



*ITU Cross Regional Seminar on Broadband  
Access (Fixed, Wireless including Mobile) for  
CIS, ASP and EUR Regions*

## **Session 5**

# **Case studies on BWA Network Planning**

*Ignat Stanev  
ITU Consultant, Bulgaria*

ITU Seminar

Chisinau, Moldova, 4-6 October 2011

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### **Content of the presentation :**

- ❖ **Wireless Broadband Access network planning**
- ❖ **Case study 1 – Mali (for Operator) :**
  - *WBA for Bamako urban and suburban area*
- ❖ **Case study 2 – Georgia (for Administration) :**
  - *WBA for Tbilisi suburban rural area*
- ❖ **Case study 3 – Tajikistan (for Regulator) :**
  - *WBA for Dushanbe urban and suburban area*
- ❖ **Case study 4 – Moldova (for Administration) :**
  - *WBA network segment for the capital Chisinau*
  - *WBA network segment for typical rural area*
- ❖ **Case study 5 – Bulgaria (for University) :**
  - *WBA network segment for small town*
  - *WBA network segment for rural area*

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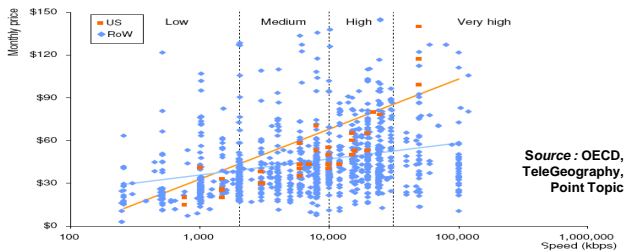
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## Broadband in the telecom networks

### BB by speed of connection:

- Low speed (256kbps – 2Mbps)
- Mediumspeed (2.5Mbps-10Mbps)
- High speed (10Mbps-32Mbps)
- Very-high speed (above35Mbps)

Offered broadband connection – by price and speed

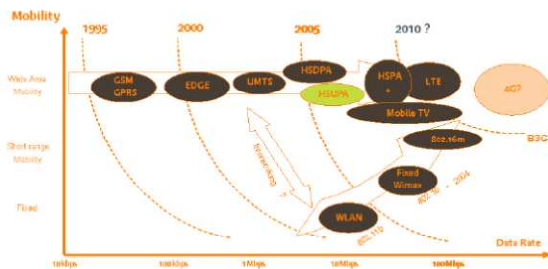
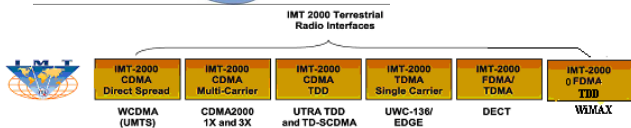
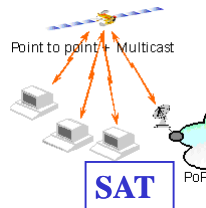
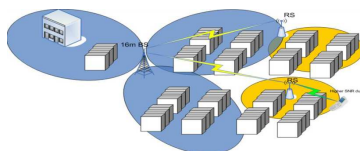


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## Wireless broadband access technologies - WBA



