]	Overall teledensity [%]
Low Income	6,0	9,26	2,15	2,54
Lower Middle	5,8	24,84	7,30	8,77
Upper Middle	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

ITU WTID 2004

Largest cities vs. rural areas in some countries

Country	Urban population (%)	% of main lines in urban areas	Total teledensity [%]
Egypt	42.6	82.0	24.4
Mauritania	49.5	100.0	14.1
Sudan	37.9	90.0	6.0
Tunisia	64.4	97.0	48.0
Djibouti	99.0	100.0	5.0
Kuwait	98.0	98.0	96.2
Libya	86.2	60.0	15.9
Palestine	90.0	80.0	36.1
Qatar	91.8	99.0	110.0
Syria	51.4	82.5	27.5



ITU WTID 2004

Largest cities vs. rural areas - user behaviour

Findings of the United Nations :

- **all growth in population will concentrate in urban areas, no growth in rural areas**
- **most of the growth will concentrate in urban areas of less developed regions**

Users will concentrate in urban areas, as urban areas put higher pressure on the individual to "do what the others do" and from technical point it is easier to connect people in urban areas

IT density as bases for BB services requiring PC/Internet access

Density statistics for Information technology :

	Internet hosts per 10 000 inhabitants	Internet users per 10 000 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

Ratio Low Income/High Income : 1 : 64 1 : 63

Sub-Saharan Africa region :

Low Income : 39

Lower middle Income : 4

Upper middle Income : 5

High Income : 1

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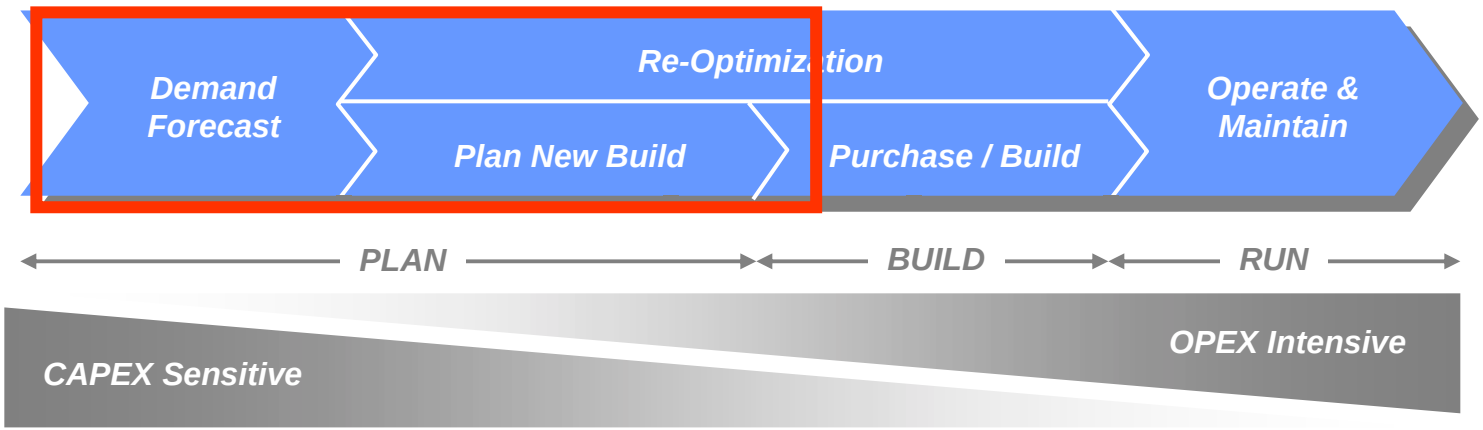
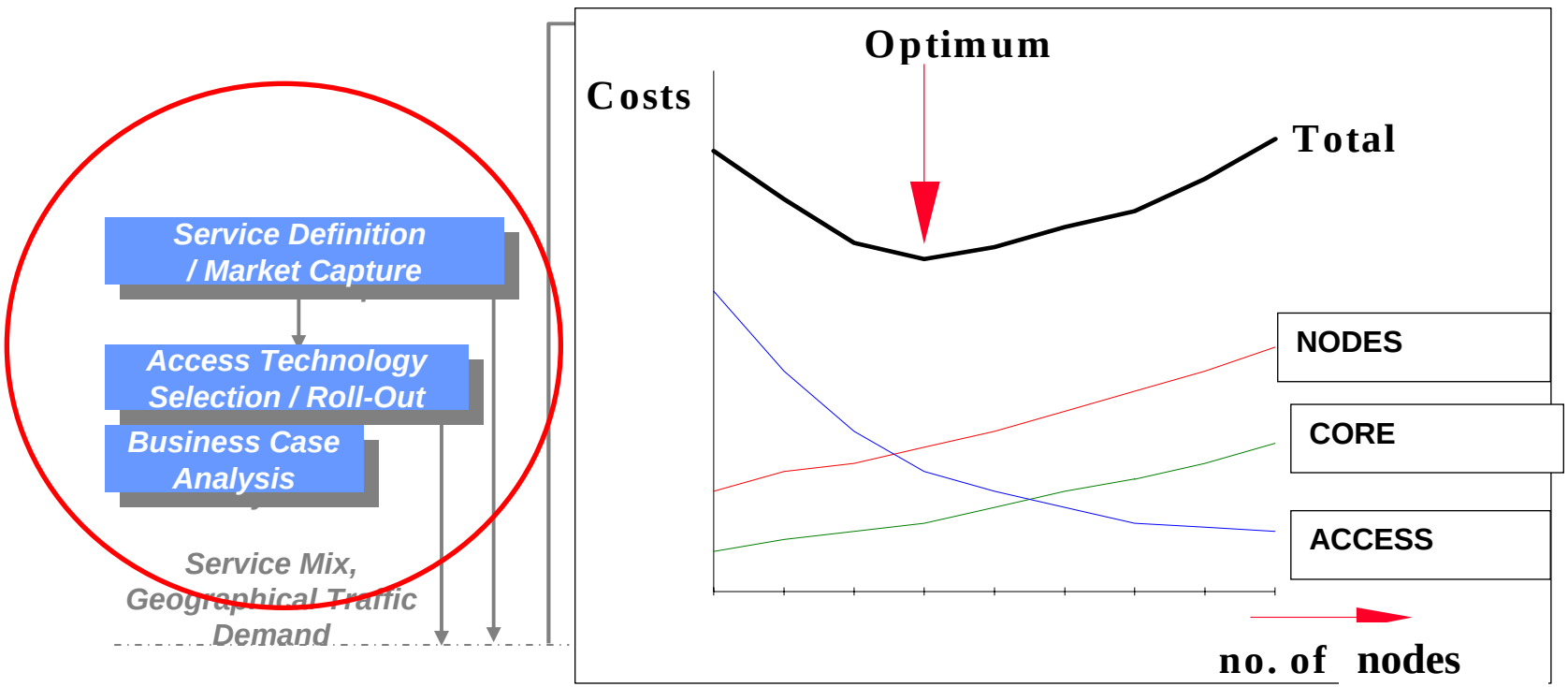
Planning of broadband wireless access

