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EUROPEAN PARLIAMENT

*Scientific Technology  
Options Assessment*

**STOA**

# **Computer networks for research and education:**

## **A European success story – New challenges for policy makers**



April 2, 2008



# From Digital Divide to Digital Inclusion

## *Are we REDI?*

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***EARNEST Workshop on Computer Networks for Research & Education:  
A European Success Story – New Challenges for Policy Makers***

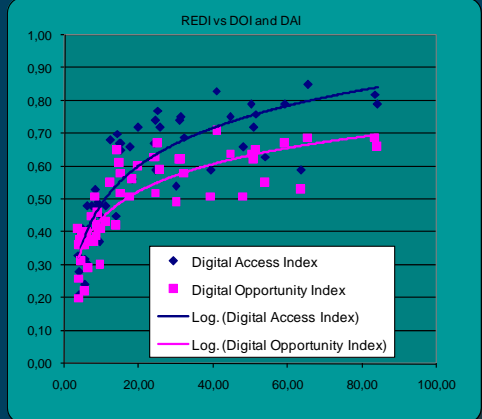
***Scientific Technology Options Assessment - STOA  
European Parliament, Brussels, April 2<sup>nd</sup> 2008***

# Research and Education Networking Digital Divide and Index (REDI)



A way to quantify and measure “the uneven distribution, difference or gap in regular and effective access to and usage of digital resources and technologies”

... between scientists, researchers, students, etc\* attached to research and education networks



... due to infrastructural, social, economic, educational, regulatory and other causes, including but not limited to, unavailability of, difficulty in accessing, unawareness of the availability and/or capabilities of, lack of understanding of how to access and/or use such digital resources and technologies.

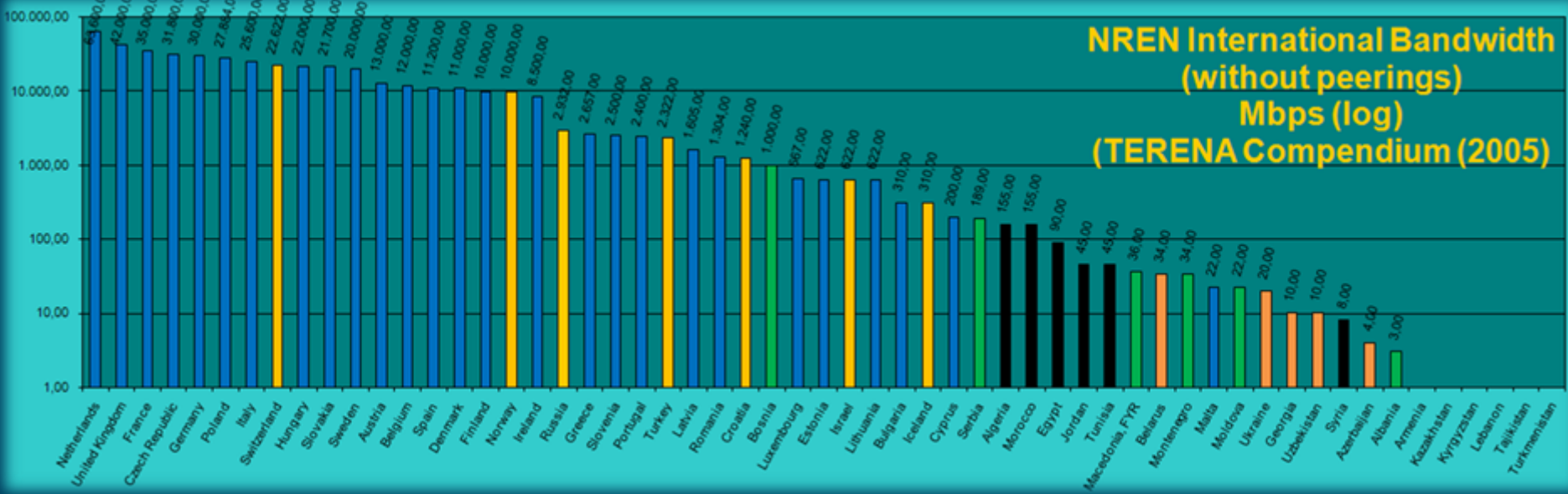
\* Conclusions should be able to be deduced for organizations, campuses, and geographic areas attached to research and education networks.

