ITU-T/ITU-D Seminar on Standardization and Development of NGN for the Arab region

Session 9

Planning of Broadband Wireless Access for Rural and Remote Areas

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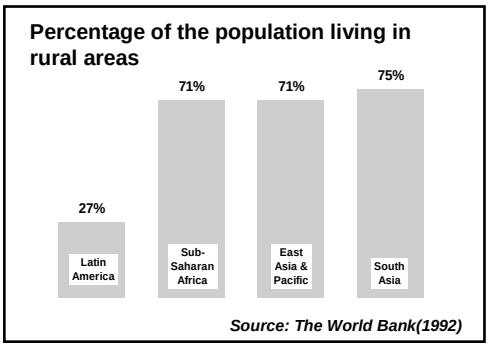
ITC, Bulgaria

Introduction

Rural and remote areas telecom case :

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



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**

Rural population and teledensity

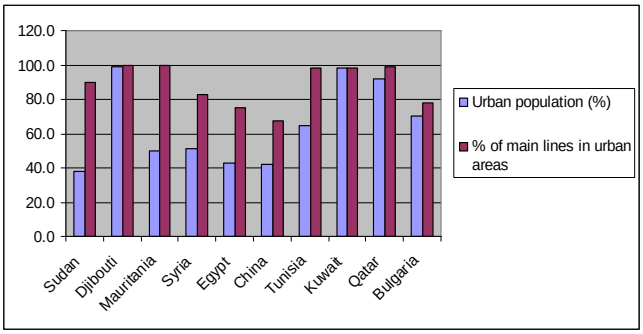
	Population of large cities as %	Large city teledensity [%]	Rural areas teledensity [%]	Overall teledensity [%]
Low Income	6,0	9,26	2,15	2,54
Lower Middle	5,8	24,84	7,30	8,77
Upper Middle	16,1	30,77	21,10	22,94
High Income	10,8	57,49	54,83	55,21
Africa	12	6,42	1,39	1,99
Americas	13,6	34,8	21,72	11,39
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

1 : 4,3
1 : 3,4
1 : 1,5
1 : 1,05

ITU WTID 2002

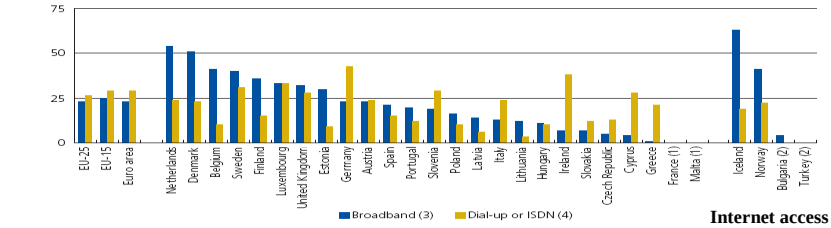
Largest cities vs. rural areas in some countries

Country	Urban population (%)	% of main lines in urban areas	Total teledensity [%]
Egypt	42.6	74.8	32.5
Mauritania	49.5	100.0	25.6
Sudan	37.9	90.0	7.1
Tunisia	64.4	98.0	68.8
Djibouti	99.0	100.0	7.9
Kuwait	98.0	98.0	107.6
Qatar	91.8	99.0	110.0
Syria	51.4	82.5	27.5
China	41.8	67.4	56.5
Bulgaria	70.0	78.0	113.1

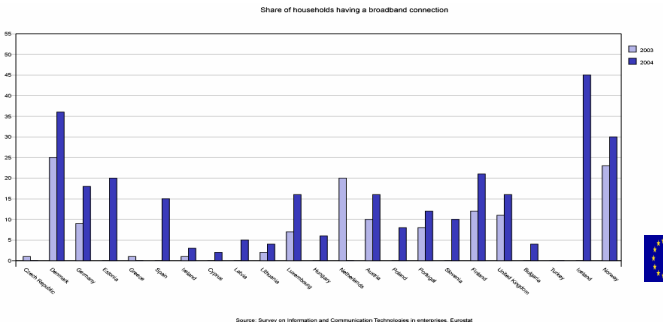


ITU WTID 2006

Broadband connection – statistics



Internet access of households by type of connection, 2005 (Yearbook 2006-07)



