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31.07.2006

## **Deliverable D1.4: Requirements of user communities**

### **Deliverable D1.4**

Contractual Date:	31.07.2006
Actual Date:	31.07.2006
Contract Number:	026617
Instrument type:	SSA
Work Package	WP1
Nature of Deliverable:	R (Report)
Dissemination Level	PU (Public)
Lead Partner	URAN
Document Code	POS-06-003

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### **Abstract**

Following the data presented in D1.1 and D1.2 this Deliverable presents the results of a special survey aimed at the specific needs of the selected user communities.

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Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003

# Table of Contents

0	Executive Summary	3
1	Requirements of User Communities	4
1.1	Introduction	4
1.2	Survey	4
1.3	Aspects of user needs	5
	1.3.1 Internet applications	5
	1.3.2 Services	6
	1.3.3 Types of network	7
1.4	Institutions by level of needs	7
2	User Needs Table	9
3	Analysis of the Obtained Data	11
3.1	Baltic and Eastern Europe countries	11
	3.1.1 Estonia	12
	3.1.2 Latvia	13
	3.1.3 Lithuania	14
	3.1.4 Belarus	15
	3.1.5 Ukraine	16
	3.1.6 Moldova	18
3.2	Caucasian countries	19
	3.2.1 Armenia	20
	3.2.2 Azerbaijan	20
	3.2.3 Georgia	21
4	Conclusions	23
5	References	24

## Table of Figures

<b>Table 1.</b> Institutions from Baltic and Eastern Europe countries divided by needs and priority	11
<b>Figure 1.</b> Structure of requirements of institutions in Estonia	12
<b>Figure 2.</b> Structure of requirements of institutions in Latvia	13
<b>Figure 3.</b> Structure of requirements of institutions in Lithuania	14
<b>Figure 4.</b> Structure of requirements of institutions in Belarus	15
<b>Figure 5.</b> Structure of requirements of institutions in Ukraine	17
<b>Figure 6.</b> Structure of requirements of institutions in Moldova	18
<b>Table 2.</b> Institutions from Southern Caucasus countries divided by needs and priority	19
<b>Figure 7.</b> Structure of requirements of institutions in Armenia	20
<b>Figure 8.</b> Structure of requirements of institutions in Azerbaijan	21
<b>Figure 9.</b> Structure of requirements of institutions in Georgia	22

## 0 Executive Summary

After compiling the Users database in D1.1 the requirements of user communities and current connectivity of institutions were studied. The institutions in 6 target countries (Belarus, Estonia, Latvia, Lithuania, Moldova and Ukraine) were divided according to their needs ("basic" and "advanced"). For Georgia, Armenia and Azerbaijan the needs for Internet connectivity were studied. The Users database was supplemented with data about the current and required connectivity (User Needs in Paragraph 2). User needs in different countries are summarised on 9 diagrams.

# 1 Requirements of User Communities

## 1.1 Introduction

Requirements of user communities in beneficiary countries are the first important step to start developing the NRENs fiber infrastructure map. The idea of the Porta Optica project is to collect all necessary data to decide where such infrastructure is highly demanded.

Connecting research and education institutions to the NREN fiber infrastructure will have a significant impact on user engagement in the new research projects related to astronomy, fusion energy science, high energy physics, climate modeling, biochemistry, which usually use the GRID infrastructure and need high-speed data networks capable of transporting huge data files - ranging from up to hundreds of terabits in size and supporting intensive calculations and simulations.

The proper network infrastructure will also enable education collaborations between universities and local schools including shared seminars, distance learning programs, and international science fair. Furthermore, it will allow students and researchers from beneficiary countries for more efficient cooperation in scientific ventures with leading research centers in the world.

There is a strong need to prepare sufficient expertise which allows to obtain view of the institutions requirement for fiber connection including current and future engagement in European projects.

Hence, the following study was included in the deliverable.