Network planning

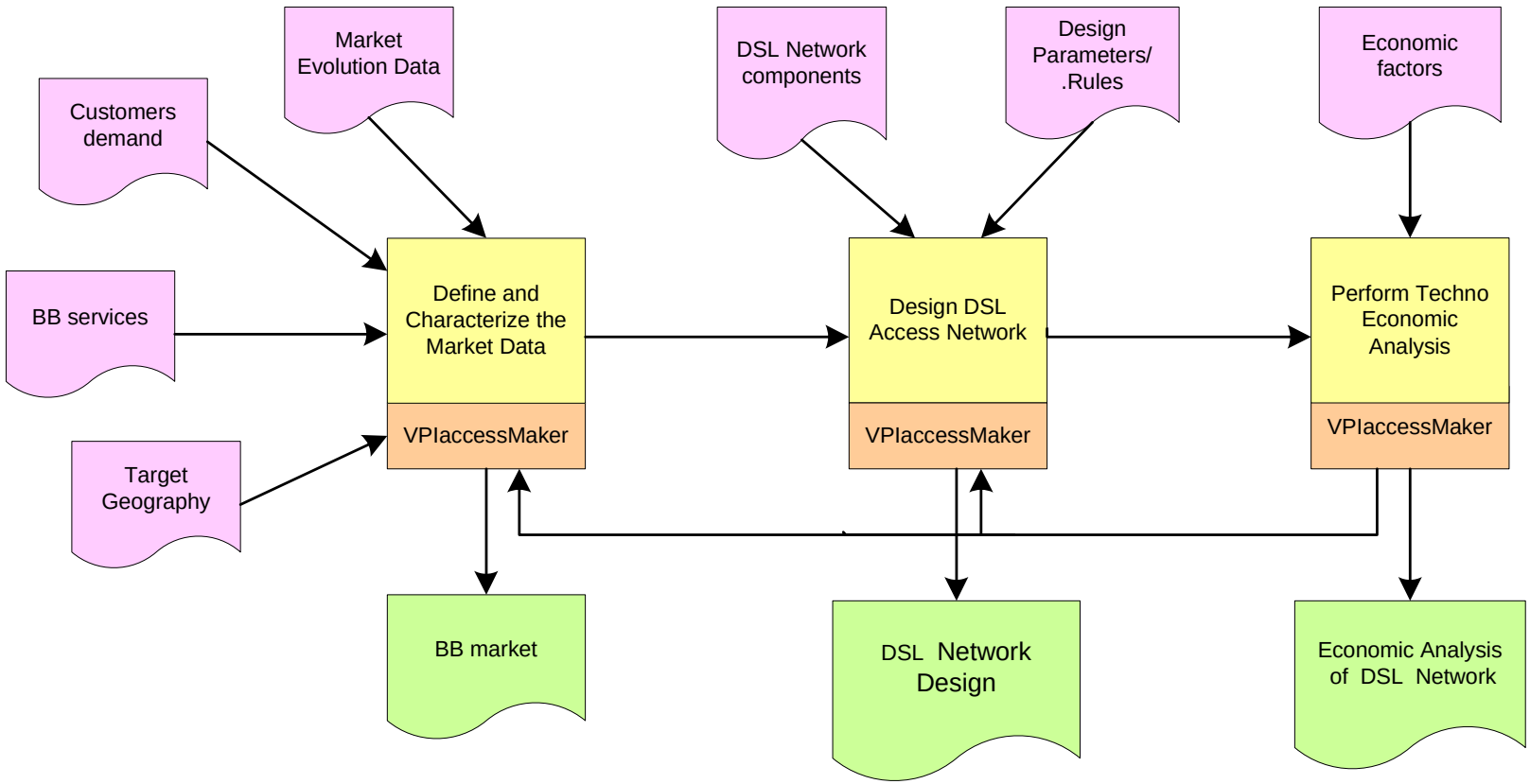




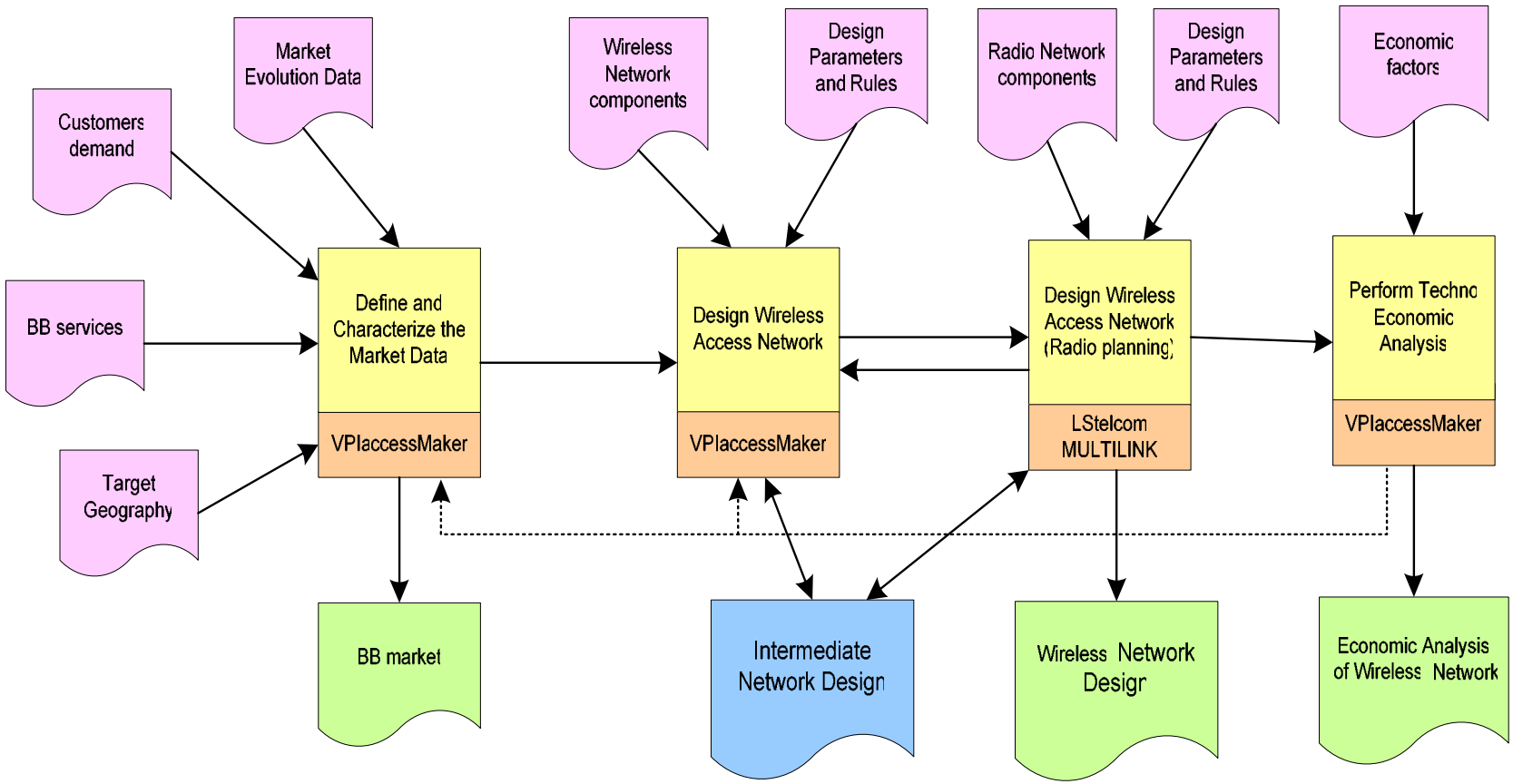
Planning case studies performed with available network planning tools