Eurostat

IT density as bases for BB services

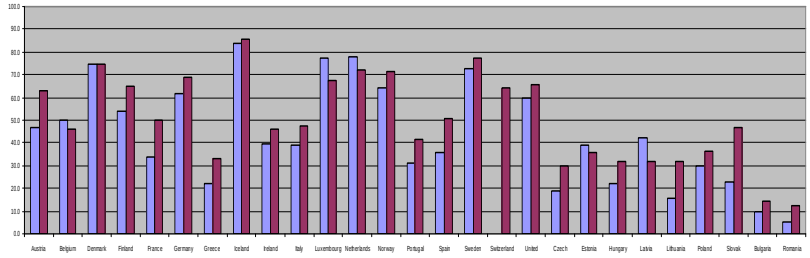
	Internet hosts per 10 000 inhabitants	Internet users per 10 000 inhabitants	PCs per 100 inhabitants
Low Income	1	62	0,6
Lower Middle Income	4,3	264,9	2,5
Upper Middle Income	78,7	992,7	8,2
High Income	1 484	3 992	37
Africa	3,4	84,9	1,1
Americas	1 333	2 164	26,6
Asia	28,7	434	2,2
Europe	191,5	1 804,5	18
Oceania	883,3	2 771,5	39,9
WORLD	232,7	820,8	7,7

ITU WTID 2002

Low/High Income:

1 / > 60

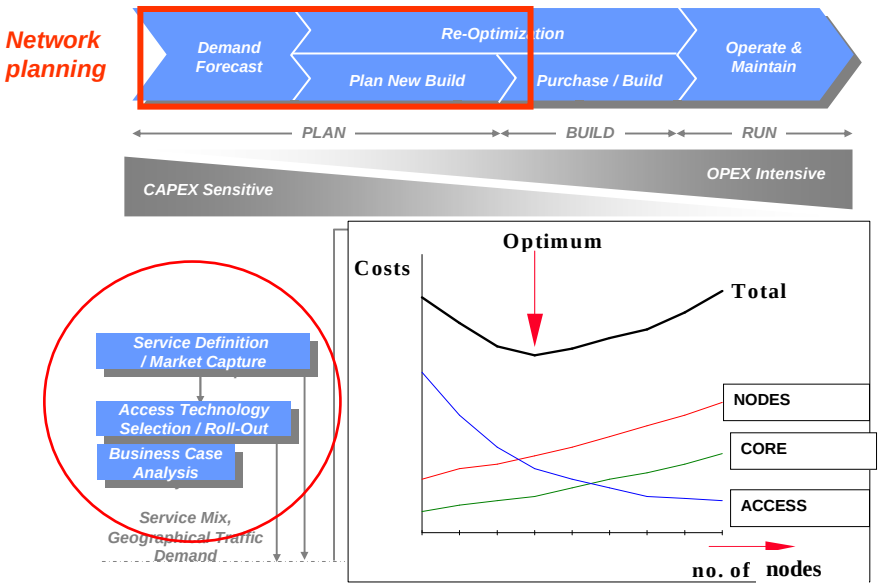
Source :
ITU Database 2006



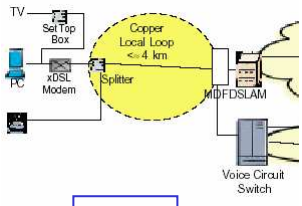
EU Project - Broadband for All

- To develop the network technologies and architectures allowing a generalised and affordable availability of broadband access to European users, including those in **less developed regions, peripheral and rural areas**.
- Optimised access technologies, as a function of the operating environment, **at affordable price** allowing for a generalized introduction of broadband services in Europe including less developed regions

