ITU-BDT Regional Seminar on Fixed Mobile Convergence and new network architecture for the Arab Region

Session 2.2.5

Planning of Broadband Wireless Access for Rural and Remote Areas

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Presentation content:

- First this presentation discusses the characteristics of the rural and remote areas through statistical data for different telecom indicators
- Then there is a summary of the necessary service, market, technology modeling as bases for planning of the broadband wireless access
- Finally two case studies with planning of broadband wireless in the access network of rural areas are presented

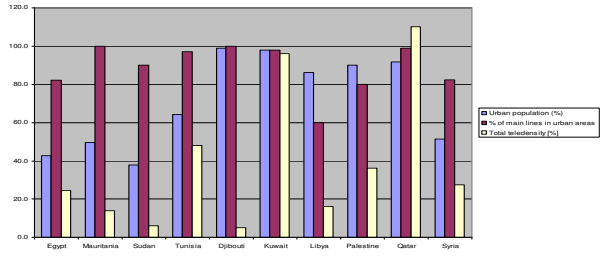
Teledensity diversity - largest cities vs. rural areas

	Population of large cities as %	Large city teledensity [%]	Rural areas teledensity [%]	Overall teledensity [%]	
Low Income	6,0	9,26	2,15	2,54	1 : 4,3
Lower Middle Income	5,8	24,84	7,30	8,77	1 : 3,4
Upper Middle Income	16,1	30,77	21,10	22,94	1 : 1,5
High Income	10,8	57,49	54,83	55,21	1 : 1,05
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 2002

Largest cities vs. rural areas in some Arab 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

Country diversity for the Arab region

Arab Countries	Low income	Lower middle incon	Upper middle income	High income
Algeria		X		
Bahrain				X
Comoros	X			
Djibouti		X		
Egypt		X		
Iraq		X		
Jordan		X		
Kuwait				X
Lebanon			X	
Libya			X	
Mauritania	X			
Morocco		X		
Palestine		X		
Oman			X	
Qatar				X
Saudi Arabia			X	
Somalia	X			
Sudan	X			
Syria		X		
Tunisia		X		
UAE				X
Yemen	X			

Low Income : 5

Lower middle Income : 9

Upper middle Income : 4

High Income : 4

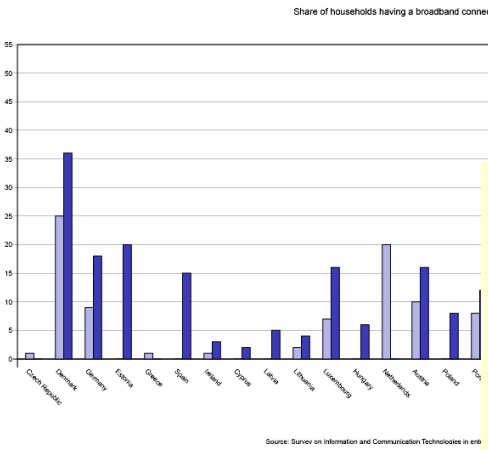
Largest cities vs. rural areas - user behaviour

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

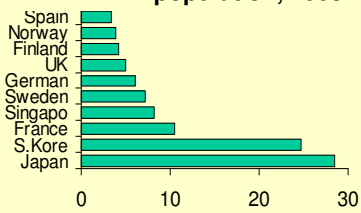
Users will concentrate in urban areas, as urban areas put higher pressure on the individual to "do what the others do" and from technical point it is easier to connect people in urban areas

Broadband connection – statistics



Eurostat

Top 10 countries by mobile multimedia users as % of population, 2003



http://reports.tmgtelecom.com/ssmi

CORDIS

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

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

Density statistics for Information technology :