- The case studies present the planning process that needs to be performed for evaluation of wireless broadband access in rural and remote areas
- Planning includes market definition and optimization of the access network. First access network is optimized regardless of the terrain characteristics, then network is analysed for coverage and result is adjusted correspondingly
- The case studies are planned with professional NP tools, available through ITU partners

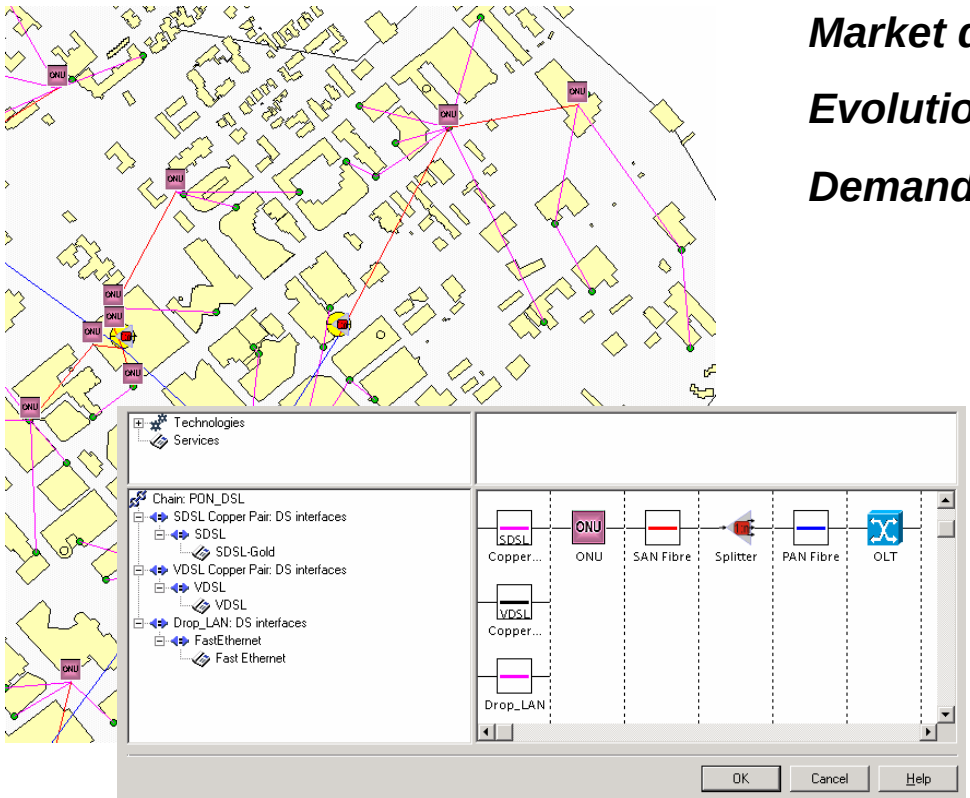
Planning process for planning of wireline (DSL) BB access network



Planning process for planning of wireless BB access network



Planning tools (Access Maker)



Technology modeling

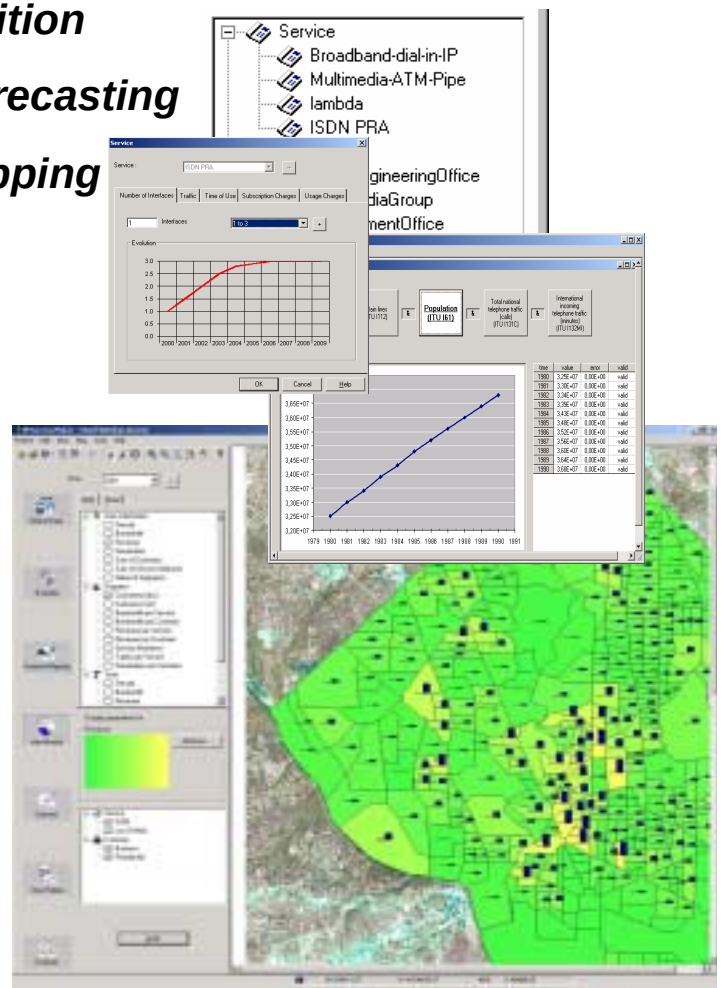
Network design optimization

Roll-out results

Market definition

Evolution forecasting

Demand mapping



Market capture for a service provider

Planning tools – (Radio Planning)

complete solution for fast microwave link engineering and designing of Radio networks.