Sub-Index	How to answer?	Indicators
Infrastructure	Network capacity	External connectivity capacity Core network capacity   Access network capacity
Usage	Resources utilization	IP outgoing traffic   IP incoming traffic
Affordability	General infrast. landscape	International Internet bandw.   Internet tariff Internet users
Knowledge	Financial capacity Policy environment	GDP   Expenditure on R&D   NREN budget Regulatory situation
Quality	Human capacity Human output	Literacy   School enrolment Patents   Researchers in R&D
	Network performance	RTT   Jitter   Throughput Unreachability   Losses



# NREN International Bandwidth

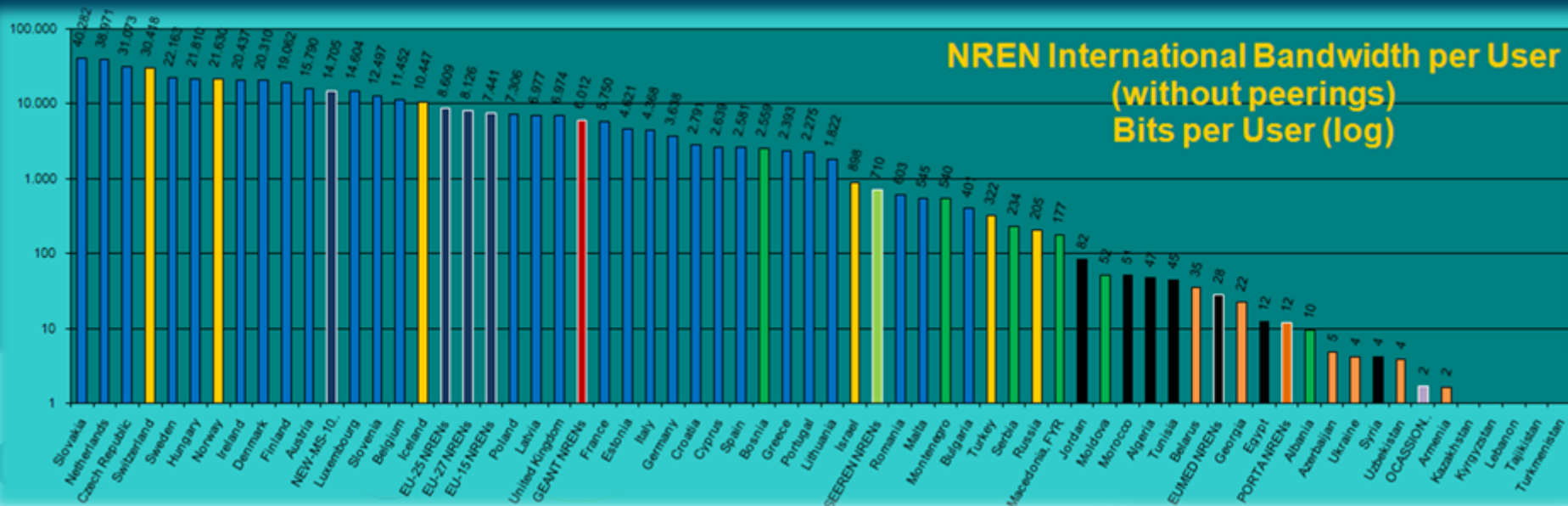
- The total capacity of external links is indicative of the nominal ability of the NREN to carry traffic to the global Internet.
  - More than two orders of magnitude disparity between EU Member States
  - More than three orders of magnitude between EU and the MED in average
    - The average GEANT2 (34), Balkan (6) and MED (7) NRENs international bandwidth is 12Gb/s, 252Mb/s and 70Mb/s respectively



