

# Planning of Broadband Wireless Access for Rural and Remote Areas



**ITU/BDT Regional Seminar  
on Broadband Wireless Access  
(BWA) for CIS, CEE and  
Baltic Countries**



**Moscow, 26-29 November 2007**

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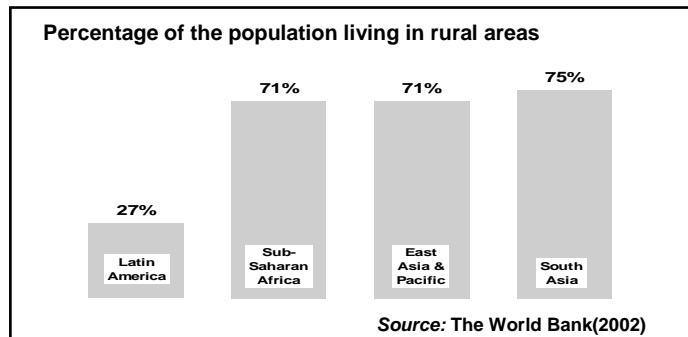
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## Presentation: motivation and content:



### Rural and remote areas telecom case :

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



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## 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

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## Largest cities vs. rural areas -user behaviour



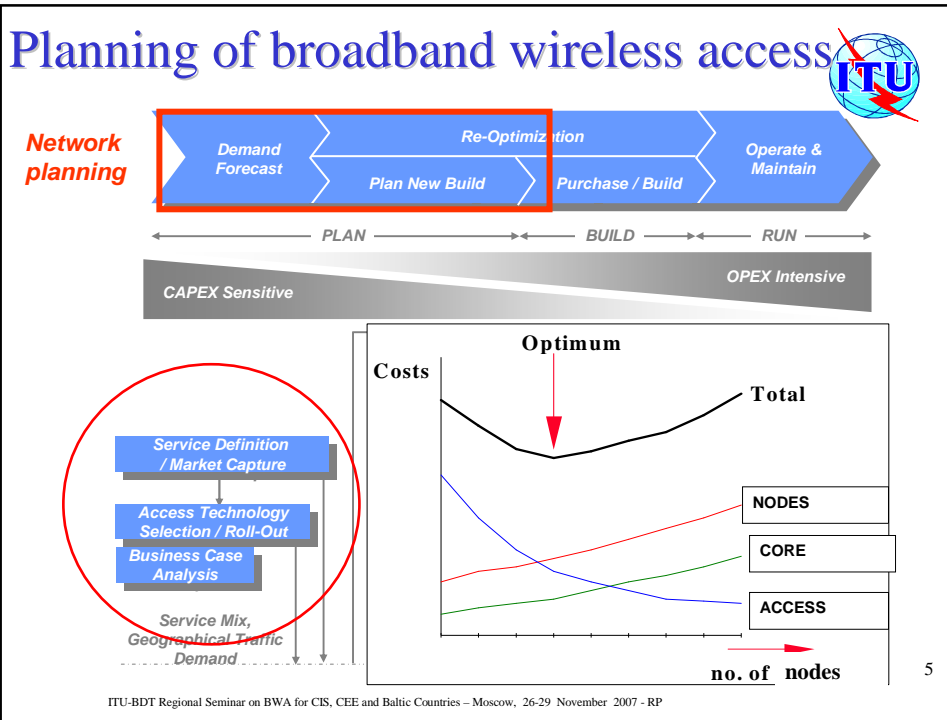
### Findings of the United Nations :

- **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**

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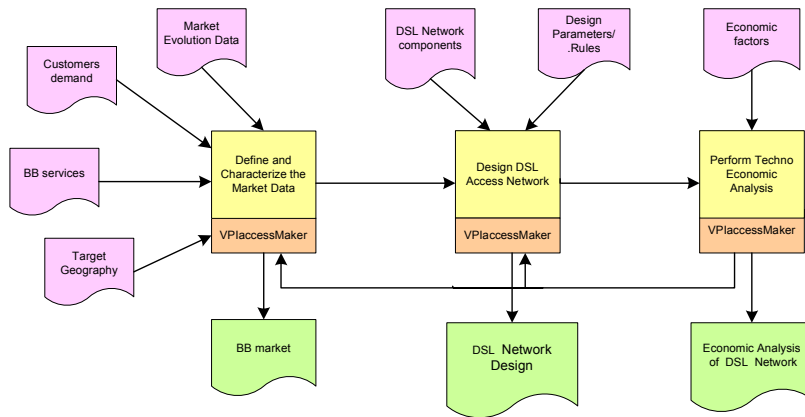
## Planning case studies performed with available network planning tools