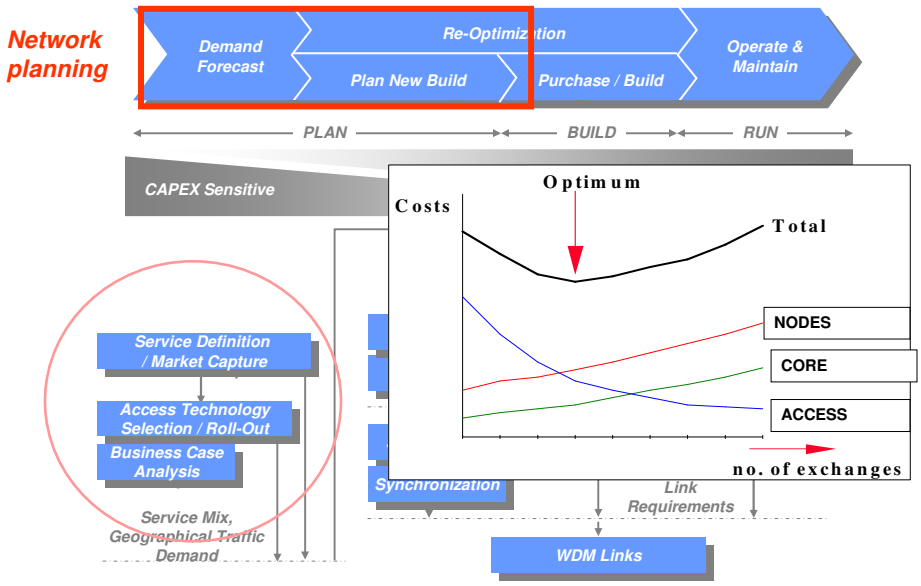
	Internet hosts per 10 000 inhabitants	Internet users per 10 000 inhabitants	PCs per 100 inhabitants
Low Income	0,98	62,21	0,59
Lower Middle Income	4,32	264,94	2,45
Upper Middle Income	78,69	992,66	8,24
High Income	1 484,20	3 992,87	37,31
Africa	3,38	84,89	1,06
Americas	1 332,97	2 164,28	26,57
Asia	28,73	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

Conclusion for the rural and remote areas characteristics

- there is difference between rural and urban telecom development, which depends mainly upon the country development (e.g. low income, high income countries)
- broadband access depends on the IT penetration in the country and that will influence the rural and remote areas BB access
- in the Arab region there is diversity of different countries (as low income, high income, etc.) which should present different requirements to the rural and remote areas BB access

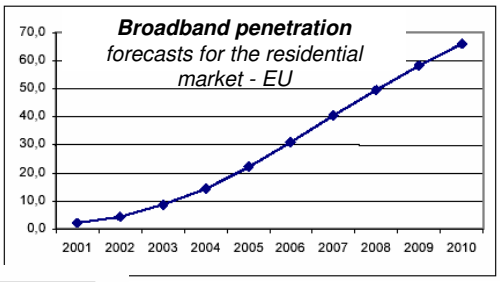
Planning of bradband wireless access

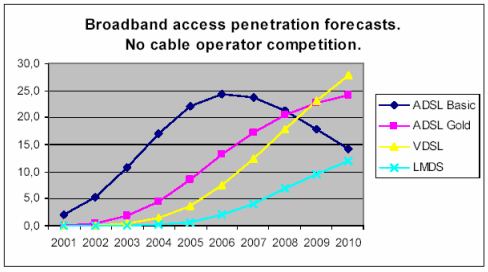


Services definition and market segmentation

Individual, family, commune services/users in rural /remote areas market

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





Segmentation of the market :

***e.g. Residential market*:**
POTS, Internet, ADSL, LMDS

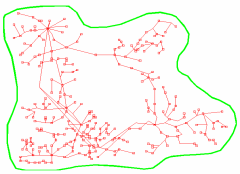
Modeling of users - customer mapping

Digital maps – Geo data

= >

zones /areas

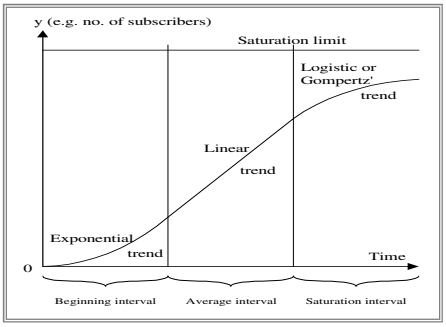
= >

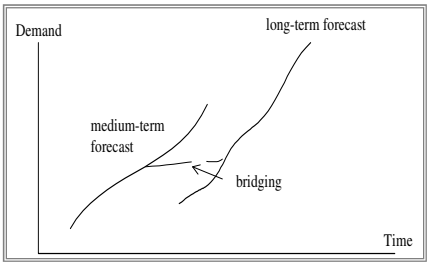


nodes / sites

Demand/service forecasting :