# NREN International Bandwidth per Researcher, Student, etc



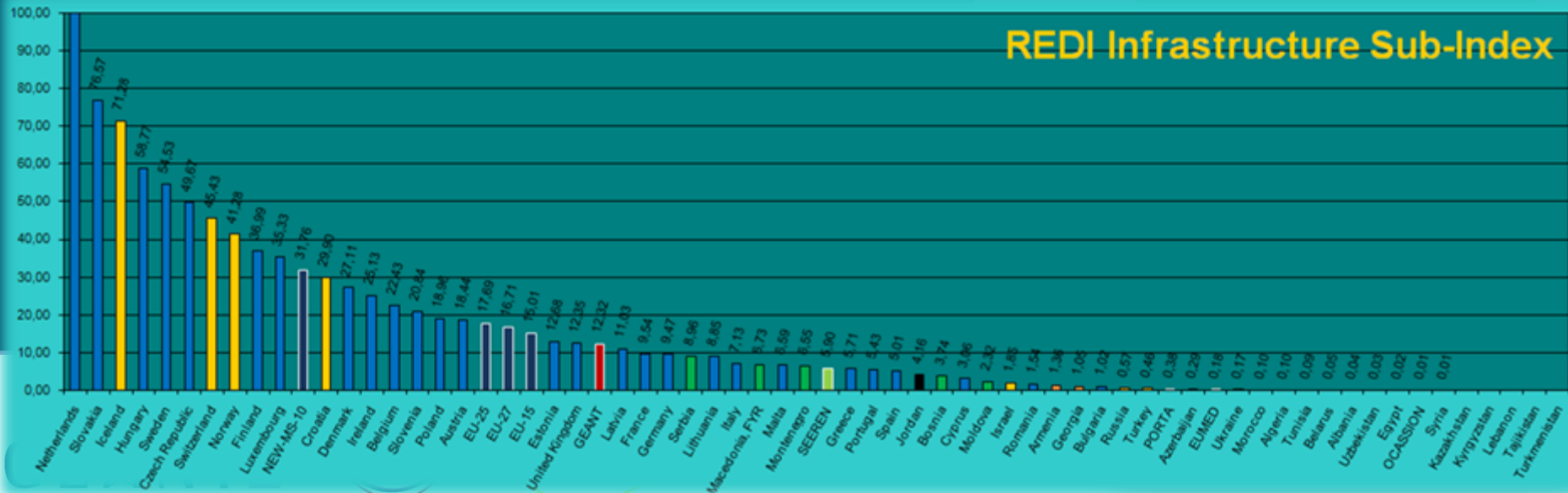
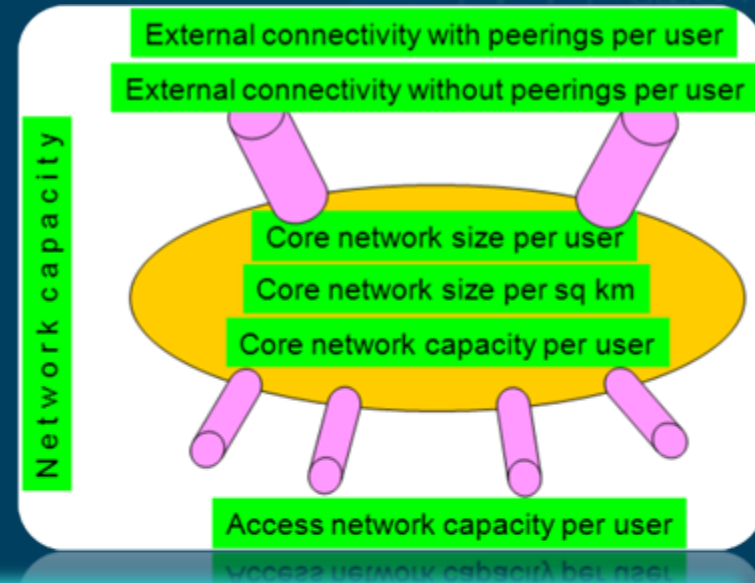
- Slovakia and the Netherlands score an average of **40kb/s**
  - **More than three orders of magnitude disparity between EU Member States, Ukraine, Syria, Uzbekistan by four orders (0.004b/s).**
  - The avg. GEANT2 (34), Balkan (6) and MED (7) NRENs international bandwidth per user is 6kb/s, 0.7kb/s and 0.03kb/s respectively .
  - **The “NEW-EU-MS-10” outperforms by a factor of 2 any other average.**
- The “trailing tail” of NRENs in the plotted figure are expected to encounter significant difficulty to access cutting-edge R&E applications and services over their international connection.