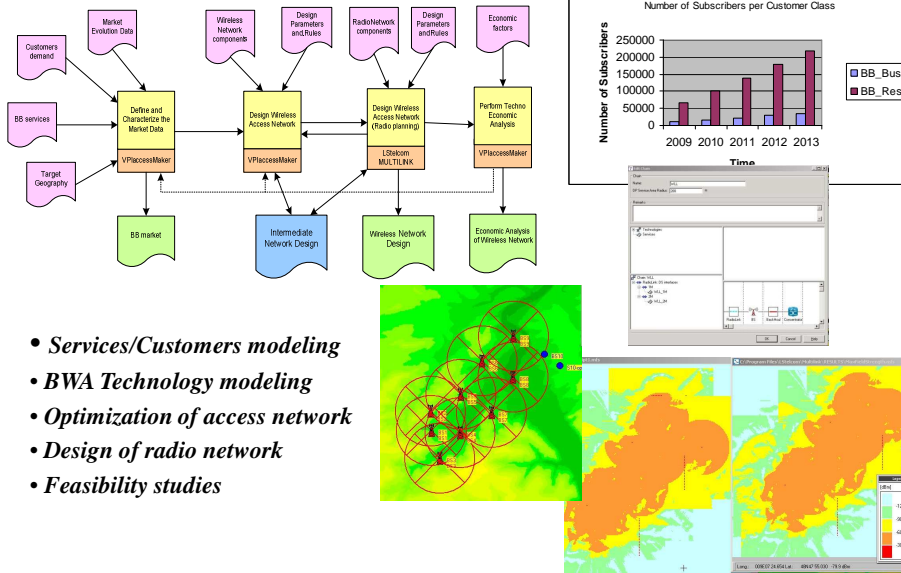
WCDMA (UMTS)	HSDPA	HSUPA	Evolved 3G	
3GPP Release 6	Release 6	Release 6	Release 7	Release 8
<ul style="list-style-type: none"> <li>- FL: 64 kbps CS</li> <li>- 384 kbps to 2 Mbps</li> <li>- RL: 64 kbps CS</li> <li>- 384 kbps RL</li> <li>- MMS / LCS</li> <li>- ATM Transport</li> </ul>	<ul style="list-style-type: none"> <li>- FL: 1.8 – 14.4 Mbps</li> <li>- MMS</li> <li>- IP Transport</li> <li>- WBA-MR</li> </ul>	<ul style="list-style-type: none"> <li>- RL: 1.4 – 6.6 Mbps</li> <li>- MMS</li> <li>- WLAN-UMTS Interworking</li> </ul>	<ul style="list-style-type: none"> <li>- MIMO</li> <li>- All-IP network</li> <li>- UWB support new frequencies</li> <li>- OFDMA</li> <li>- MIMO</li> <li>- Flexible bandwidth</li> </ul>	<ul style="list-style-type: none"> <li>- Continued evolution of WCDMA in 2 MHz</li> <li>- LTE</li> <li>- OFDMA</li> <li>- MIMO</li> <li>- Flexible bandwidth</li> </ul>

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## BWA Network Planning



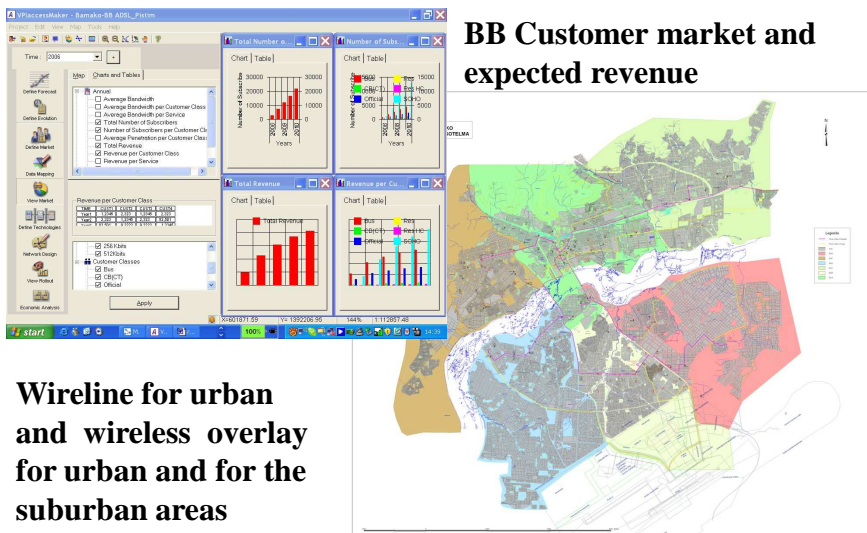
- *Services/Customers modeling*
- *BWA Technology modeling*
- *Optimization of access network*
- *Design of radio network*
- *Feasibility studies*