## 1.2 Survey

In order to study the actual requirements of user communities for the network, more than 65% of the most important 1268 educational, research and development institutions in target countries were surveyed in February – May 2006. The following data was collected:

- Current connection to Internet/GÉANT2:
  - Point of connection (postal address of main research premises)

Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003

- Type of connection:
  - Dial up / Copper leased lines / Fiber-optical line
- Estimation of Internet/GÉANT connectivity needs for the next 3 years:
  - Bandwidth
    - Less than 3 Mbps / 3 to 30 Mbps / 30 to 300 Mbps / More than 300 Mbps
  - Other requirements

In spite of the explicit nature of the questionnaire, many representatives of the institutions found it difficult to answer all questions. It could be explained by the low level of government financing which allows the institutions to use less than 10 Mbps bandwidth and leaves them unaware of the modern services and technologies. In this situation wide European experience had to be studied (SEEFIRE Deliverables, EENet User Survey, PIONIER Network and CESNET reports) to provide a reliable estimation of user needs for those institutions who did not reply. The requirements of user communities, which were obtained by the survey and estimated or found out by project partners, are analysed and summarised in the current deliverable.

### 1.3 Aspects of user needs

When describing the needs of users - research institutions and universities - the following three levels of deployment had to be identified:

- *Internet applications* - What does the institution need the Internet for?

This level describes the actual work environment and tasks of researchers: data mining/collecting, data processing, flawless and rapid communicating with colleagues and partners, data exchange, creating and running simulations, publishing etc. - see the list in 1.2.1.

- *Services* - What network services are needed for creating such work environment?
- *Network type* - What type of network is needed to enable such services?

Since the Porta Optica Study project aims to prepare the development of dark fiber network, special attention was paid to the user needs in terms of *network type*.

#### 1.3.1 Internet applications

To incorporate a list of the most important fields of activity the institutions have into the following, SEEFIRE Deliverables, EENet User Survey, PIONIER Network and CESNET reports were analysed and answers to the survey were taken into account.

##### List of possible *Internet applications* (not ordered):

- obtaining information for/about study, work and research (including distant database and libraries access)
- news reading
- data mining

Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003

- people/contacts search
- publishing information (research results, educational materials)
- communication
- videoconferencing
- audio conferencing
- distant learning
- cooperation with researchers in the country and on the international level, especially with other European researchers via Internet
- new technologies testing and development
- shared use of distributed resources
- telemetry
- virtual laboratories
- intensive calculations and simulations
- network management
- usage of public and commercial services
- web server content management
- web server usage analysis
- information content indexing

### 1.3.2 Services

The list of *Internet applications* in the previous paragraph was analysed and 3 types of *Services* needed for enabling those activities were defined:

#### List of Services:

##### Basic:

- web server
- e-mail
- Usenet, forums
- chat rooms
- user support
- mailing lists

##### Advanced:

- distant databases access
- videoconferencing
- audio streaming
- audio conferencing
- video streaming
- directory service
- web hosting

Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003

- IP telephony
- security
- security incident response
- QoS
- distant learning
- access to high performance computing centers
- wireless access to network
- DNS

#### Special:

- GRID services (projects related to astronomy, fusion energy science, high energy physics, climate modeling, biochemistry)
- testbed environment (access to new generation network services)

### 1.3.3 Types of network

After *Service* levels were analyzed, and two *Types of network* were identified:

- **basic IP provision**, where all basic services and some advanced services like directory service, web hosting, QoS, security and security incident response can be run
- **advanced network**, which should be run on FO/Giga Ethernet and enables services like distant databases access, videoconferencing, IP telephony, access to high performance computing centers, wireless LAN, GRID and distant learning

## 1.4 Institutions by level of needs

All institutions from the User Database (compiled in D1.1) were divided into 2 groups according to the level of their needs for services:

- a group of “*basic needs*”, where basic IP provision is sufficient;
- a group of “*advanced needs*” where an advanced network (FO/Giga Ethernet) is needed or already available

Furthermore, a criterion (in terms of *Type of network*) for Institutions who did not reply was set up.

An institution was assessed to have advanced needs, when one or several of the following conditions were true:

Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003

- the institution indicated the required bandwidth for the next 3 years larger than 30 Mbps
- total number of students of the Institutions is 5000 or more;
- currently, the institution participates in at least one EU project or has participated in such project(s) during previous 3 years;
- the institution is recognised by its research potential in the fields of GRIDs, high-energy physics, radio-astronomy, meteorology, engineering, medicine, data visualization, etc.

When none of those conditions was true, the institution was assessed to have basic needs.

Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003

## 2 User Needs Table

This table contains updated information concerning institutions presented in D1.1. For the sake of this stage of project implementation the Table of Institutions from D1.1 was modified. The field “User requirements” was replaced by two fields – “Current Internet connectivity” and “Needed Internet connectivity”. Some new contact information was added. Special attention was paid to the entry of the “Priority” and “Needed Internet connectivity” fields.