It can be used for planning and optimizing single links (e.g. path loss, coverage and availability calculations) as well as for doing network-wide analysis (e.g. interference calculation, channel assignment).

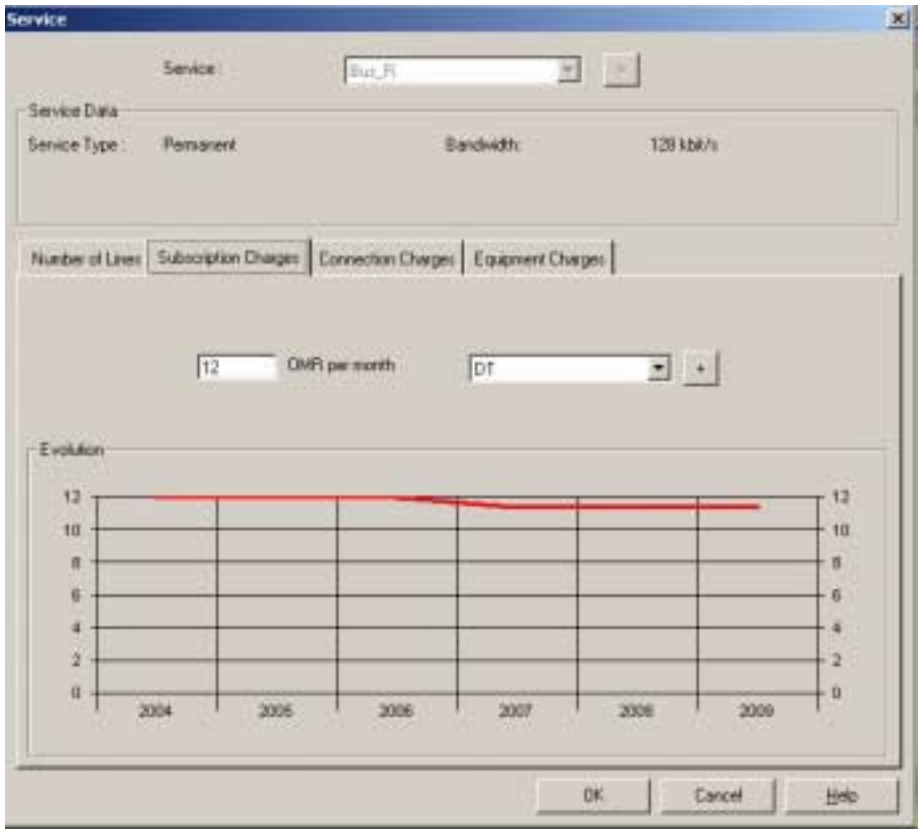
Oman – Test Case study

ITU/BDT Arab Regional Workshop on

"Wireless Network Evolution"

Muscat-Oman, 03-05 May 2004

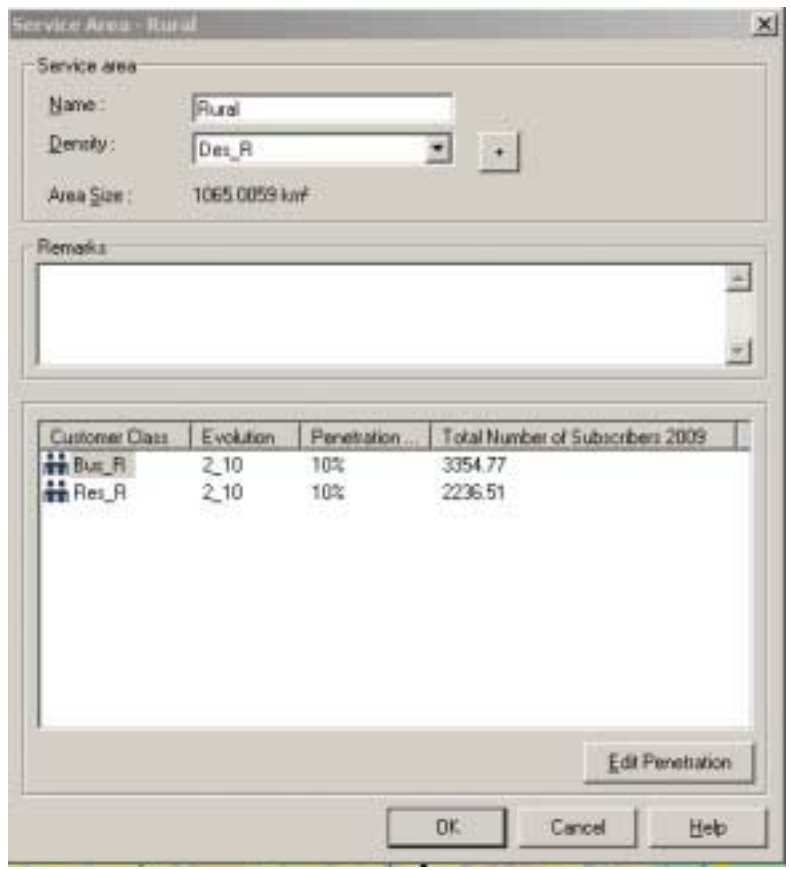
Case study Oman - Market forecasting:



- **Permanent service –**

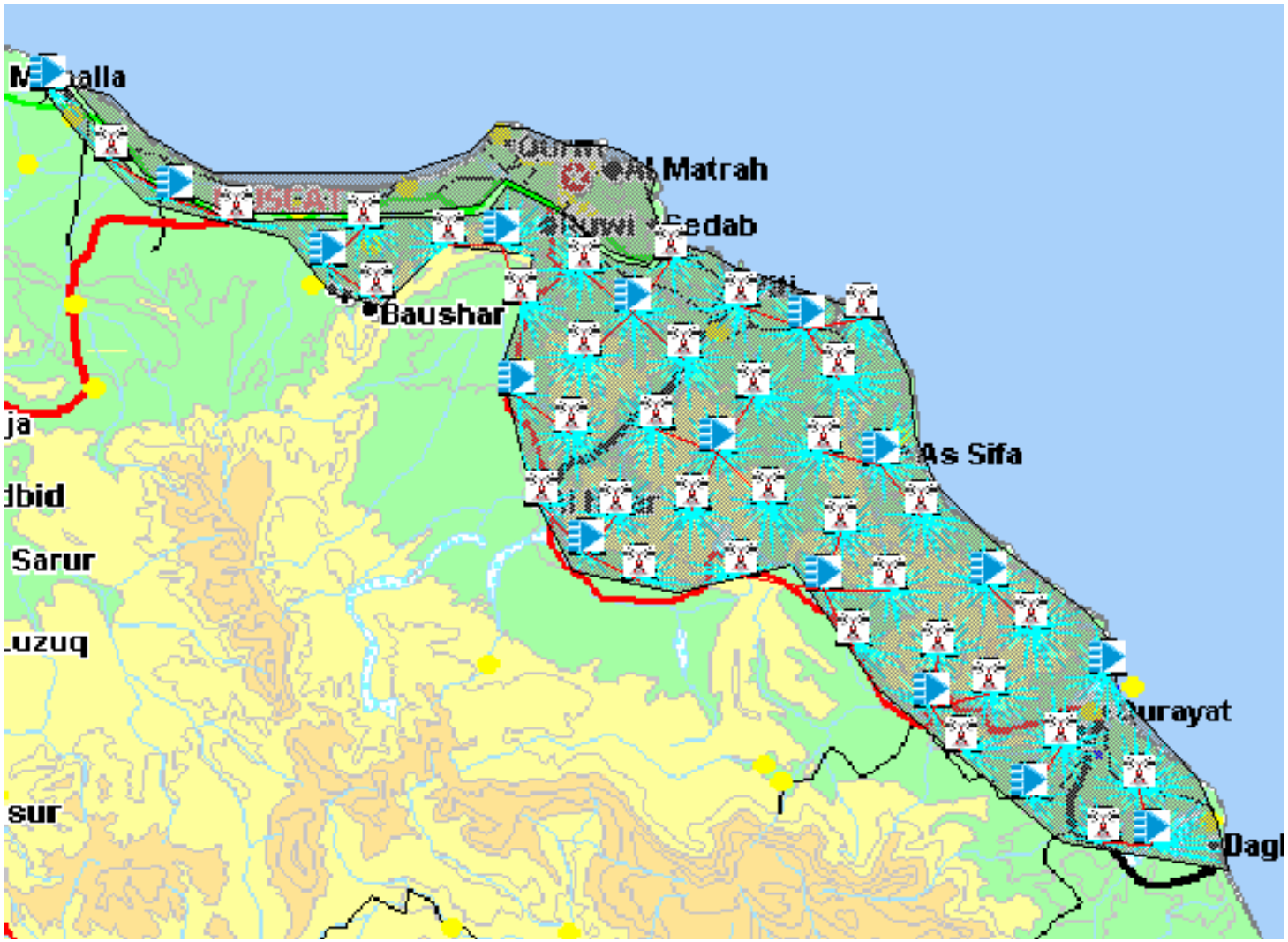
Residential - connection at 64 Kbit/s

Business - connection at 128 Kbit/s

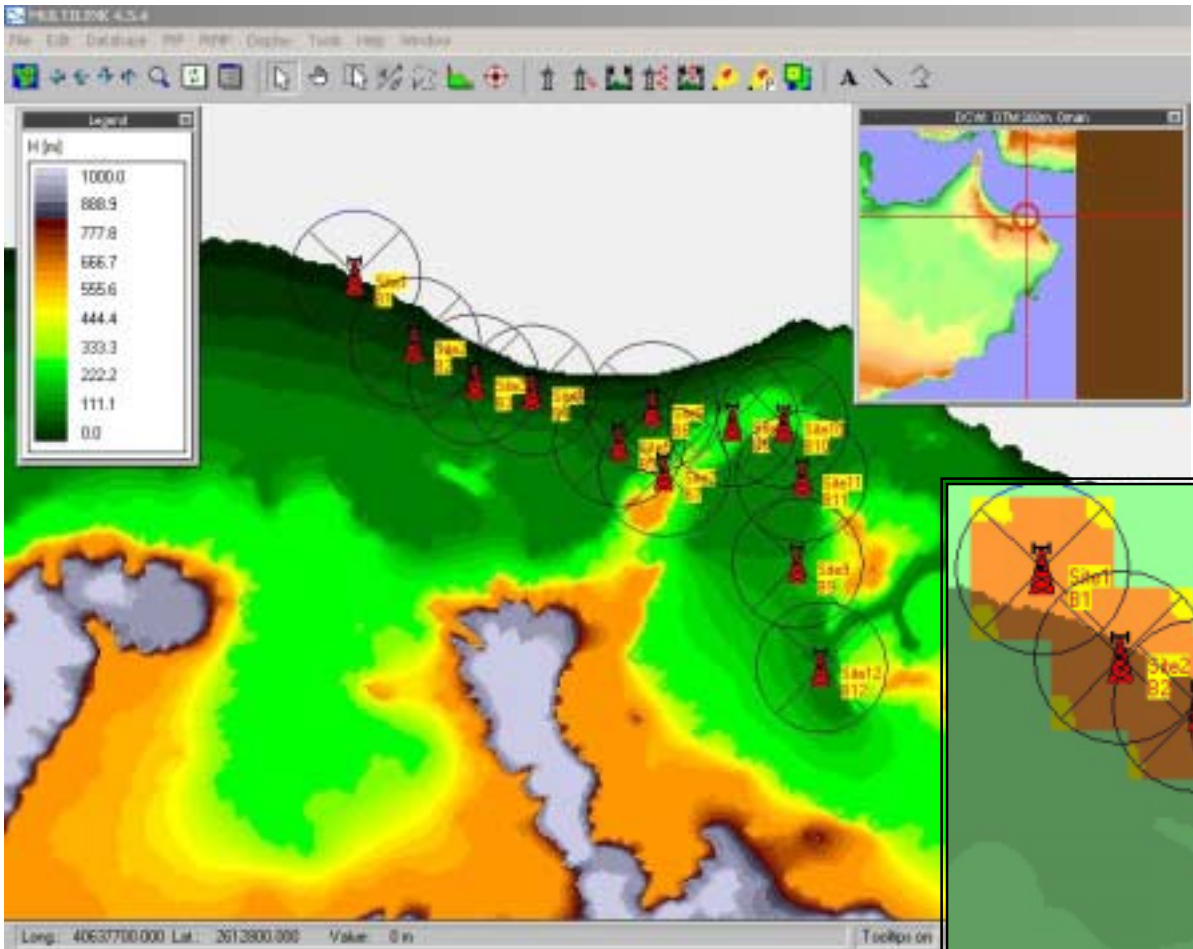


- **Market based on inhabitants / households per sq. km. and penetration from 2% to 10%**