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## Case study Mali (Bamako) – BB market



**Wireline for urban and wireless overlay for urban and for the suburban areas**

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# Case study Bamako – BB Wireless overlay network

**Wireline BB in the urban area**

**Wireless overlay network in the urban area and for the suburbs**

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# Case study Bamako - Economic Analysis :

**Revenues, Costs, NPN**

**Costs per network element**

**Revenues, Costs, NPN**

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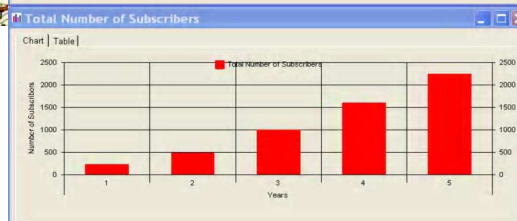
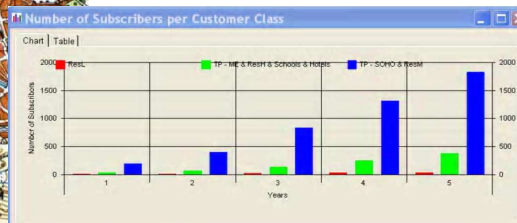
## Case study Georgia (Tbilisi) – suburban area :



Tbilisi suburban region (Tskneti, Dighomi, Tabaxmela, Chindisi )

Number of customers per village (year +4)

Number of BB customers per customer class



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## Case study Tbilisi suburbs - mountain rural area :

Wireline (xDSL)  
vs.  
Wireless (WiMAX)

Results for wireline

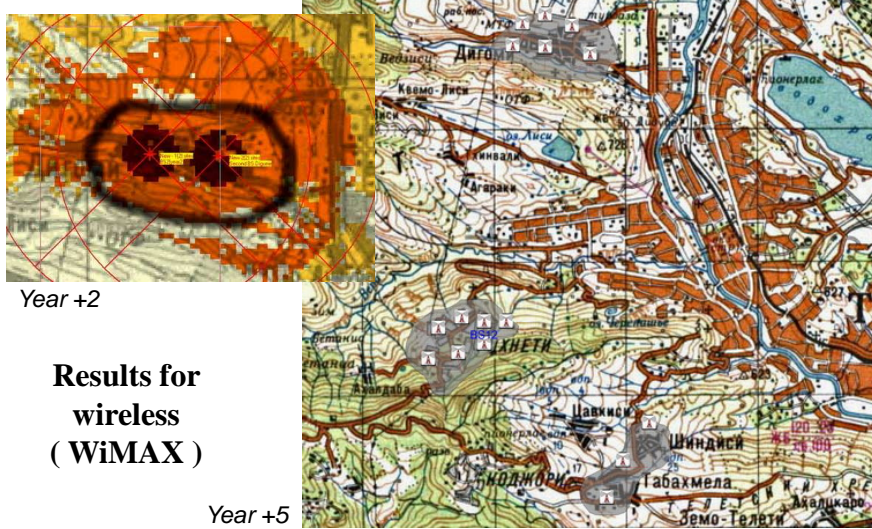


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## Case study Tbilisi suburbs – Wireless access network :



Results for wireless (WiMAX)

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## Case Study Georgia - BB access plan



**TECHNICAL REPORT  
FOR THE ITU ASSISTANCE  
ON PLANNING OF FUTURE ACCESS NETWORKS  
WITH COMPUTER TOOLS  
TO THE GEORGIAN ADMINISTRATION  
(MINISTRY OF ECONOMIC DEVELOPMENT OF  
GEORGIA)**

ITU MISSION PERFORMED BY  
**MR. IGNAT STANEV**  
*Senior Experts on Planning of Telecommunication  
Networks*

(15 to 26 October 2007)

Tbilisi (Georgia)