Thus for each institution the following detailed information which can be used or needed for further project implementation is collected<sup>1</sup>:

- City where the institution is located
- Name of institution
- Type of institution (U=University; UB=University Branch; R&D=Research and Development; O=Other type)
- Fields of activity
- Most important current and/or planned joint project(s) with EU and EE countries
- Current Internet connectivity (if information available)
- Needed Internet connectivity<sup>2</sup>
- Official postal address of the institution
- Address of premises (real POP address or address where cabling is necessary)
- Contact information
- Contact confirmed, (“yes” means that the contact person was contacted and he/she is ready to cooperate with POS project, “no” means that nobody was contacted)
- Priority for the Network development

In the table the green rows indicate the institutions with “*advanced needs*” in Estonia, Latvia, Lithuania, Belarus, Ukraine and Moldova.

<sup>1</sup> – empty cells indicate that data was not available

<sup>2</sup> – estimated or surveyed

Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003

For Southern Caucasus the present state of science and technology development allows to forecast (for the next 3 years) the maximum demand for Internet connectivity up to 30 Mbps per institution. The institutions of that region are marked with blue colour, when they need more than 3 Mbps connection.

## 3 Analysis of the Obtained Data

### 3.1 Baltic and Eastern Europe countries

In Baltic and Eastern Europe countries requirements of 969 institutions in 110 cities were analysed:

- 437 institutions have advanced needs
  - 280 institutions with Priority 1
  - 128 institutions with Priority 2
  - 29 institutions with Priority 3
- 532 have basic needs

Detailed information about the number of institutions in each category is given in the table below.

	Estonia	Latvia	Lithuania	Belarus	Ukraine	Moldova	Total
Advanced needs Priority 1	15	9	54	70	129	3	280
Advanced needs Priority 2	9	4	7	30	78	0	128
Advanced needs Priority 3	10	1	3	3	12	0	29
Basic needs	3	10	16	43	443	17	532
<b>Sum</b>	<b>37</b>	<b>24</b>	<b>80</b>	<b>146</b>	<b>662</b>	<b>20</b>	<b>969</b>

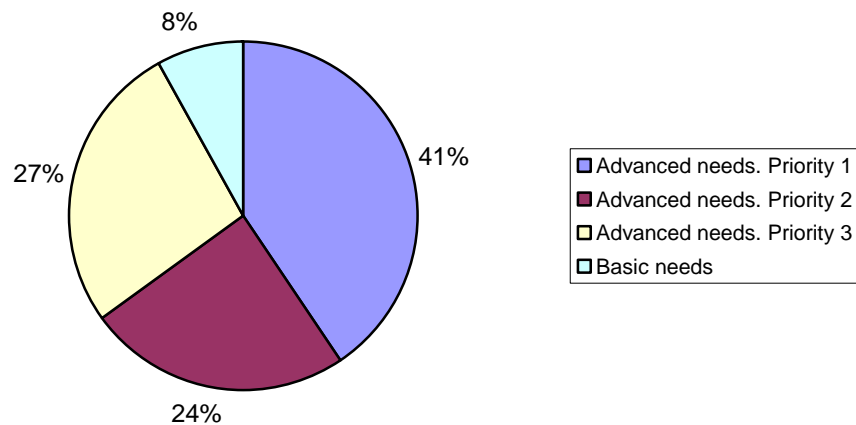
**Table 1.** Institutions from Baltic and Eastern Europe countries divided by needs and priority

### 3.1.1 Estonia

In Estonia, which has total population of 1,3 million, 37 main research and education institutions were taken into account. Institutions are located in the following cities:

- Tallinn (18),
- Tartu (9),
- Rannu (1),
- Tõravere (1),
- Haapsalu (1),
- Kohtla-Järve (1),
- Kuressaare (1),
- Viljandi (1),
- Narva (1),
- Pärnu (1),
- Türi (1),
- Rakvere (1)

15 institutions from the aforementioned cities require advanced services through the NREN infrastructure. 41 percent of research and education institutions have a priority in the first phase NREN development.