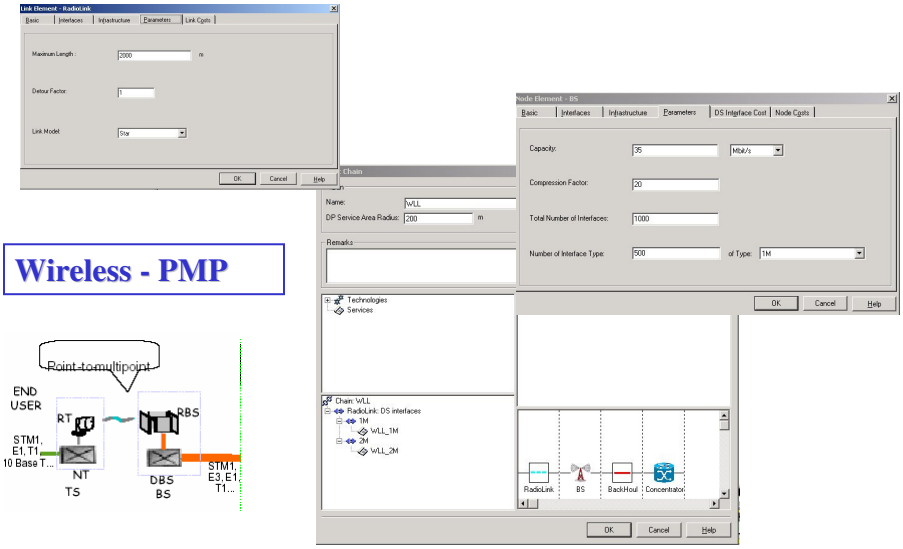
Forecasting of urban, suburban, rural, remote areas, populated places, houses, etc.





Demand/service forecasting uses different methods, including trend methods based on saturation limit

Modeling of technological alternatives for BB Access

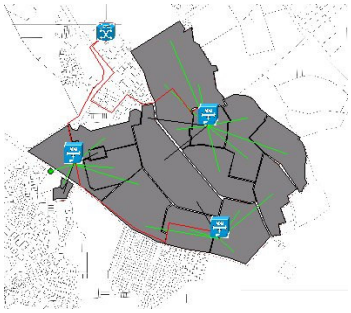


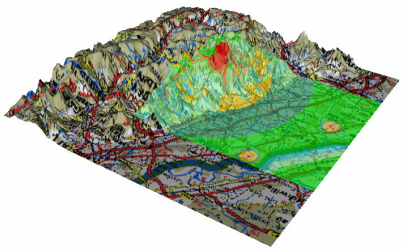
Wireless - PMP

Network optimization

Location problem :

Optimal placement of exchanges, RSU, routers, DSLAM, BS, etc.



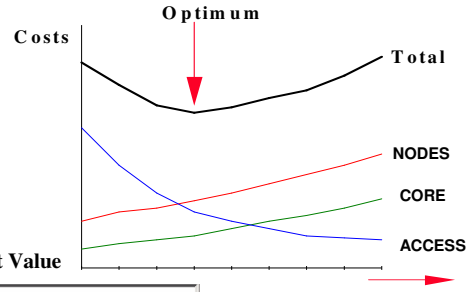


Boundaries problem :

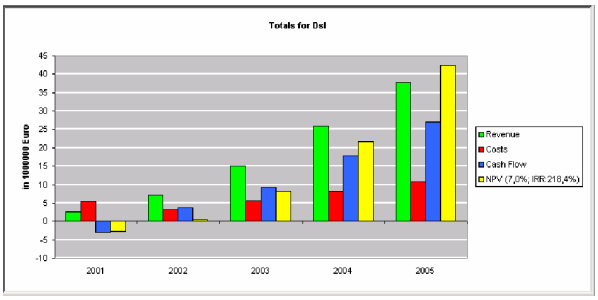
Optimal service areas of exchanges, RSU, routers, DSLAM, BS, etc.