Planning of broadband wireless access

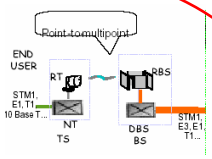


Broadband access technologies

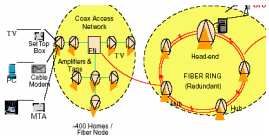


xDSL

SAT

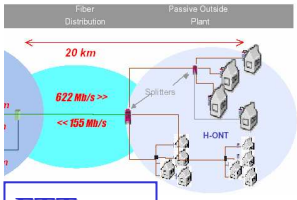


WLL



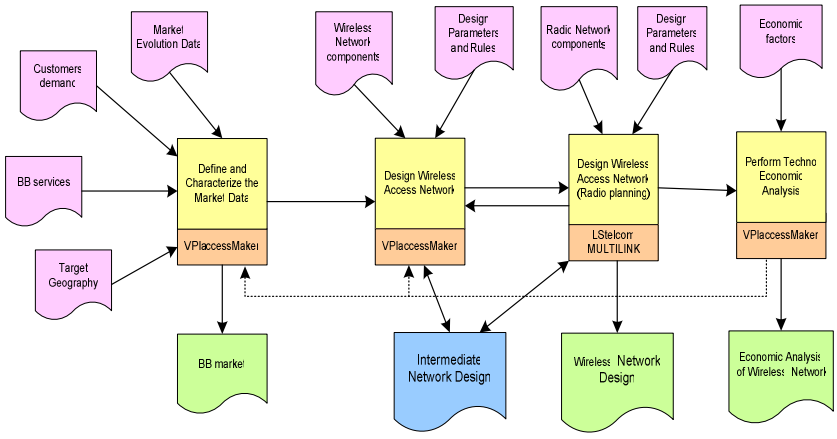
HFC

Power line



FTTx

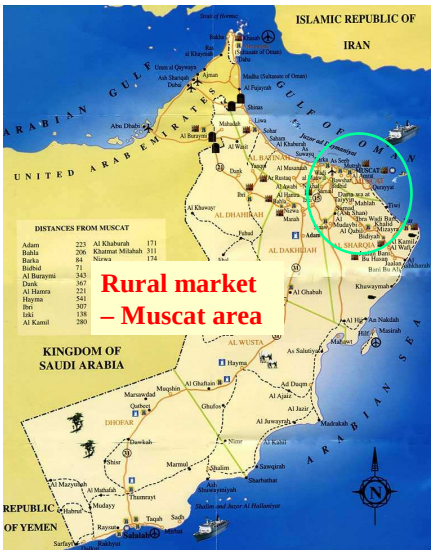
Planning process for planning of wireless BB access network



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

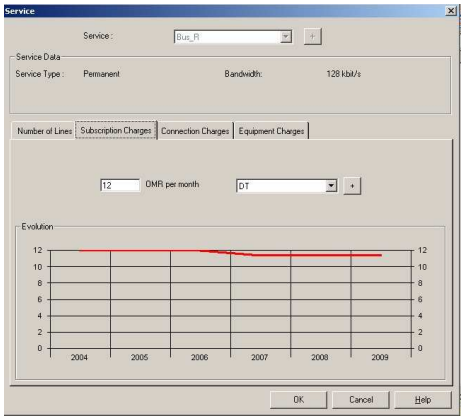
Oman – Test Case study



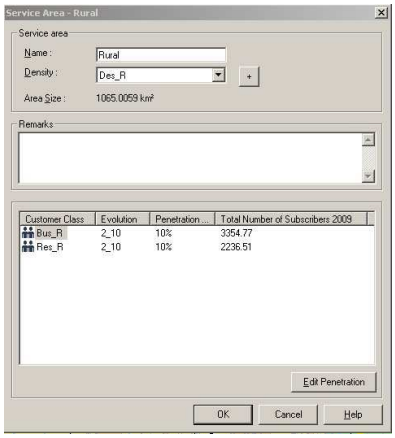
ITU/BDT Arab Regional Workshop on "Wireless Network Evolution"

Muscat-Oman, 03-05 May 2004

Case study Oman - Market forecasting:

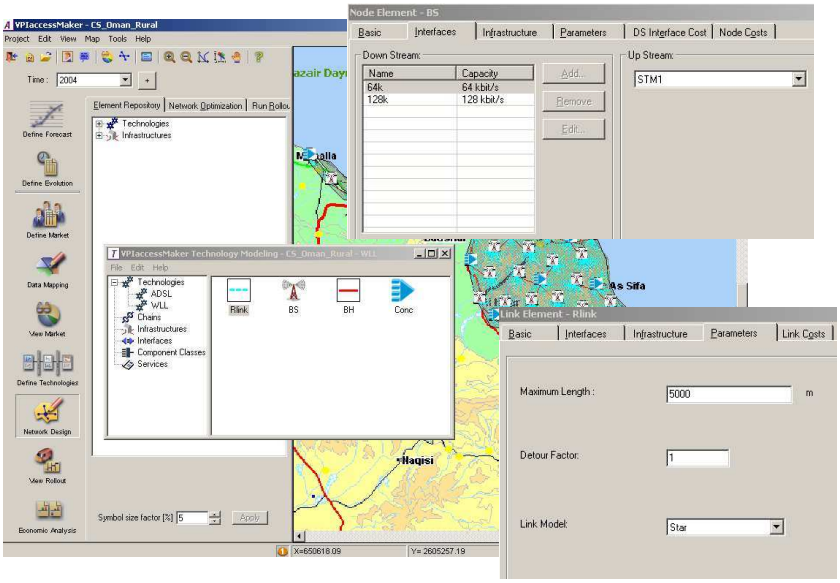


➢ **Permanent service –**
Residential - connection at 64 Kbit/s
Business - connection at 128 Kbit/s

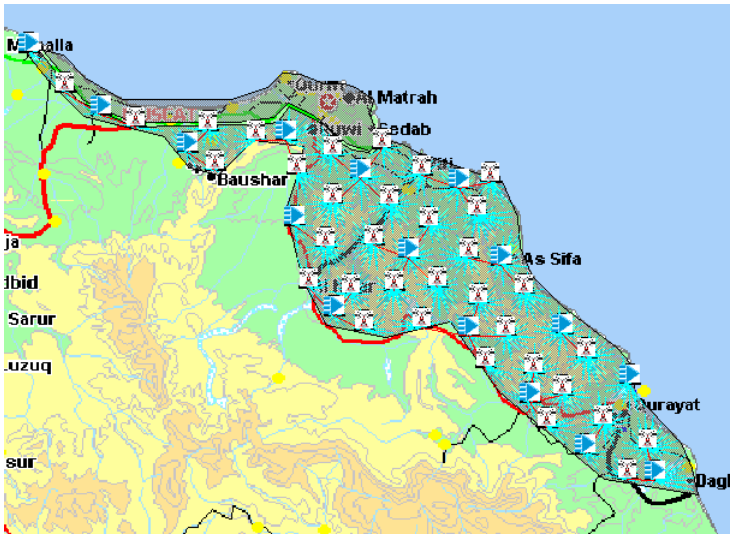


➢ **Market based on inhabitants / households per sq. km. and penetration from 2% to 10%**

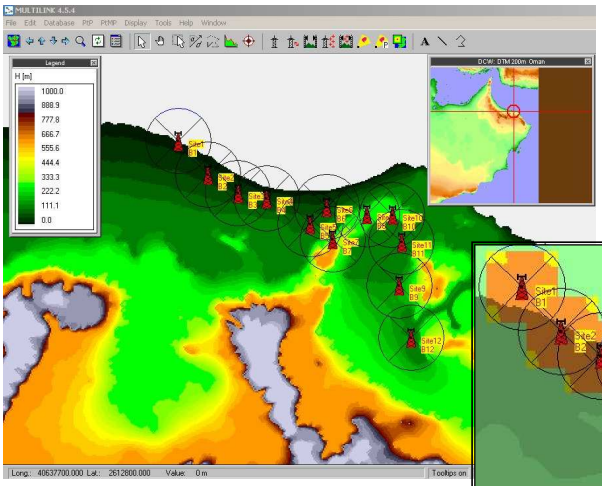
Case study Oman - Technology definition :