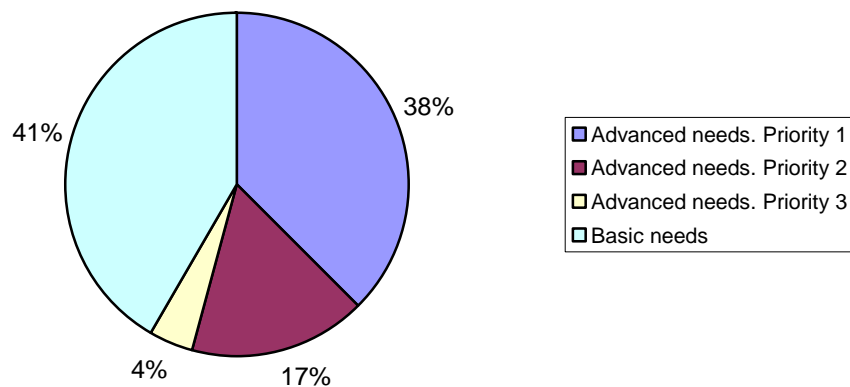
**Figure 1.** Structure of requirements of institutions in Estonia

### 3.1.2 Latvia

In Latvia, which has total population of 2,3 million, 24 research and education institutions were taken into account. Institutions are located in the following cities:

- Riga (17),
- Vīļani (1),
- Salaspils (1),
- Ventspils (1),
- Valmiera (1),
- Rezekne (1),
- Jelgava (1),
- Dobele (1).

9 institutions from Riga (capital), Salaspils, Ventspils, Valmiera, Jelgava require advanced services through the NREN infrastructure. 38 percent of research and education institutions have a priority in the first phase NREN development.



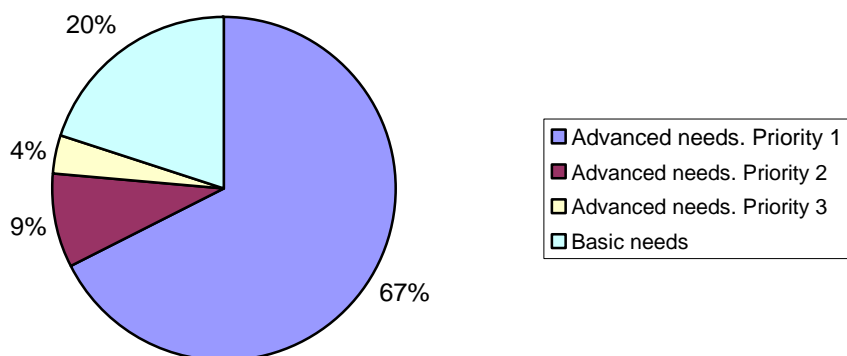
**Figure 2.** Structure of requirements of institutions in Latvia

### 3.1.3 Lithuania

In Lithuania, which has total population of 3,4 million, 80 research and education institutions were taken into account. Institutions are located in the following cities:

- Alytus (1),
- Druskininkai (1),
- Kaunas (16),
- Kedainiai (2),
- Klaipeda (2),
- Marijampole (1),
- Moletai (1),
- Palanga (1),
- Panevezys (4),
- Siauliai (4),
- Taurage (2),
- TelSiai (2),
- Utena (1),
- Vilnius (42).

54 institutions from Alytus, Kaunas, Kedainiai, Klaipeda, Marijampole, Moletai, Palanga, Panevezys, Siauliai, Taurage, TelSiai, Utena, Vilnius (capital) require advanced services through the NREN infrastructure. 67 percent of research and education institutions have a priority in the first phase NREN development.



**Figure 3.** Structure of requirements of institutions in Lithuania

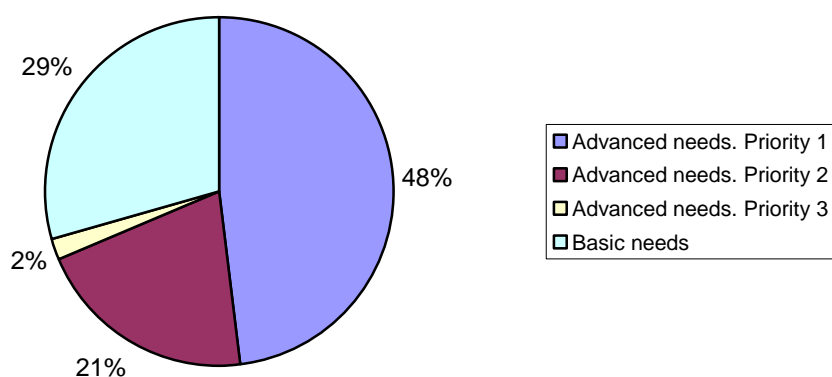
Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003

### 3.1.4 Belarus

In Belarus, which has total population of about 10 million, 146 research and education institutions were taken into account. Institutions are located in the following cities:

- Baranovichy (1),
- Brest (2),
- Gomel (7),
- Gorki (1),
- Grodno (3),
- Zhlobin (1),
- Minsk (118),
- Mogilev (3),
- Mozir (1),
- Molodechno (1),
- Novopolok (1),
- Pinsk (1),
- Vitebsk (5),
- Novopolosk (1).