### Content

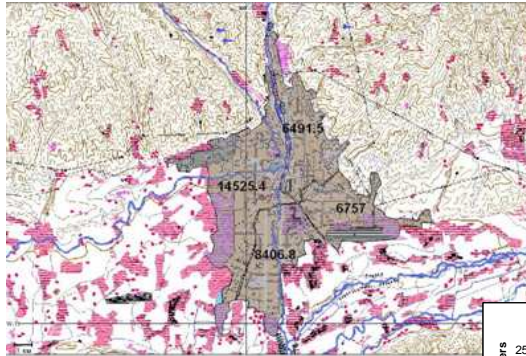
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## Case study Tajikistan (Dushanbe) – urban and suburban area :

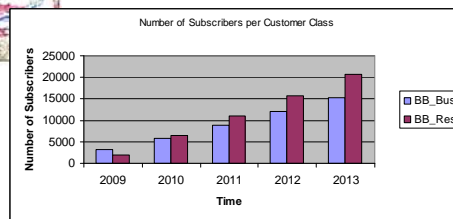


**Dushanbe urban  
(4 districts)**

Year	Total Number of Customers	Class 1 : Residential	Class 2 : Business
5	36191	20765	15396

**Number of BB customers per district (year +5)**

**Number of BB customers per customer class**

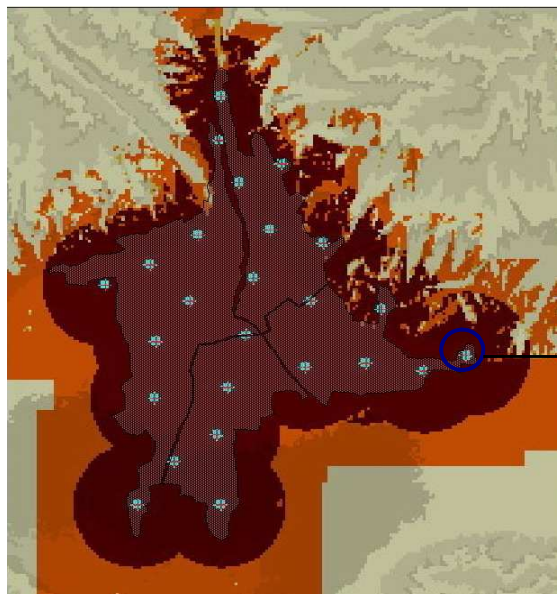


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## Case study Dushanbe – access network for urban area :



**Dushanbe city  
(4 districts)**

**Wireless overlay**

BS

**Technical solution  
WiMAX for VoIP,  
Data, Internet,  
IPTV/Video  
( 25 BSs)**

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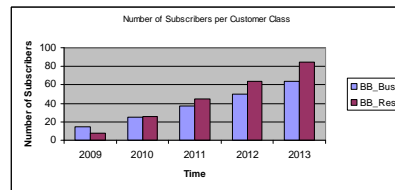
## Case study Dushanbe –suburban area :



Number of customers per village (year +5)

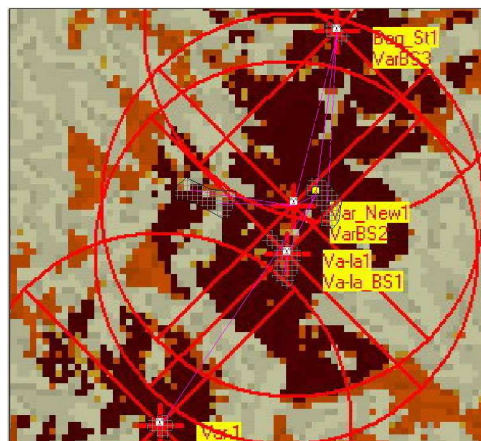
Dushanbe suburban  
(sample with 5 villages)

Year	Total Number of Customers	Class 1 : Residential	Class 2 : Business
5	148	84	64