Network costing

Cost components of telecom network



Overall economic results –
Revenues, Cost, Cash-flow and Net Present Value



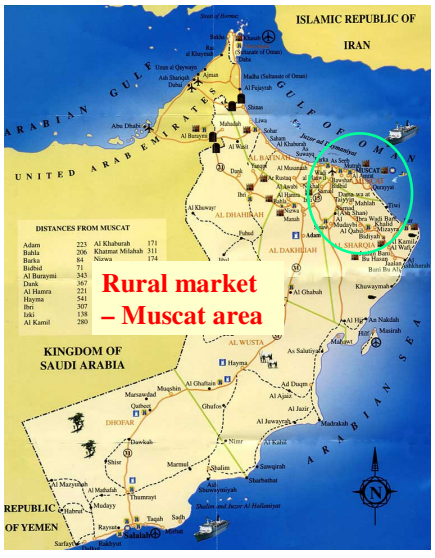
Conclusion for planning of bradband wireless access

- 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

Case studies objectives :

- This case studies intends to present the planning process that needs to be performed for evaluation of different broadband solutions in the last mile for urban and suburban (rural) areas
- Special attention is drown on the wireless technological solutions, which include additional network optimization with regard to evaluation and optimization of the terrain coverage

Oman – Test Case study

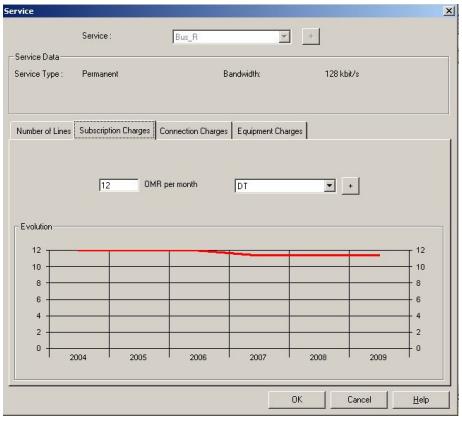


ITU/BDT Arab Regional Workshop on

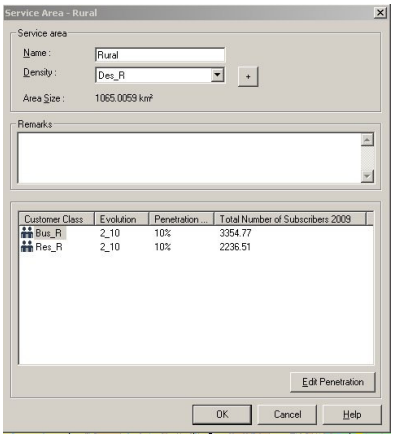
"Wireless Network Evolution"

Muscat-Oman, 03-05 May 2004

Case study - Market forecasting:

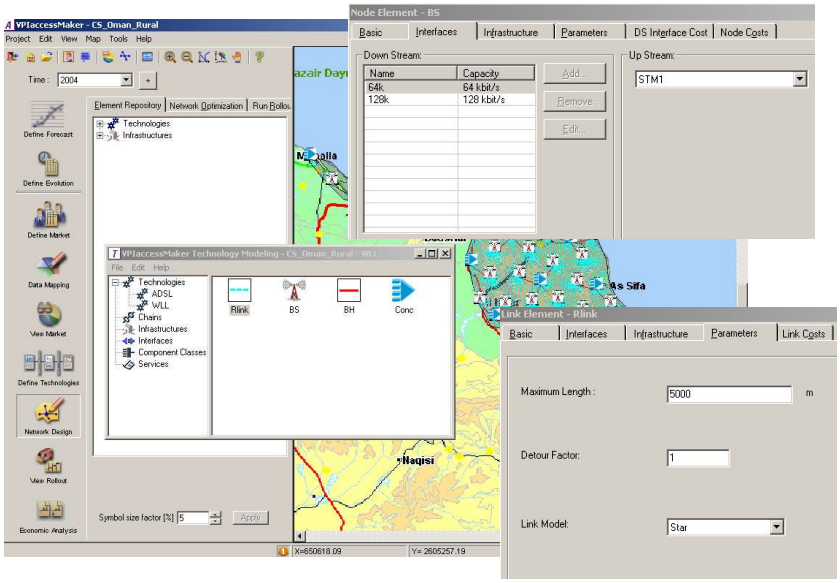


- **Permanent service –**
  Residential - connection at 64 Kbit/s
  Business - connection at 128 Kbit/s