103 institutions from Minsk (capital), Mogilev, Molodechno, Vitebsk require advanced access services through to the NREN infrastructure. About 50% of research and education institutions have a priority in the first phase NREN development. A quarter will be considered at the last step.



**Figure 4.** Structure of requirements of institutions in Belarus

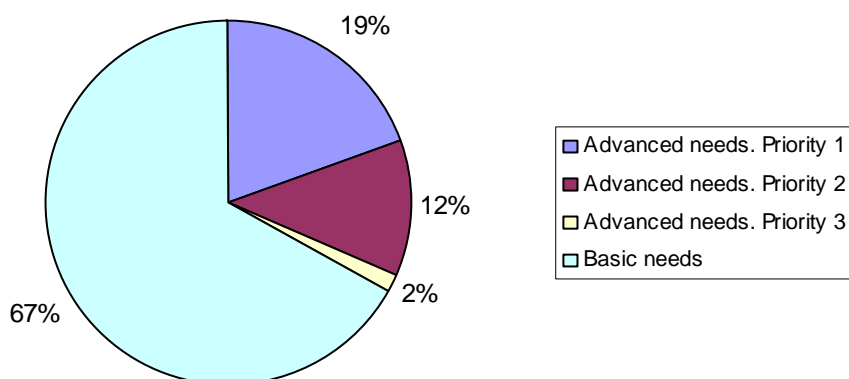
### 3.1.5 Ukraine

In Ukraine, which has total population of 46,5 million, 662 research and education institutions were taken into account. Institutions are located in the following cities:

- Alchevsk (1),
- Berdiansk (2),
- Beregove (1),
- Brovary (1),
- Cherkassy (4),
- Chernigov (5),
- Chernivtsi (9),
- Chornobyl (2),
- Donetsk+Makejevka (29),
- Dnipropetrovsk + Dniprodzerzhinsk (25),
- Dubljany (1),
- Drogobych (1),
- Evpatoria (1),
- Feodosia (3),
- Glukhiv (1),
- Gorlovka (1),
- Ivano-Frankivsk (12),
- Kiev (261),
- Kamjanets-Podilsky (2),
- Kerch (2),
- Khmelnitskyj (7),
- Kharkov (69),
- Kherson (4),
- Kirovograd (3),
- Kramatorsk (1),
- Kremenchug (1),
- Krivyy Rig (3),
- Kulynychi (1),
- Lugansk (7),
- Lutsk (4),
- Lviv (47),
- Mala Danylivka (1),
- Mariupol (2),
- Melitopol (2),
- Mukacheve (4),
- Nauchny (1),
- Nikolajev (11),
- Nova Kahovka (1),
- Odessa (36),

- Perejaslav-Khmelnytsky (1),
- Poltava (6),
- Rivne (6),
- Samchiky (1),
- Sevastopol (5)
- Severodonetsk+Lisichansk (5),
- Shostka (2),
- Simferopol (8),
- Slovjansk (3),
- Sumy (8),
- Ternopil (8),
- Uman (3),
- Uzhgorod (8),
- Velyka Bakta (1),
- Vinnytsa (8),
- Yalta (3),
- Zaporizhia (12),
- Zhovti vody (1),
- Zhytomir (5).

103 institutions from Lviv, Dubljany, Drohobych, Lutsk, Rivne, Ivano-Frankivsk, Ternopil, Uzhgorod, Chernivtsi, Khmelnytskyj, Kiev (capital), Chornobyl, Zhytomir, Vinnytsa, Cherkassy, Sumy, Shostka, Poltava, Kremenchug, Kirovograd, Kharkov, Dnipropetrovsk + Dniprodzerzhinsk, Krivyj Rig, Zaporizhia, Donetsk+Makejevka, Mariupol, Kramatorsk, Slovjansk, Lugansk, Odessa, Nikolajev, Kherson, Simferopol, Evpatoria, Nauchny, Yalta, Sevastopol require advanced services through the NREN infrastructure. 19 percent of research and education institutions have a priority in the first phase NREN development.