- **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**

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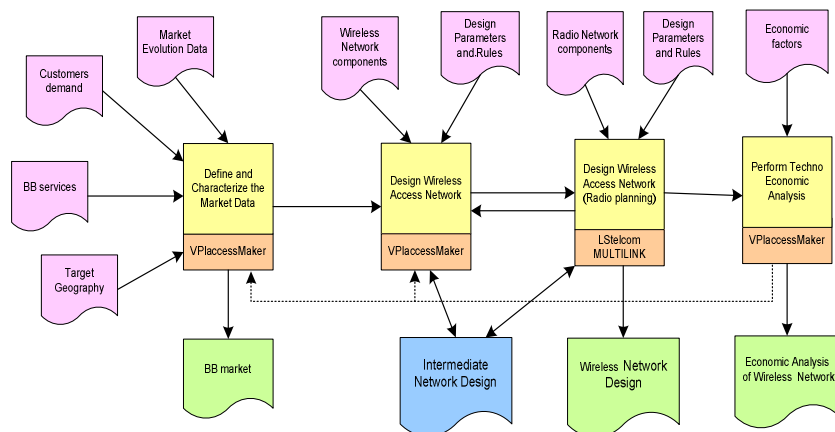
# Planning process for planning of wireline (DSL) BB access network



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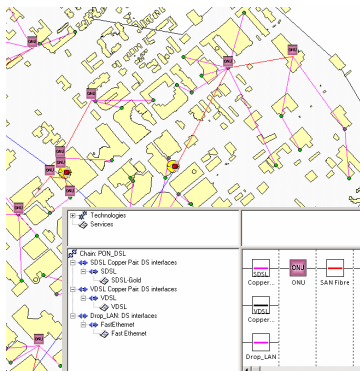
# Planning process for planning of wireless BB access network



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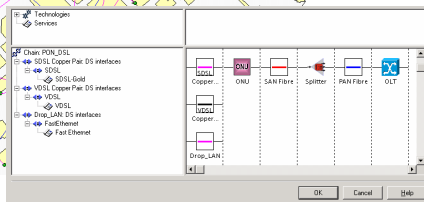
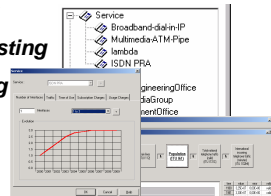
## Planning tools (Access Maker)



**Market definition**

**Evolution forecasting**

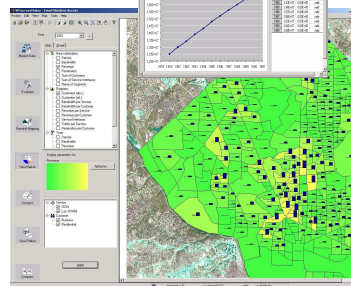
**Demand mapping**



**Technology modeling**

**Network design optimization**

**Roll-out results**

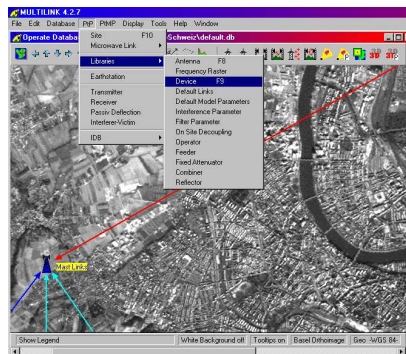


Market capture for a service provider 9

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## 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).*

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## Oman – Test Case study



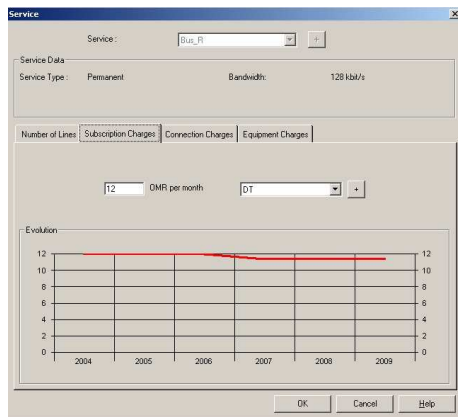
ITU/BDT Arab Regional Workshop on “Wireless Network Evolution”