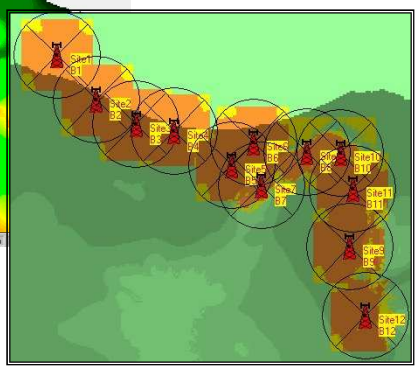
Case study Oman - Planning process :



Case study Oman - Planning wireless :

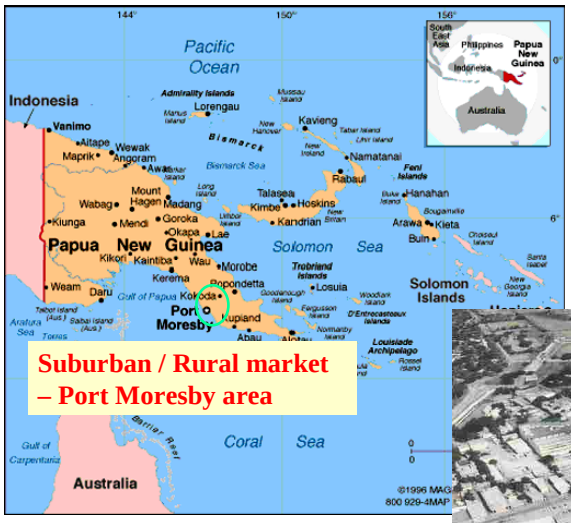


BS coverage calculation

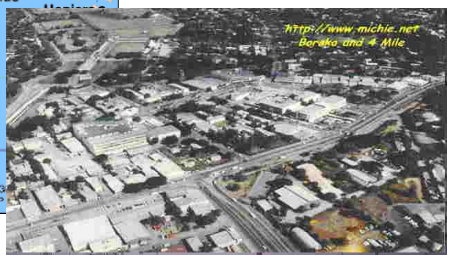


Max server coverage

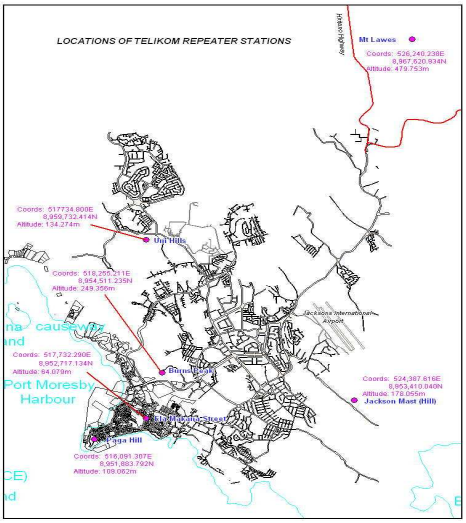
Case study – Papua New Guinea :



TELIKOM planning team



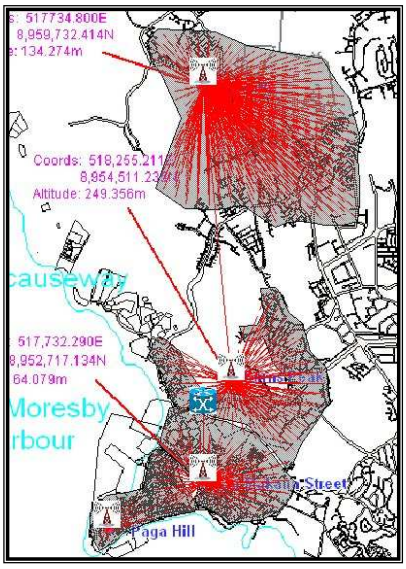
Case study Papua New Guinea – Suburban and rural area :



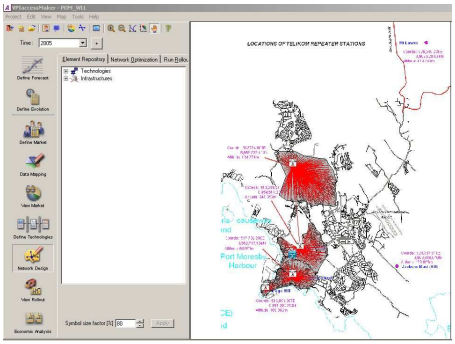
User per sector:	**254**
Sector payload:	**18 Mbps**
Radius per BS:	**3 KM**
Frequency of Operation:	**2.3, 2.4 GHz**
Bandwidth:	**3.5 MHz**