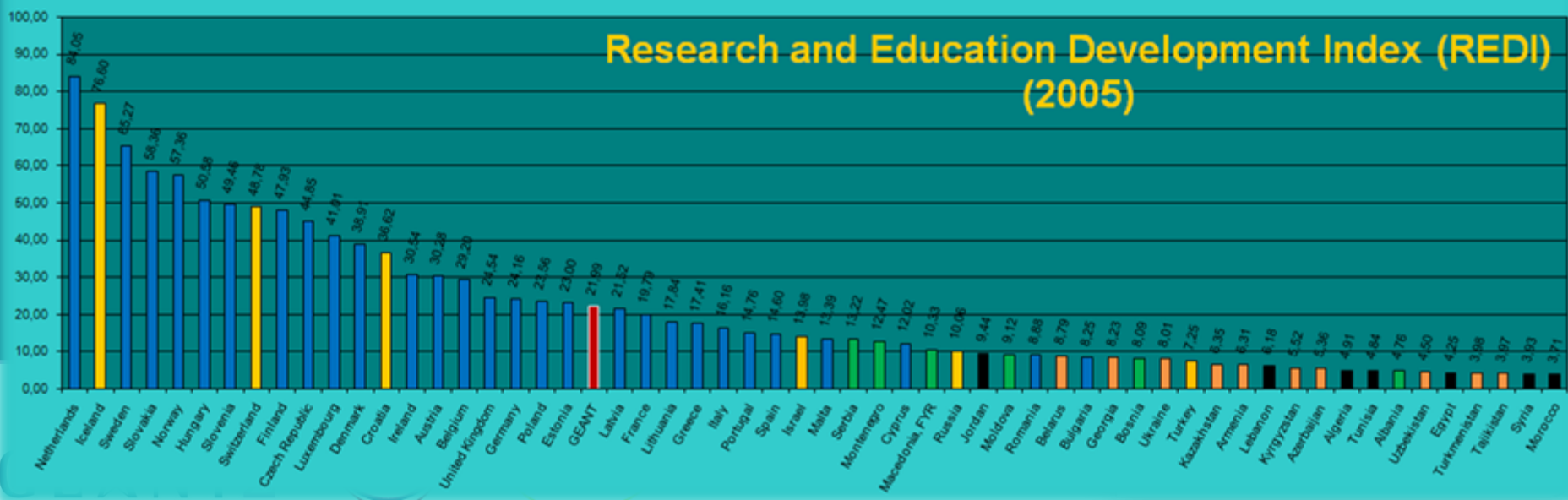
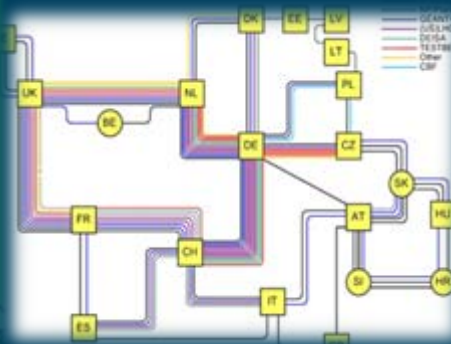
# NREN Infrastructure Index