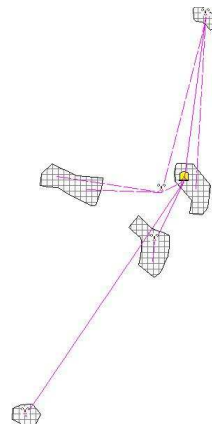
Number of customers per customer class

## Case study Dushanbe suburban – wireless access network :



Results for wireless ( 3 BS - WiMAX )

Dushanbe suburban  
(sample with 5 villages)





# Case Study Tajikistan - BB access plan



DRAFT

**TECHNICAL REPORT  
FOR THE ITU ASSISTANCE  
ON PLANNING OF BROADBAND NETWORKS  
WITH NGN ELEMENTS  
TO THE TAJIKISTAN ADMINISTRATION (STATE  
SERVICE TO SUPERVISION AND REGULATION  
IN THE FIELD OF COMMUNICATION AND  
INFORMATION)**

**SUMMARY**

ITU MISSION PERFORMED BY  
**MR. IGNAI SIANEV**  
*Senior Experts on Planning of Telecommunication  
Networks*

(13 to 27 November 2008)  
*Dushanbe (Tajikistan)*

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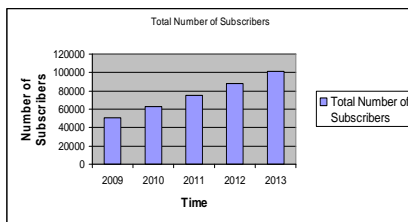
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# Case study Moldova (Chisinau) - BB market :

## ➤ Pessimistic scenario (20%)

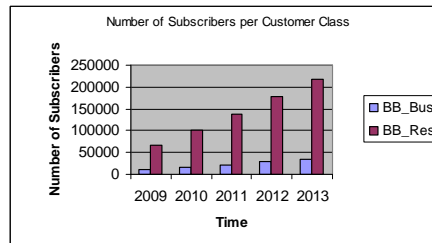


### Estimated market segment

year	xDSL	WiMAX	FTTB	LAN+CATV
2009	67.4%	0.1%	17.4%	15.1%
2009	50916	76	13144	11407
2013	70%	2%	23%	5%
2013	101238	2893	33264	7231
Difference	50322	2817	20119	-4176

## ➤ Optimistic scenario (35%)

Estimated market segment				
year	xDSL	WiMAX	FTTB	LAN+CATV
2009	67.4%	0.1%	17.4%	15.1%
2009	50916	76	13144	11407
2013	70%	2%	23%	5%
2013	177167	5062	58212	12655
Difference	126251	4986	45064	1248