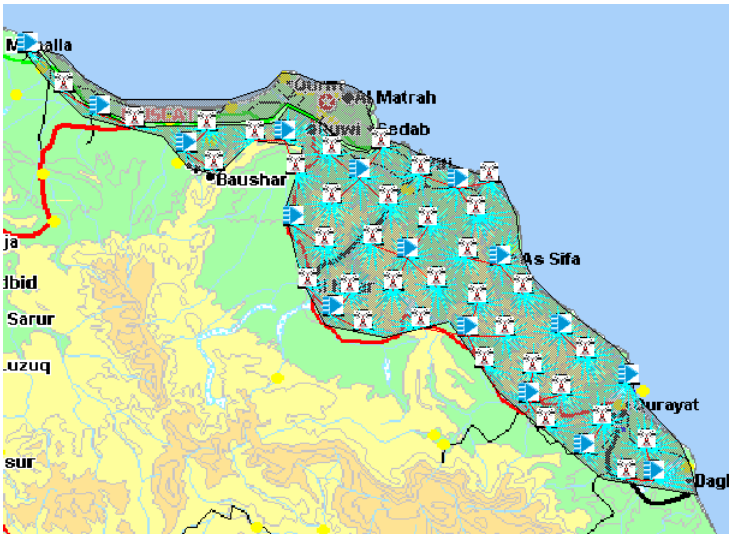


- **Market based on inhabitants / households per sq. km. and penetration from 2% to 10%**

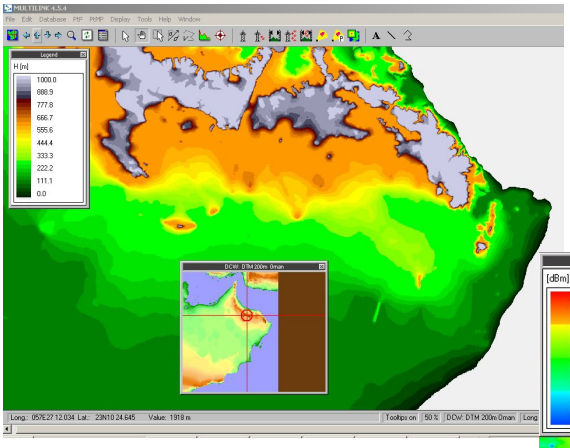
Case study - Technology definition :



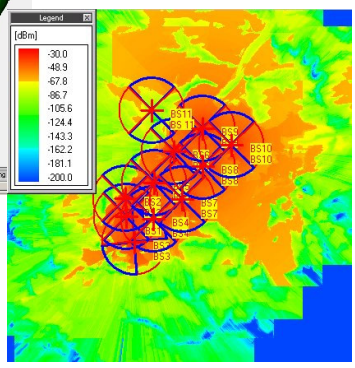
Case study - Planning process :



Case study - Planning wireless :