**Figure 5.** Structure of requirements of institutions in Ukraine

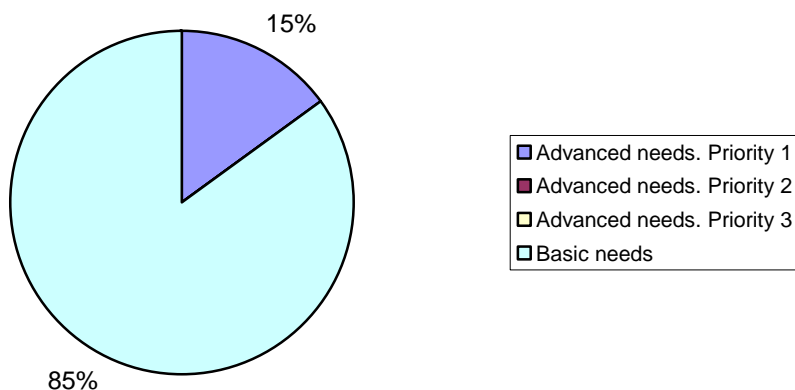
Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003

### 3.1.6 Moldova

In Moldova, which has total population of 3,4 million, 20 research and education institutions were taken into account. Institutions are located in the following cities:

- Chisinau (17),
- Balti (1),
- Comrat (1),
- Cahul (1) .

3 institutions from Chisinau (capital) require advanced services through the NREN infrastructure. 15 percent of research and education institutions have a priority in the first phase NREN development.



**Figure 6.** Structure of requirements of institutions in Moldova

### 3.2 Caucasian countries

In Southern Caucasus countries requirements of 166 Institutions in 14 cities were analysed:

- 34 Institutions have advanced requirements
  - 26 institutions with priority 1
  - 8 institutions with priority 2
- 132 institutions have basic needs

Detailed information about the number of institutions in each category is given in the table below.

	Armenia	Azerbaijan	Georgia	Total
3 to 30 Mbps Internet connectivity required Priority 1	8	14	4	26
3 to 30 Mbps Internet connectivity required Priority 2	0	8	0	8
3 to 30 Mbps Internet connectivity required Priority 3	0	0	0	0
Basic needs	42	30	60	132
<b>Sum</b>	<b>50</b>	<b>52</b>	<b>64</b>	<b>166</b>

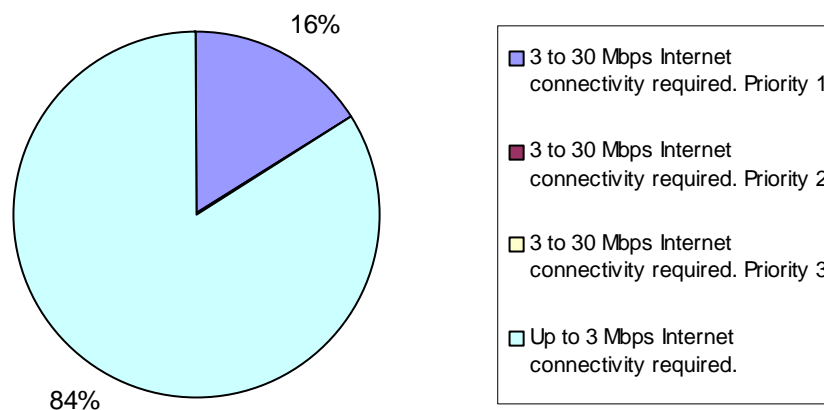
**Table 2.** Institutions from Southern Caucasus countries divided by needs and priority

### 3.2.1 Armenia

In Armenia, which has total population of 3 million, 50 research and education institutions were taken into account. Institutions are located in the following cities:

- Abovyan (1),
- Ashtarak (4),
- Garni (2)
- Gyumri (2),
- Yerevan (41),

8 institutions from Yerevan (capital) require 3 to 30 Mbps Internet connectivity through the NREN infrastructure. 16 percent of research and education institutions have a priority in the first phase NREN development.