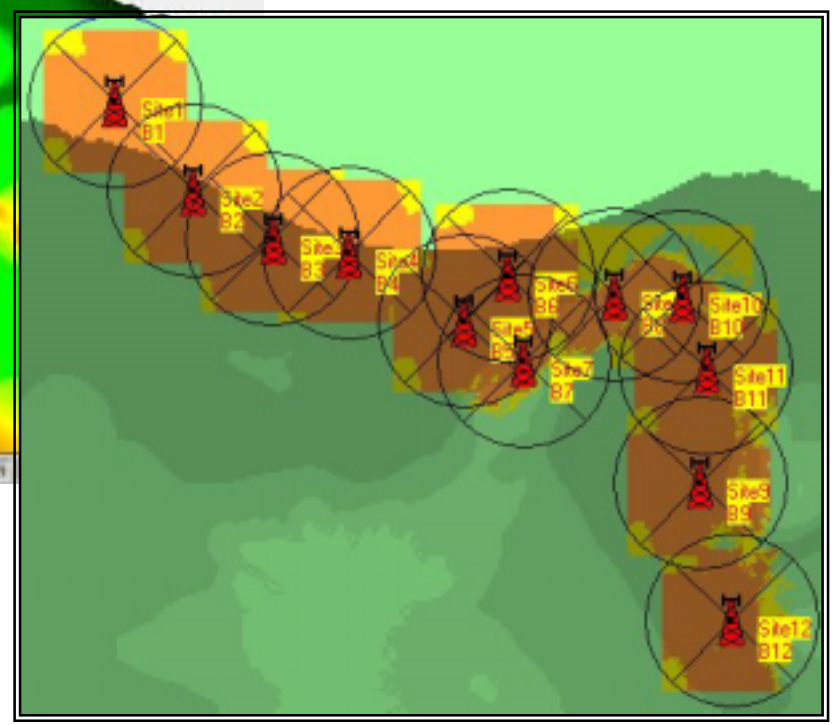
Case study Oman - Planning process :



Case study Oman - Planning wireless :



BS coverage calculation



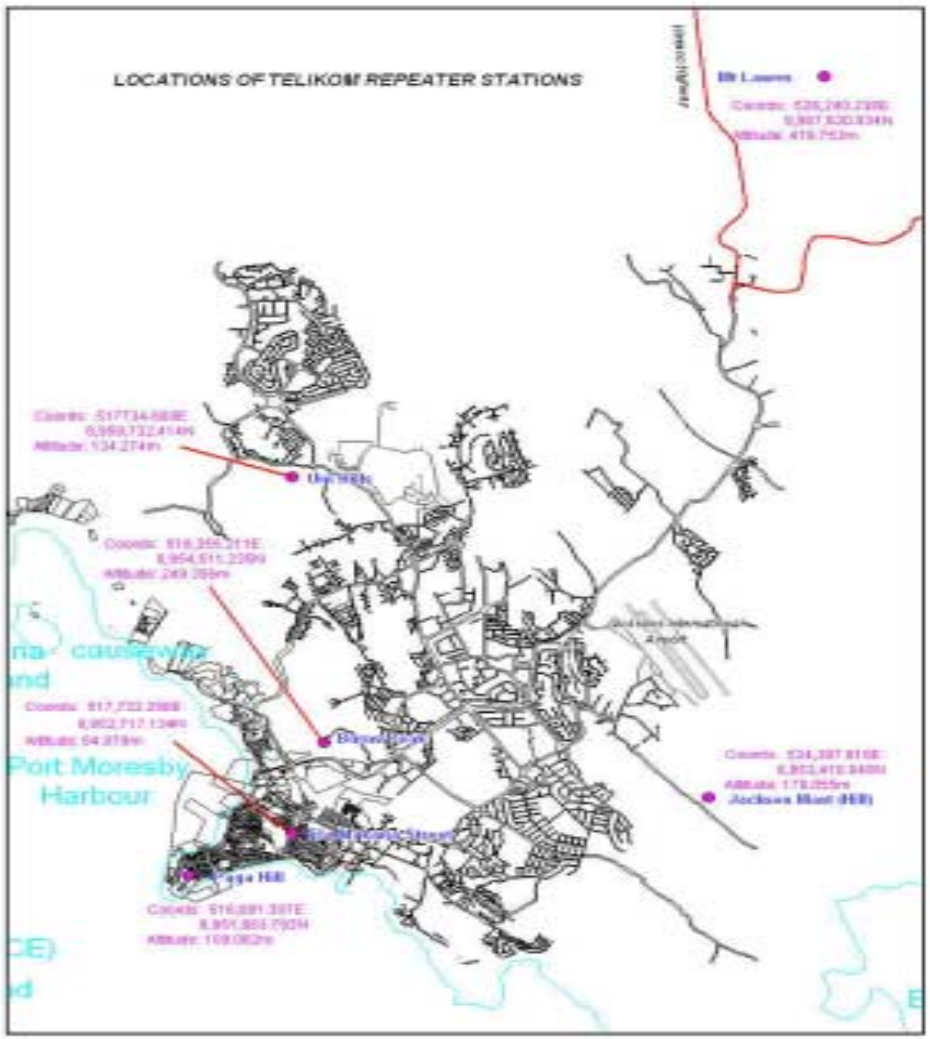
Max server coverage

Case study – Papua New Guinea :