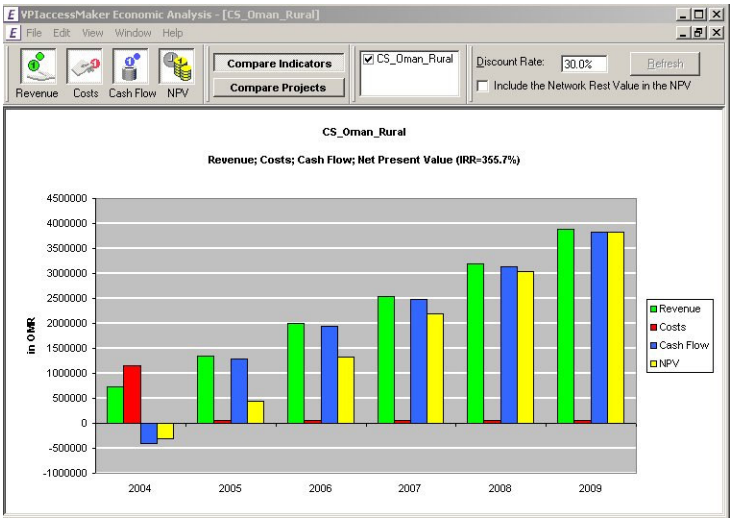


BS coverage calculation

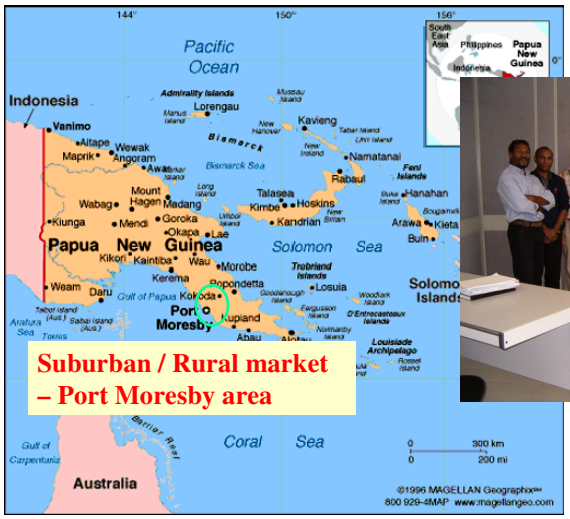


Max server coverage

Case study - Economic Analysis :



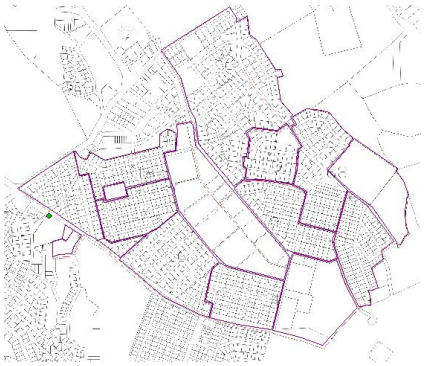
Case study – Papua New Guinea :



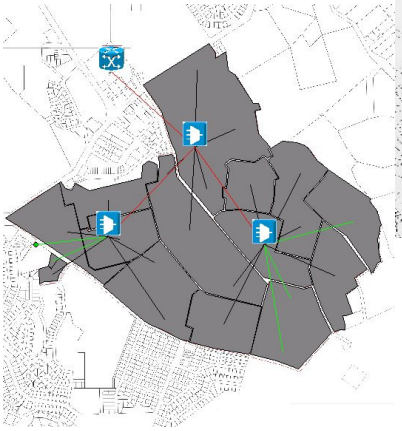
Part of TELIKOM planning team

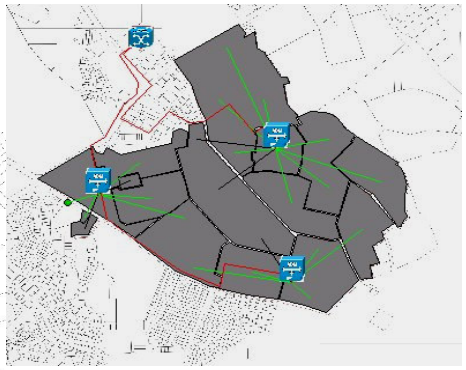
Case study – Suburban area :

Broadband Solution Study of Boroko suburban area in Port Moresby



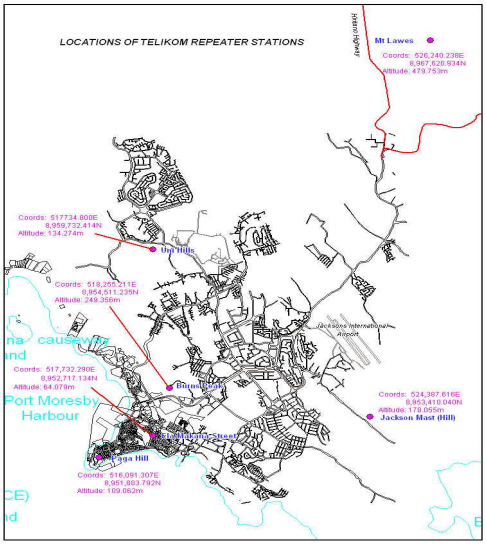
Case study - Planning process :