**Figure 7.** Structure of requirements of institutions in Armenia

### 3.2.2 Azerbaijan

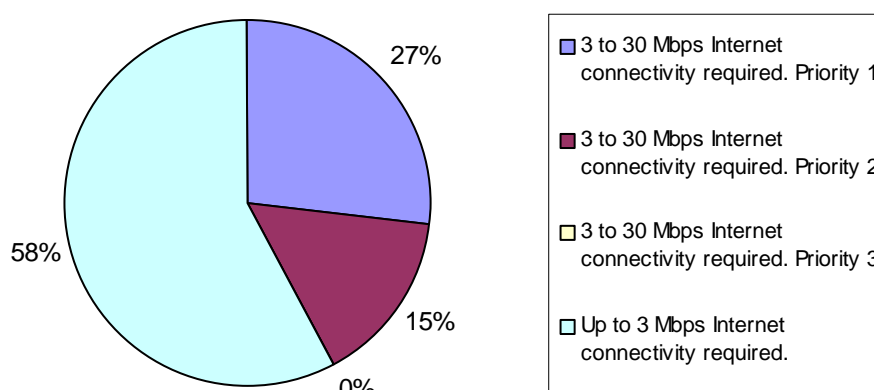
In Azerbaijan, which has total population of 8,5 million, 52 research and education institutions were taken into account. Institutions are located in the following cities:

- Baku (34),
- Ganja (5),
- Lenkoran (1),

Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003

- Mingechevir (2),
- Nakhchevan (4),
- Shaki (1),
- Shamakhy (1),
- Sheki (1)
- Sumgayit (3).

14 institutions from Baku (capital), Ganja, Sumgayit, Shamakhy, Nakhchevan require 3 to 30 Mbps internet connectivity through the NREN infrastructure. 27 percent of research and education institutions have a priority in the first phase NREN development.



**Figure 8.** Structure of requirements of institutions in Azerbaijan

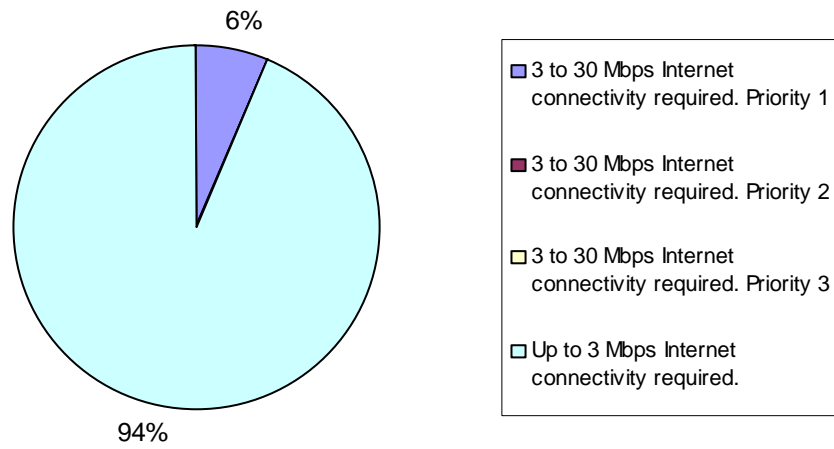
### 3.2.3 Georgia

In Georgia, which has total population of 4,4 million, 64 research and education institutions were taken into account. Institutions are located in the following cities:

- Batumi (2),
- Gori (1),
- Kutaisi (3),
- Tbilisi (57),
- Telavi (1).

4 institutions from Tbilisi (capital) require 3 to 30 Mbps internet connectivity through the NREN infrastructure. Six percent of research and education institutions have a priority in the first phase NREN development.

Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
Document Code:	POS-06-003



**Figure 9.** Structure of requirements of institutions in Georgia

## 4 Conclusions

As the survey and assessment of user needs proved, the level of requirements as well as the current connectivity of institutions differs strongly between the 3 regions and, in some cases, also within the countries. However, for all nine target countries the most important research institutions demanding high level services and backbone were identified and the deliverable serves as input data for subsequent planning the network - Points of Presence and link capacities.

## 5 References

- SEEFIRE <http://www.seefire.org/content/modules/downloads/SEEFIRE-WP1-D12FibreAcquisitionExperiences-a-20050830a.pdf>
- EENet User Survey <http://www.eenet.ee/EENet/1904>

## Appendix A Database

Project:	Porta Optica Study
Deliverable Number:	D1.4
Date of Issue:	31.07.2006
EC Contract No.:	026617
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