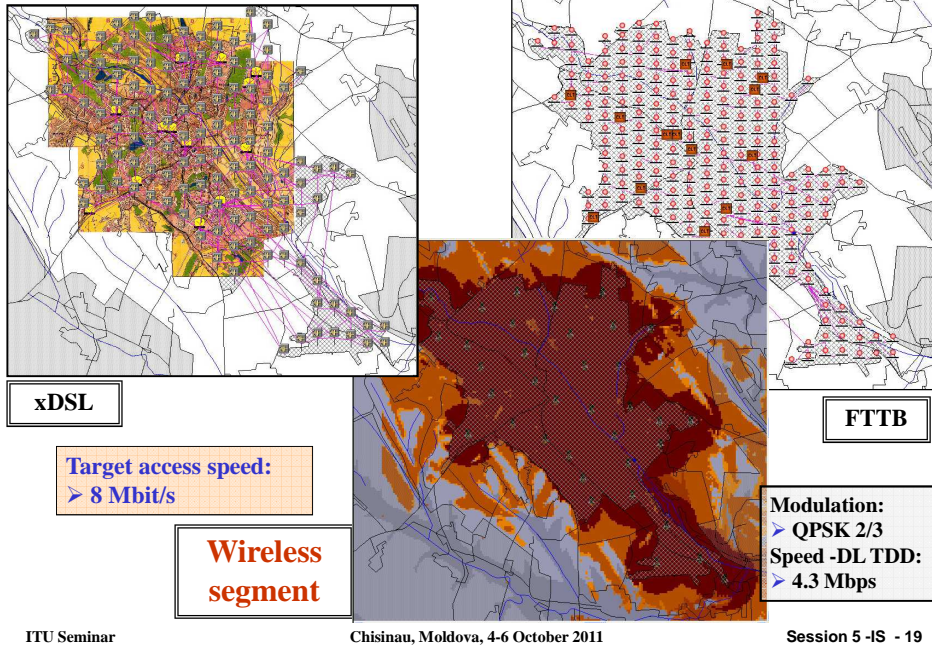


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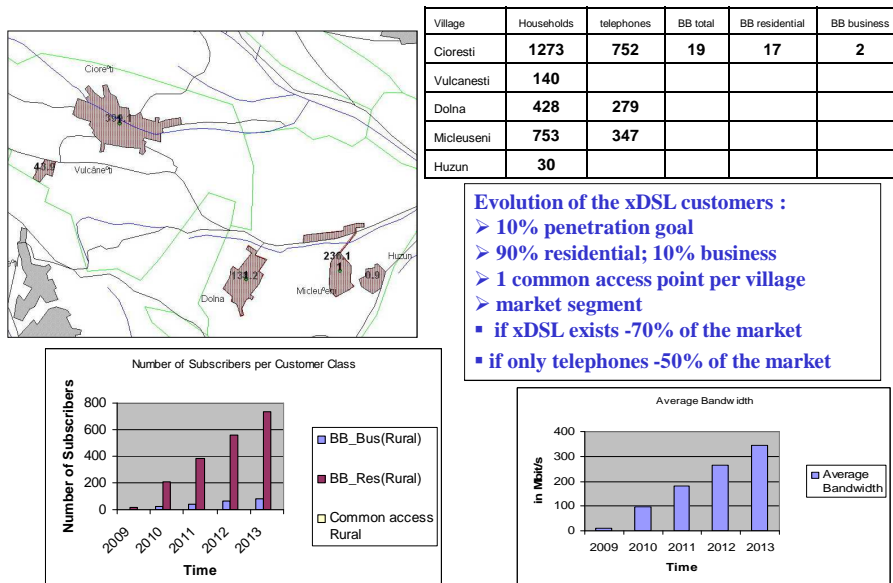
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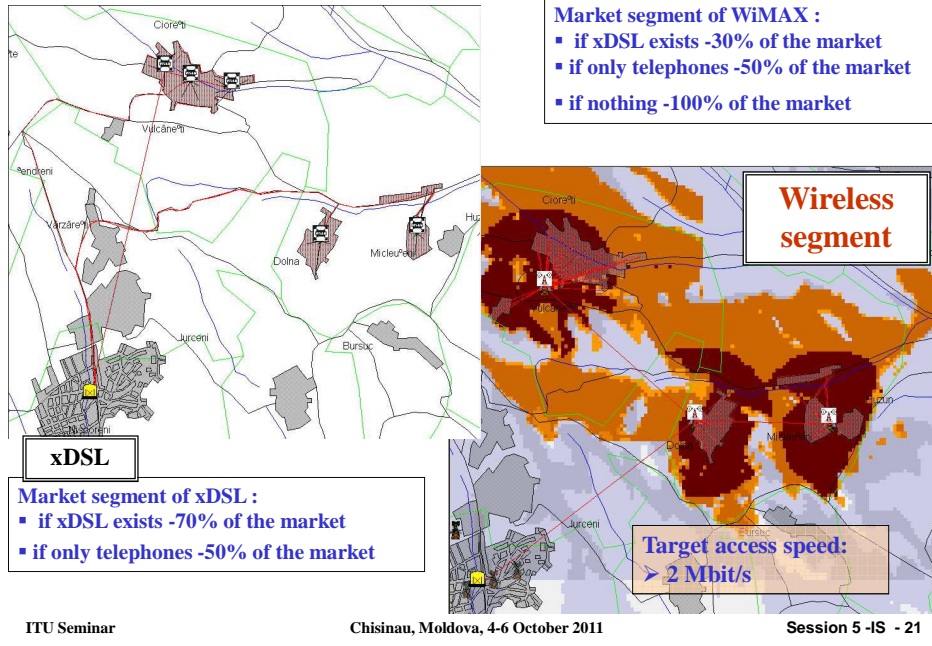
## Case study Chisinau - BB access network :