TELIKOM planning - wireless BB access

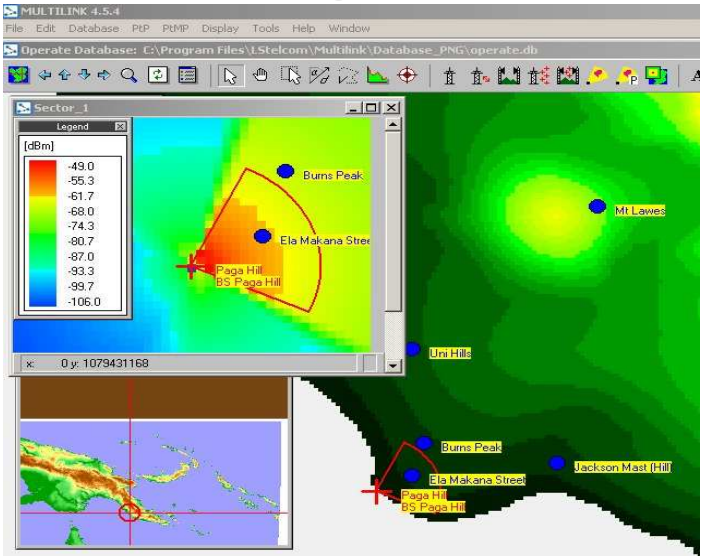
Case study Papua New Guinea – Planning process :



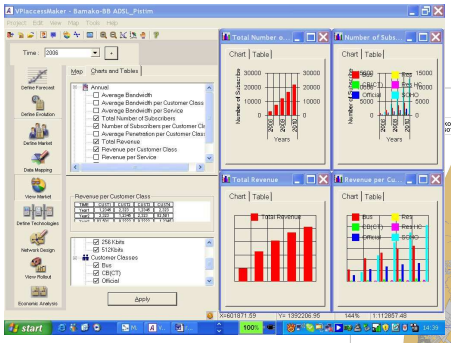
optimization of service areas

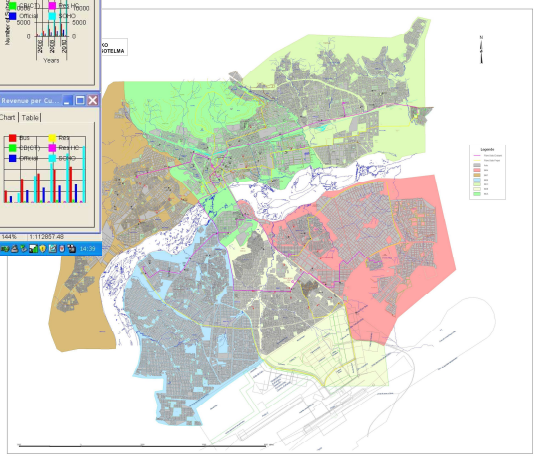


Case study Papua New Guinea – Planning wireless :



Case study Bamako - suburban area :