Suburban / Rural market – Port Moresby area

TELIKOM planning team

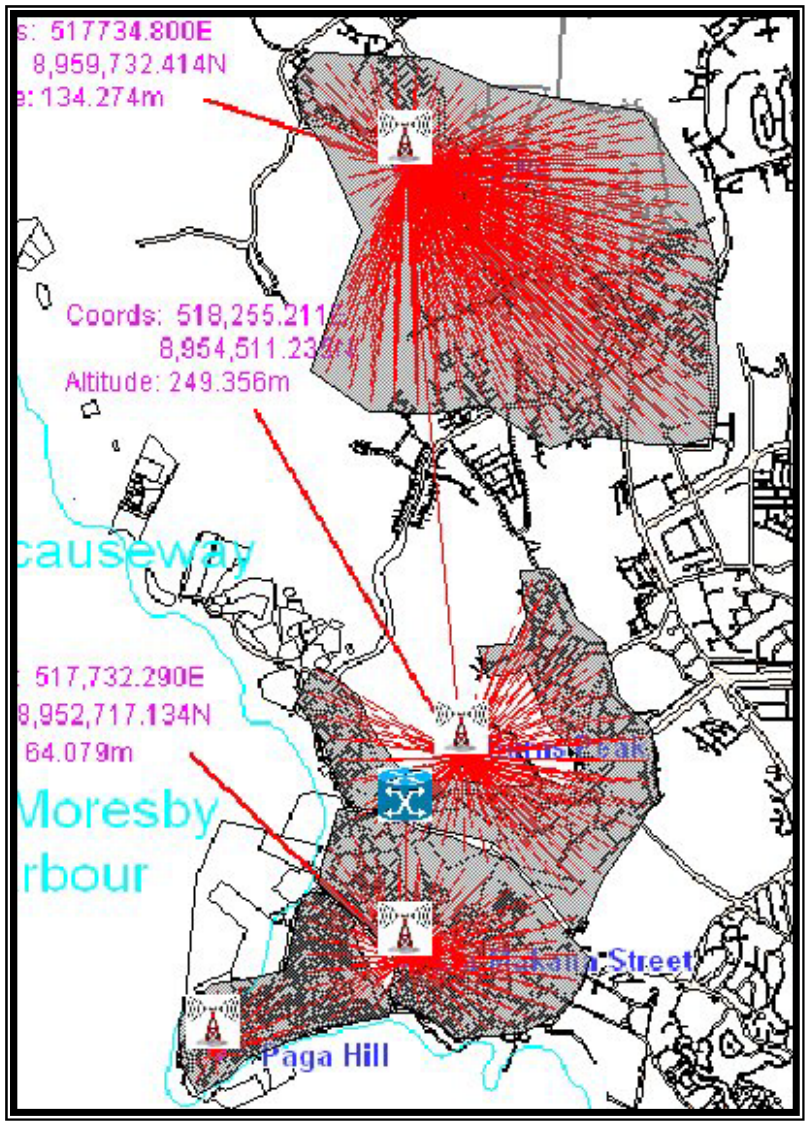
Case study Papua New Guinea – Suburban and rural area :



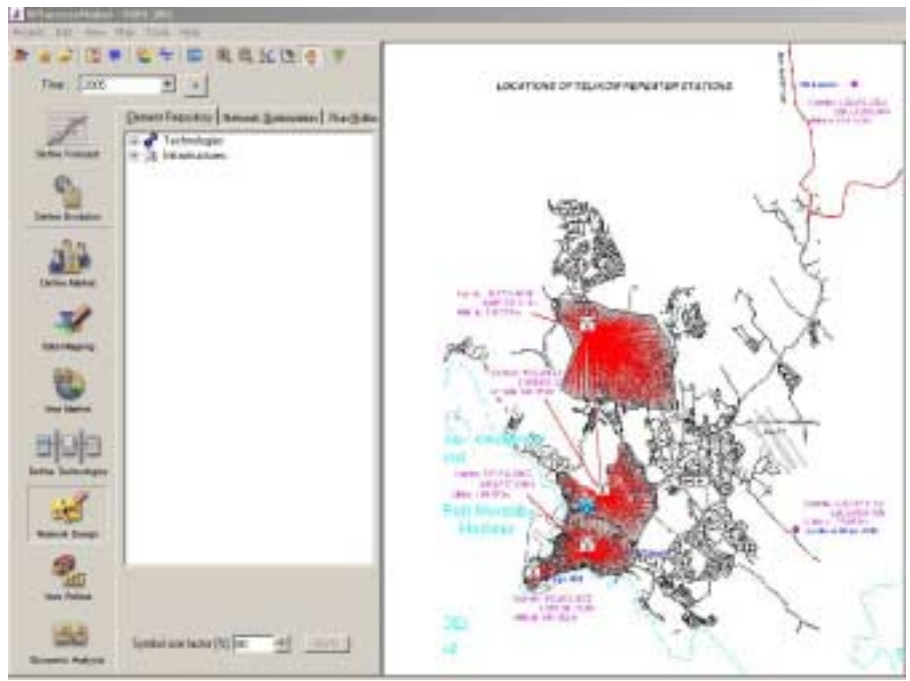
User per sector:	**254**
Sector payload:	**18 Mbps**
Radius per BS:	**3 KM**
Frequency of Operation:	**2.3, 2.4 GHz**
Bandwidth:	**3.5 MHz**

TELIKOM planning - wireless BB access

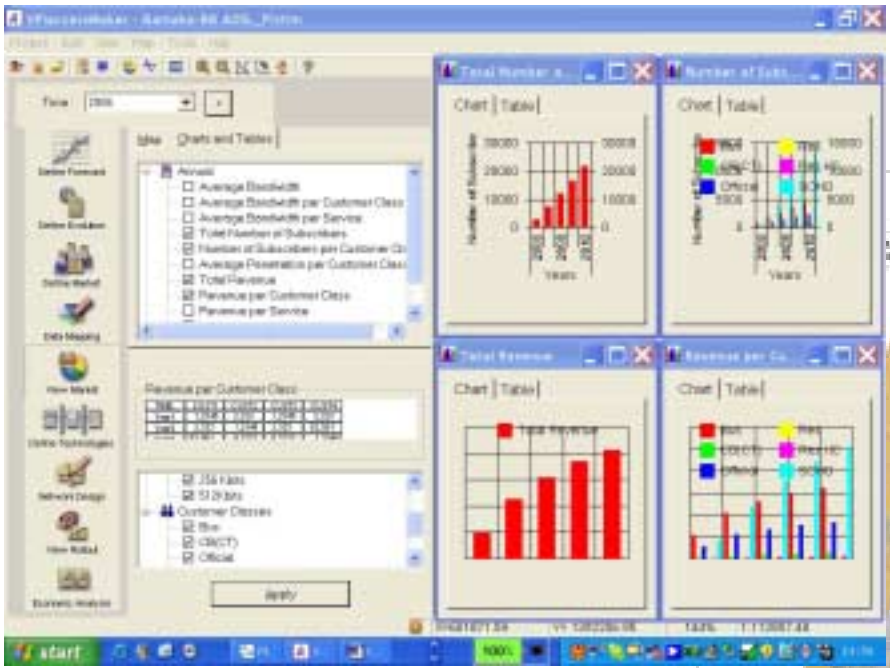
Case study Papua New Guinea – Planning process :