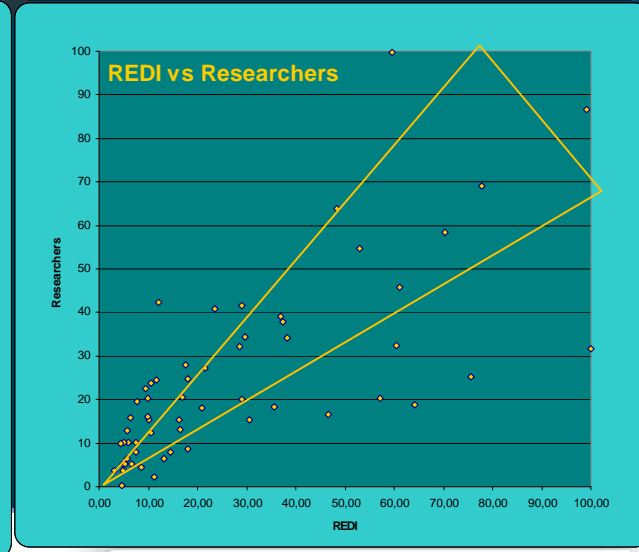
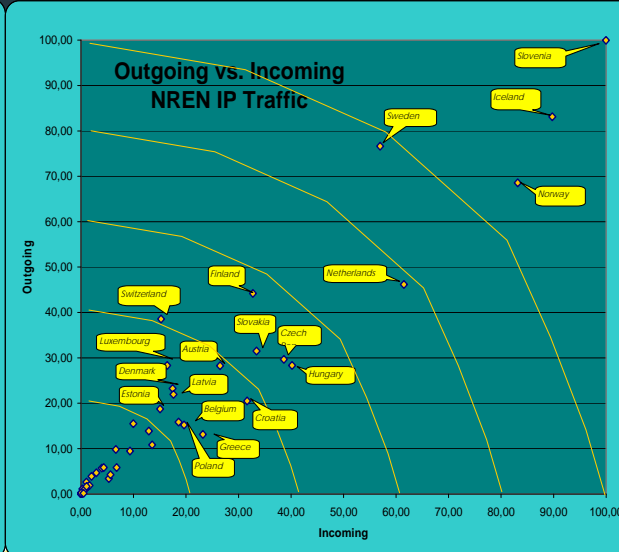
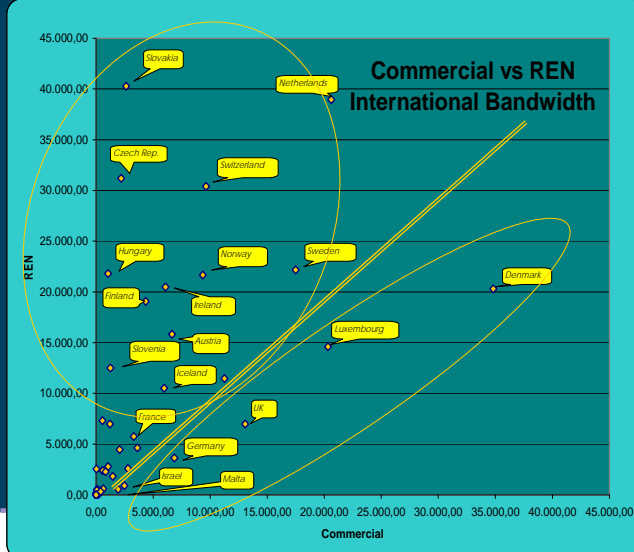
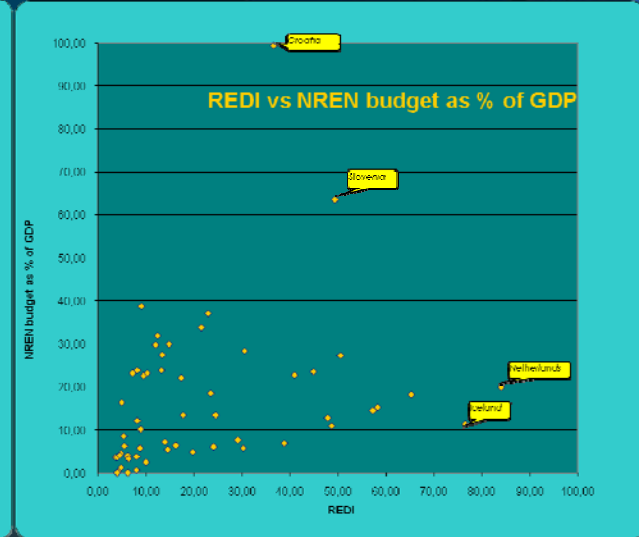
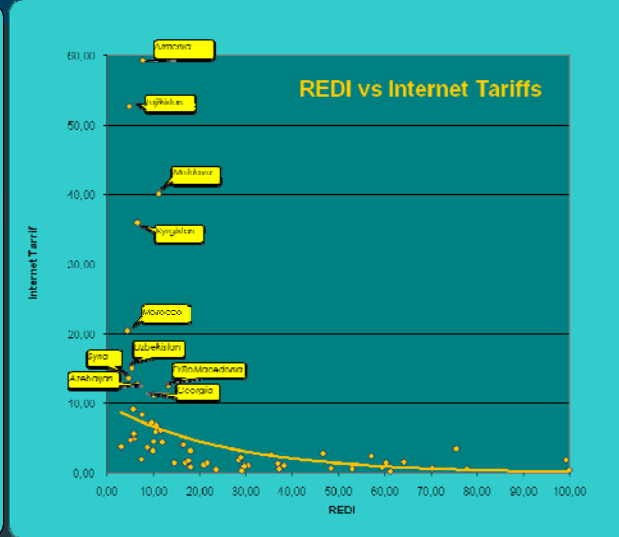
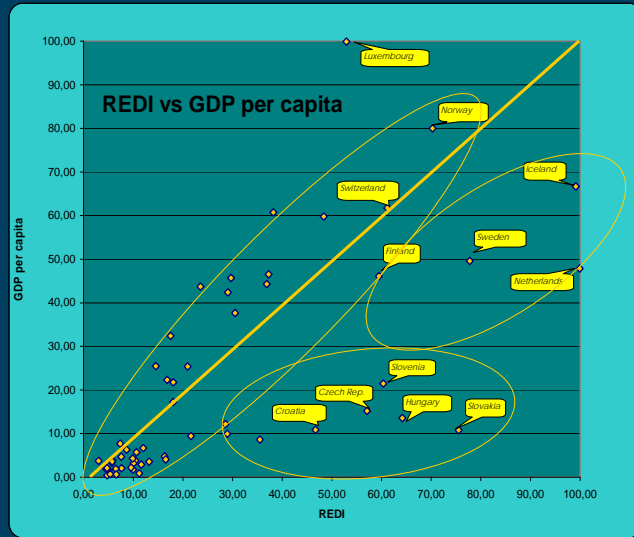
- By convoluting the set of indicators related to the NREN infrastructure, it is exhibited that there is a significant disparity
  - **two orders** of magnitude between Bulgaria (1,02) and the Netherlands (100)
  - **four orders** of magnitude between Syria (0,01) and the Netherlands (100).
  - between avg. GEANT2 (12,32), Balkan (5,90) and MED (0,18).



# Research and Education Development Index (2005 data)



# Plotting the Digital Divide



# Conclusions - Recommendations



1. GÉANT extensions in developing regions.
2. NRENs' institutional role.
3. Predictability, fair competition, and deregulation of (telecom) markets.
4. EC special support action for low REDI performers (e-RED Initiative).
5. Member States' R&E roadmaps in sync and in tune.
6. Education and training programmes for accessing and utilizing e-Infrastructures.
7. Monitor periodically progress towards sustainability through the REDI.
8. Policy Statement - Declaration of Solidarity for diminishing the digital divide.



JNPartners Co.