## Case study for typical rural area - BB market :



## Case study rural - BB access network :



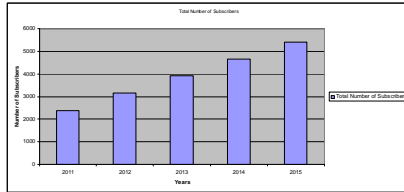
## Case Study Moldova - BB access plan

  <b>TECHNICAL REPORT FOR THE ITU ASSISTANCE ON BROADBAND NETWORK PLANNING TO THE MOLDOVA ADMINISTRATION (MINISTRY OF INFORMATION DEVELOPMENT OF THE REPUBLIC OF MOLDOVA)</b>  <b>SUMMARY</b>  <b>ITU MISSION PERFORMED BY MR. IGAT STANEV</b> <i>Senior Experts on Planning of Telecommunication Networks</i>  (9 to 27 August 2009) Chisinau (Moldova)	<b>ANNEX</b>  <b>NETWORK PLANNING MASTER PLAN</b>  <b>ITU MISSION PERFORMED BY MR. IGAT STANEV</b> <i>Senior Experts on Planning of Telecommunication Networks</i>  (9 to 27 August 2009) Chisinau (Moldova)																																								
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## Case study Bulgaria – small town

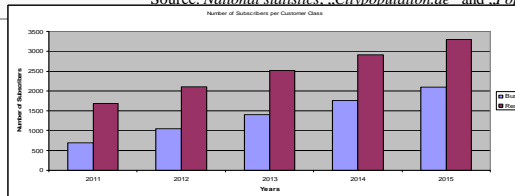
**Total number of BB customers**



**Berkoviza**

year	1946	1956	1965	1975	1985	1992	2001	2005	2007	2009
population	6 876	9 227	11 562	16 167	16 420	16 146	15 459	14 460	14 189	13 917

Source: National statistics, „Citypopulation.de“ and „Pop-stat.mashke.org“



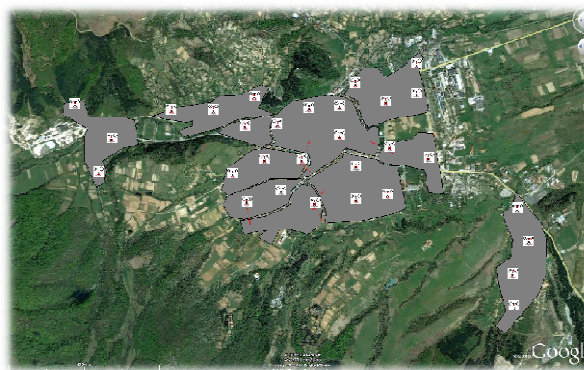
**Number of BB customers per customer class**

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## Bulgaria small town - BB access network



Technologies

- WIMAX
- RR
- WIMAX BS
  - WIMAX BS1
  - WIMAX BS10
  - WIMAX BS11
  - WIMAX BS12
  - WIMAX BS13
  - WIMAX BS14
  - WIMAX BS15
  - WIMAX BS16
  - WIMAX BS17
  - WIMAX BS18
  - WIMAX BS19
  - WIMAX BS2
  - WIMAX BS20
  - WIMAX BS21
  - WIMAX BS22
  - WIMAX BS23
  - WIMAX BS24
  - WIMAX BS25
  - WIMAX BS26
  - WIMAX BS27
  - WIMAX BS28
  - WIMAX BS29
  - WIMAX BS3
  - WIMAX BS30
  - WIMAX BS4
  - WIMAX BS5
  - WIMAX BS6
  - WIMAX BS7
  - WIMAX BS8
  - WIMAX BS9