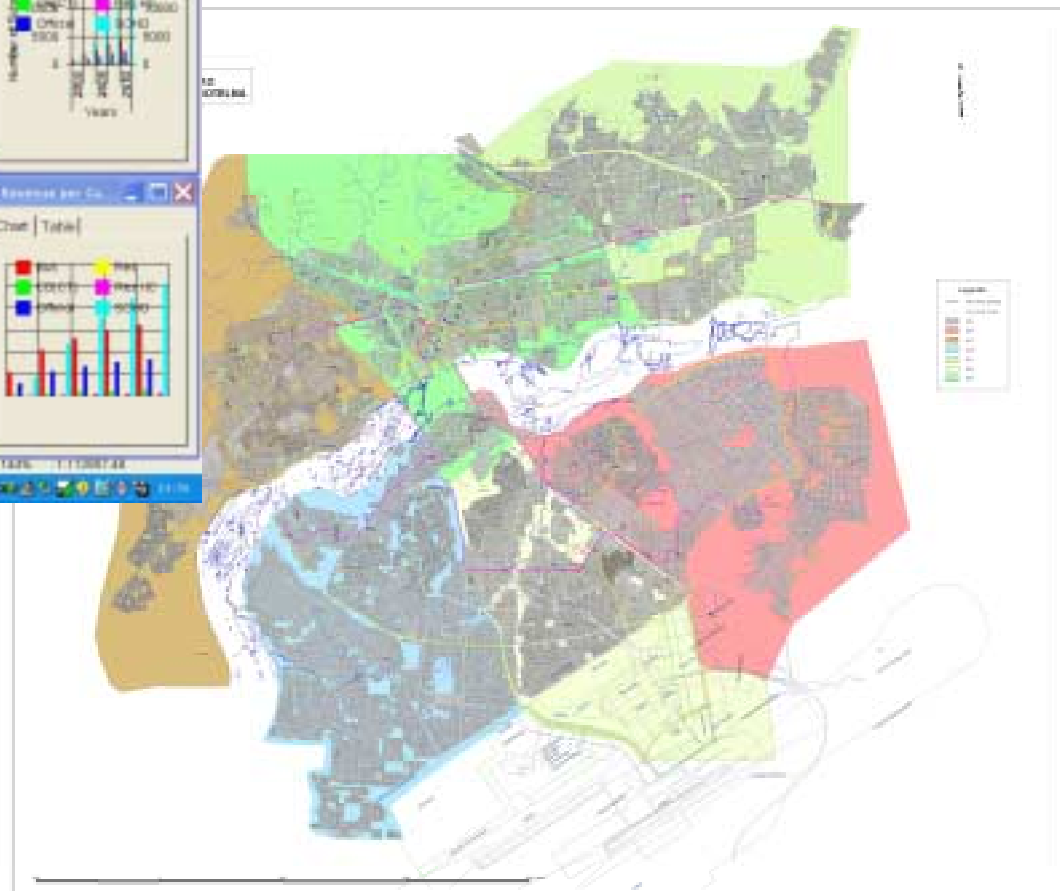


optimization of service areas



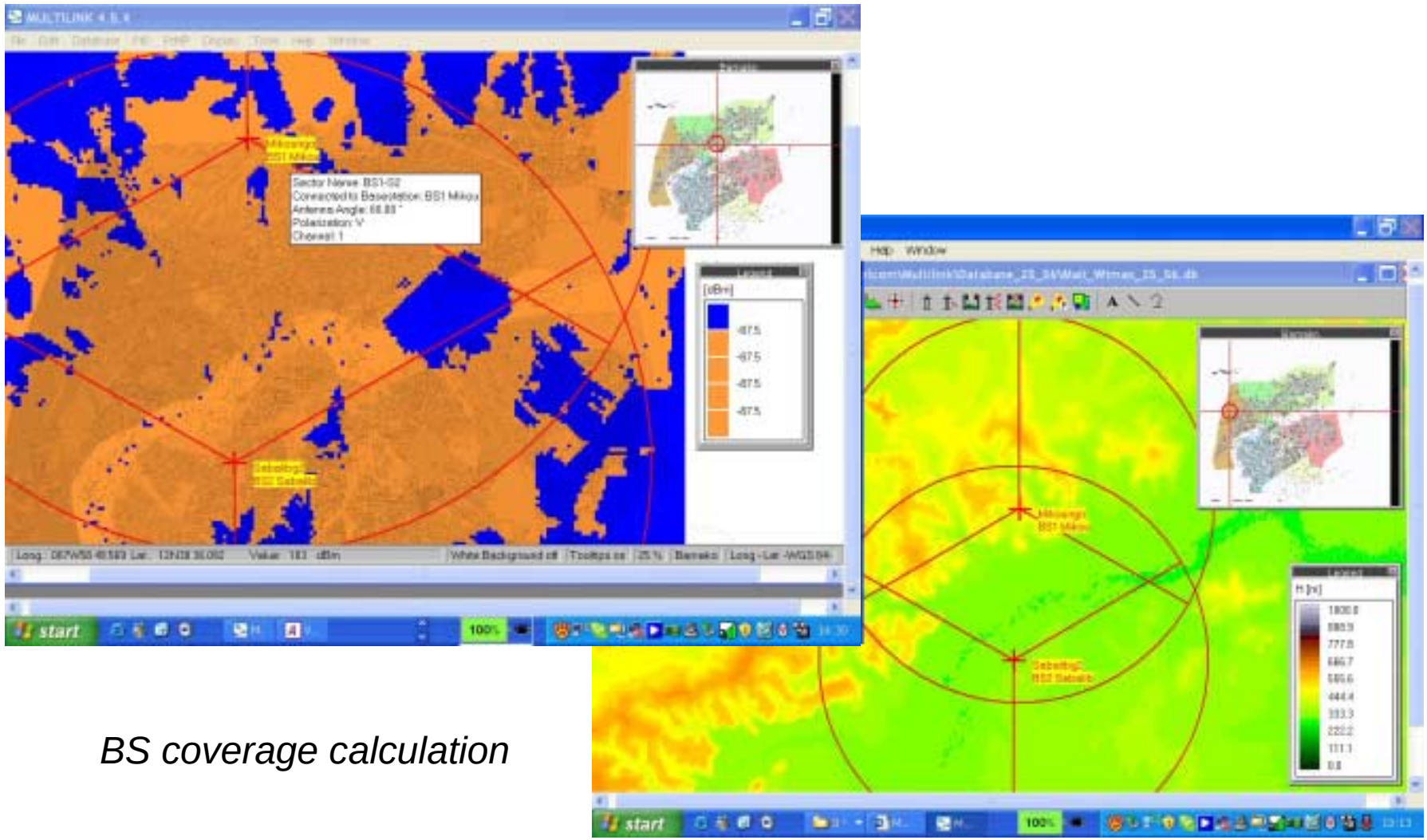
Case study Bamako - suburban area :





Wireline xDSL
and
WiMAX overlay

Case study Bamako - Planning wireless :



BS coverage calculation

Conclusions for planning of bradband wireless access

- Service/market forecasting, access network optimization and economic analysis are main phases of planning also for broadband wireless access in rural and remote areas
- Planning of broadband wireless access requires additional analysis with regard to evaluation and optimization of the terrain coverage
- Effective planning of broadband wireless access in rural and remote areas includes application of appropriate planning tools