Muscat-Oman, 03-05 May 2004

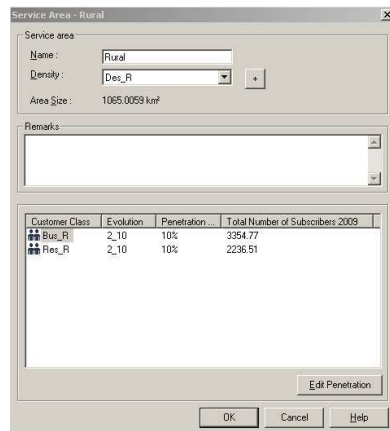


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## Case study Oman - Market forecasting



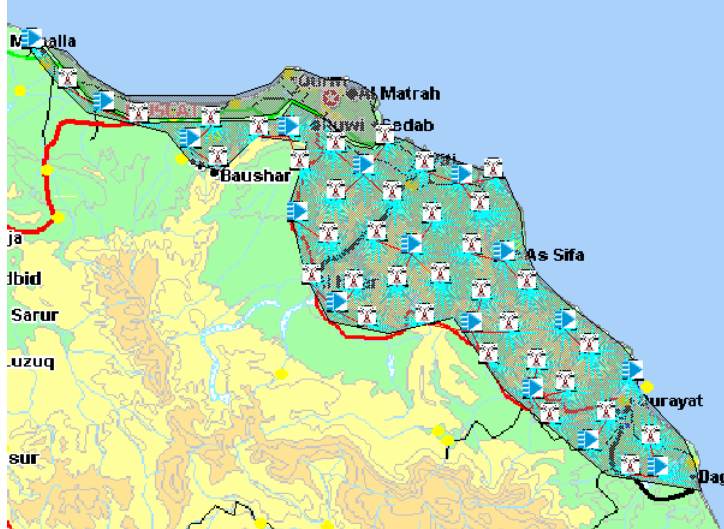
➤ Permanent service –  
Residential - connection at 64 Kbit/s  
Business - connection at 128 Kbit/s



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

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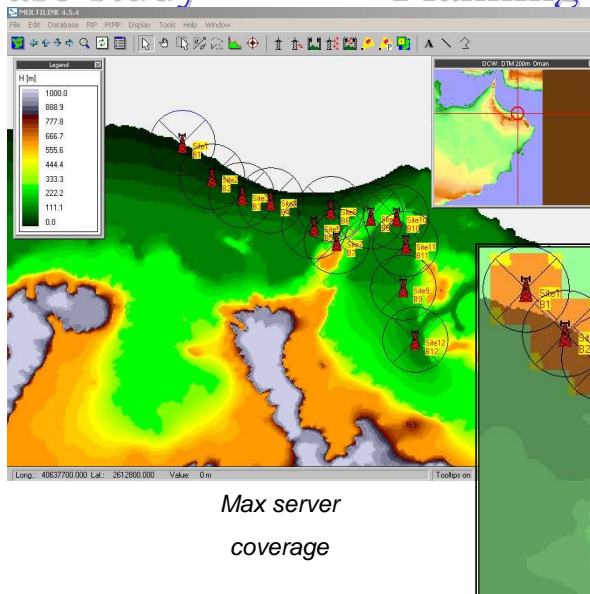
# Case study Oman - Planning process



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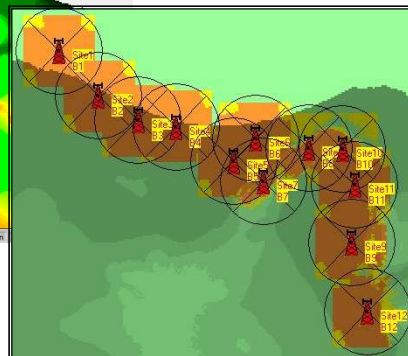
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# Case study Oman - Planning wireless



BS coverage calculation

Max server coverage



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# Case study – Papua New Guinea



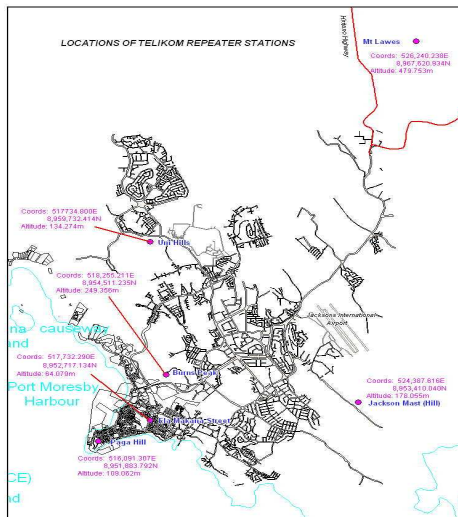
TELIKOM planning team



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# 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**