Infrastructures

**Wireless technology solution**

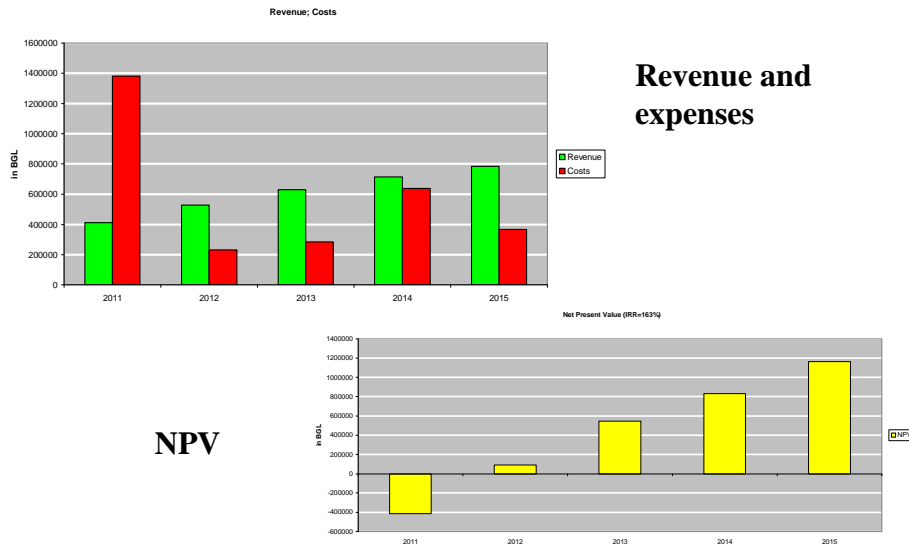
ITU Seminar

Chisinau, Moldova, 4-6 October 2011

Session 5-IS - 24



## Bulgaria small town – feasibility study



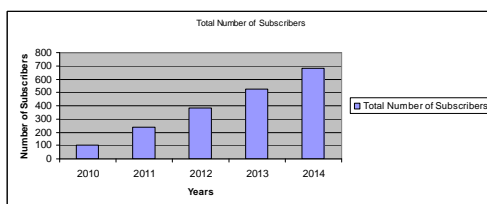
ITU Seminar

Chisinau, Moldova, 4-6 October 2011

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## Case study Bulgaria - rural area

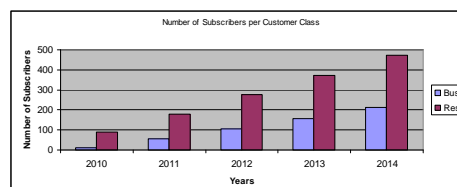
Lucky village	2005 total	2005r. men	2005 women	2006 total	2006 men	2006 women
population	3861	2062	1799	3793	2015	1778



Number of BB customers per year of the planning period

Existing number of broadband customers

	Business	Residential
Rural area	12	89



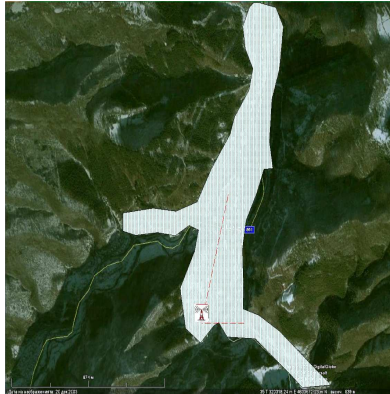
Number of BB customers per customer class

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## Bulgaria rural area - BB access network :



1 WiMAX BS connected to one Router

Technology wireless solution



## Summary

- The case studies present the planning process that needs to be performed for planning of broadband access networks
- Planning process includes market definition, dimensioning and optimization of the access network elements, economic analysis and results.
- The BWA case studies illustrate ITU projects on assisting of developing countries