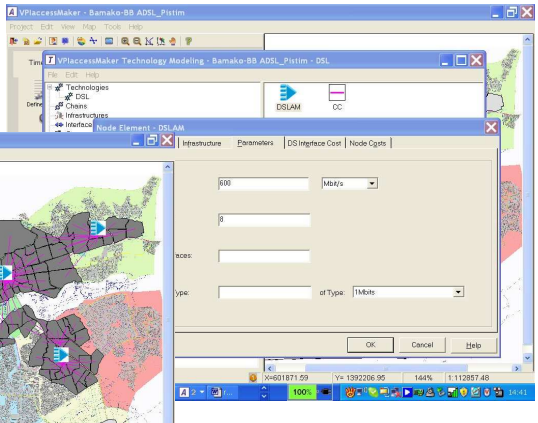


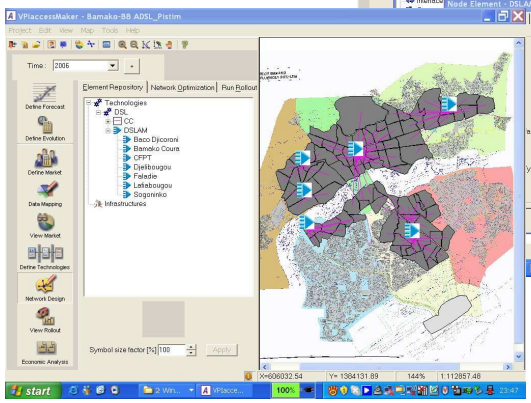


Wireline xDSL
and
WiMAX overlay

Case study Bamako - Planning process :

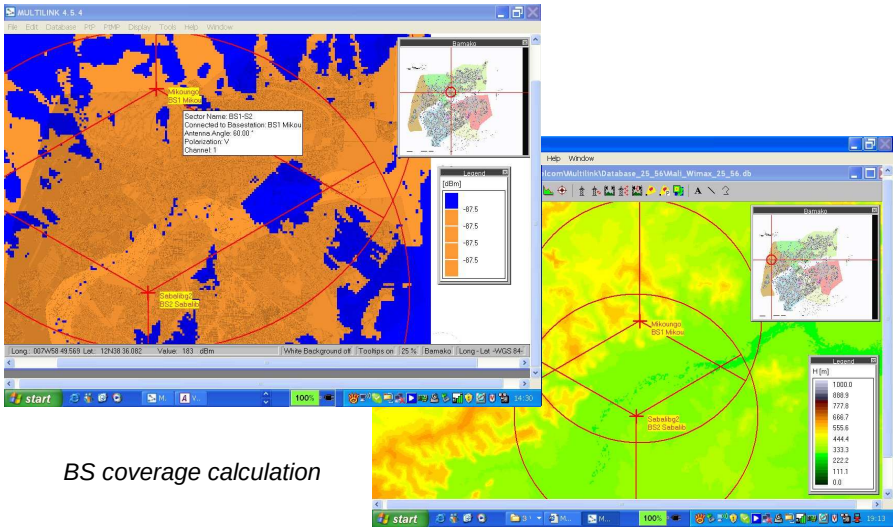
Technology specification





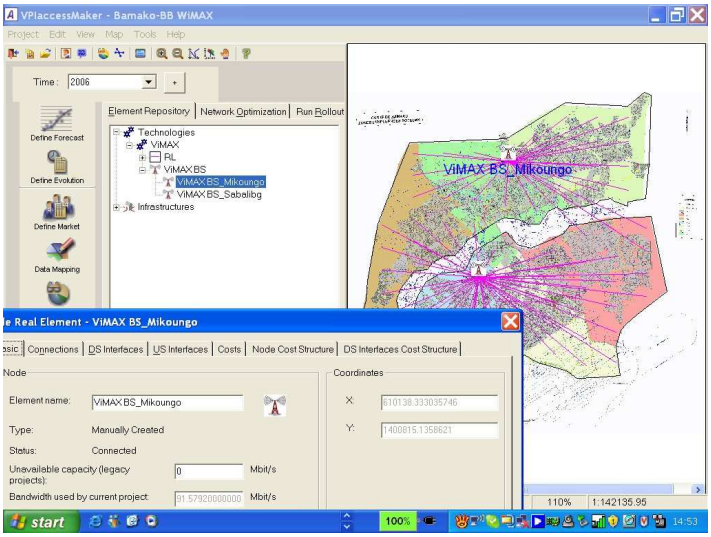
Network Optimization

Case study Bamako - Planning wireless :