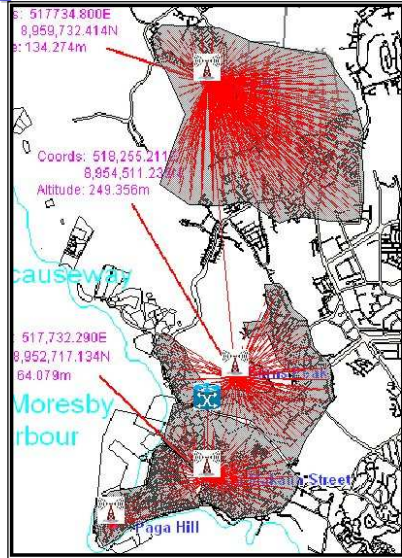
TELIKOM planning - wireless BB access

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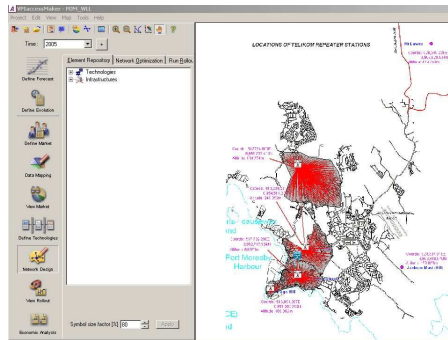
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# Case study Papua New Guinea – Planning process



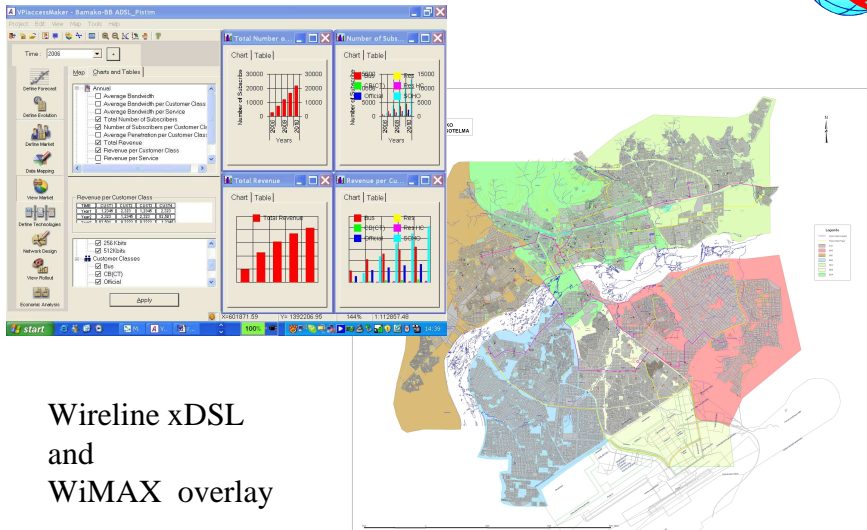
optimization of service areas



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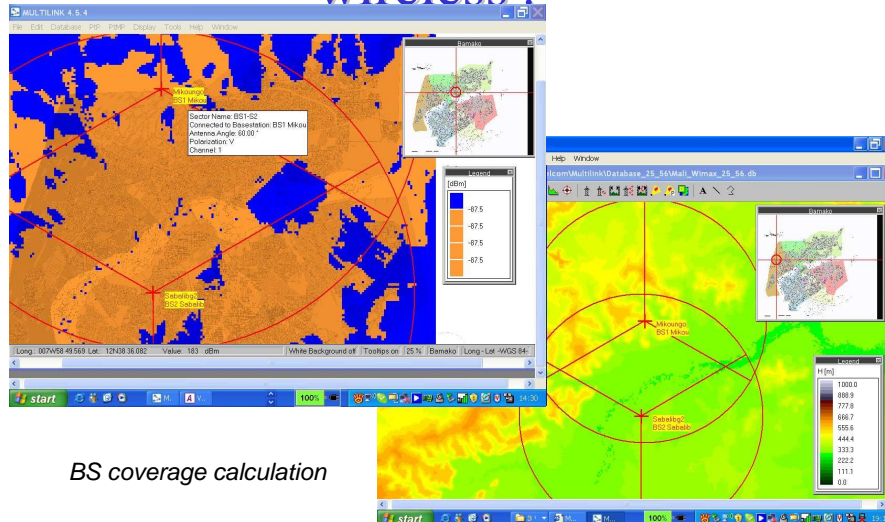
# Case study Bamako - suburban area



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## Case study Bamako - Planning wireless :



BS coverage calculation

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## Conclusions for planning of broadband 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**

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