TELIKOM planning - ADSL BB access

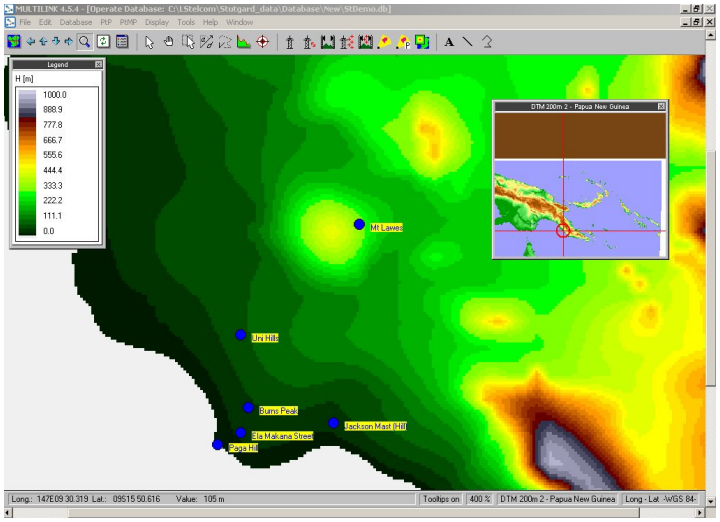
Case study – Suburban and rural area :



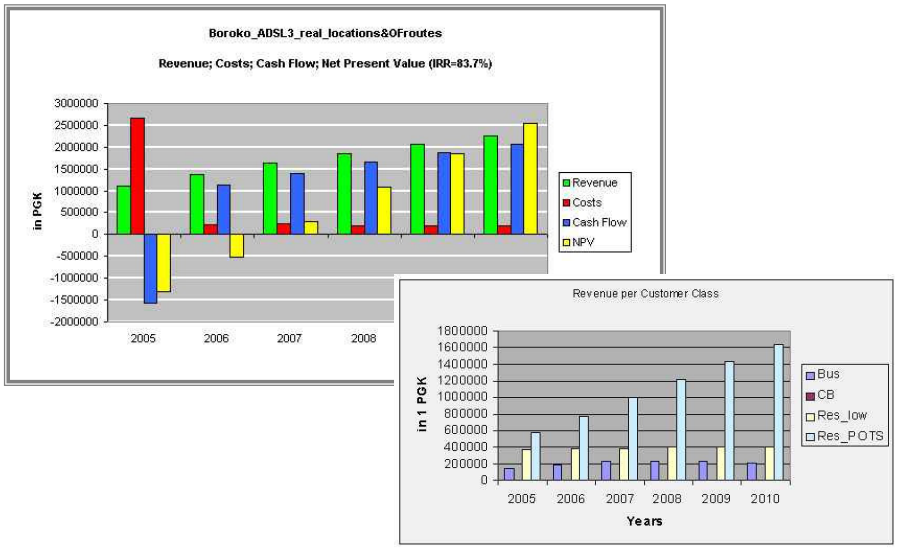
User per sector:	**254**
Sector payload:	**18 Mbps**
Radius per BS:	**3 KM**
Frequency of Operation:	**2.3, 2.4 GHz**
Bandwidth:	**3.5 MHz**

TELIKOM planning - wireless BB access

Case study – Planning wireless :



Case study - Economic Analysis :



Conclusion from the case study on planning of broadband access

- **This case studies presents the planning process that needs to be performed for evaluation of different broadband solutions in rural and remote areas**
- **Through careful planning of the different alternatives and comparison of the corresponding economical consequences the best long-term solution is taken.**
- **The whole case studies are performed with NP tools operating on real data. The highly professional NP tools are provided by companies, partners of ITU in the network planning programs and activities.**