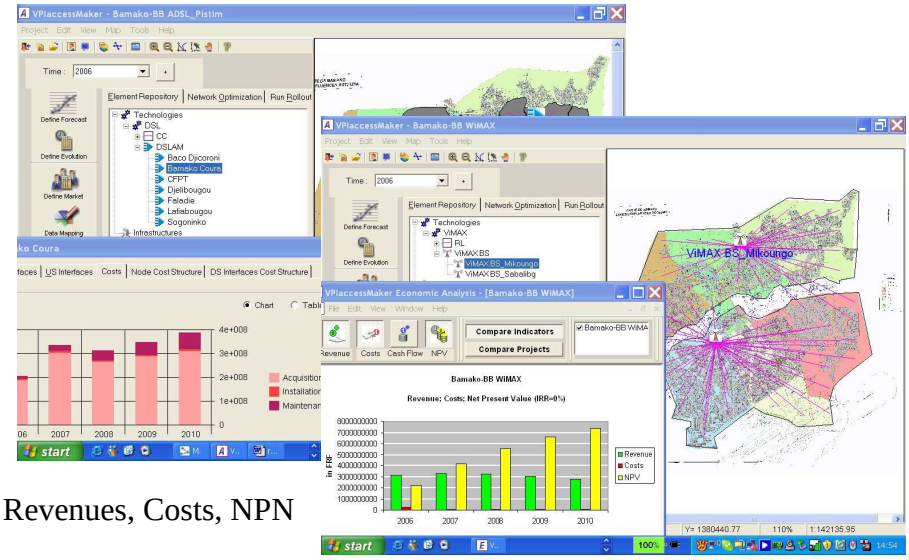


BS coverage calculation

Case study Bamako – Wireless access network :



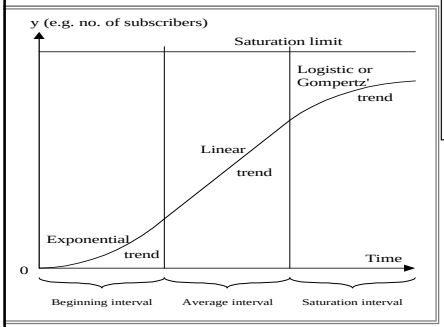
Case study Bamako - Economic Analysis :

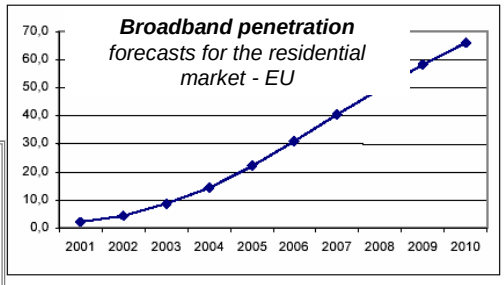


Revenues, Costs, NPN

Requirements to services and customer segments definition and forecasting

e.g. Permanent service
Defined by required bandwidth or bit rate





Forecasting of customer segments *e.g. Residential market*:

Typical for rural and remote areas : Individual, family, *commune* services/users

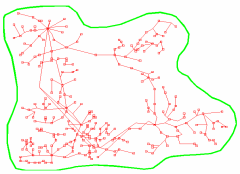
Requirements to the modeling of user locations

Digital maps – Geo data

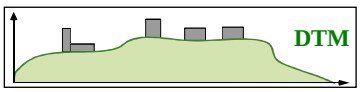
zones /areas

= >

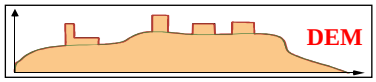
= >

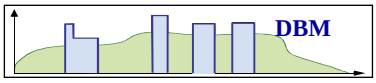


nodes / sites



Elevation data

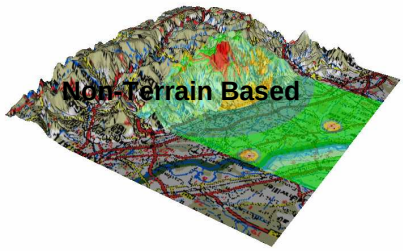




Requirements to the network optimization

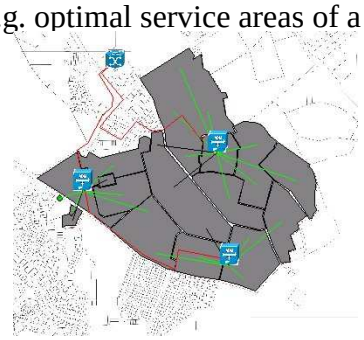
Location on nodes :

E.g. optimal placement of BS



Service areas :

E.g. optimal service areas of a BS



Prediction Models :

Terrain Based