



## Geographic Issues

### Discussion note

Geographic issues in research and education networking are often related to the digital divide that exists between different countries and regions in and around Europe. The "digital divide" is the difference in access to, or availability of, digital resources between continents, nations and/or groups of people within a nation. Wikipedia defines digital divide as "the gap between those with regular, effective access to digital technologies and those without".

More specifically for the case of NRENs, the digital divide can be defined as "the uneven distribution, difference or gap in regular and effective access to, and usage of, digital resources and technologies".

The digital divide can be due to infrastructural, social, economic, educational, regulatory and other factors, including but not limited to, unavailability or difficulty in accessing digital resources and technologies, or even lack of understanding on how to access and/or use them. Therefore, measuring, quantifying and tackling the digital divide is a multi-faceted challenge.

The EARNEST study of geographic issues aimed to trace and quantify the various aspects of the digital divide by producing an enhanced, concrete and structured method of measuring the status of research and education development. The ultimate goal was to contribute to the deeper understanding of the challenges of the digital divide or digital inclusion and digital opportunities, as well as to suggest ways to address these challenges and opportunities in a more effective manner.

The report of the study describes the process for collecting, measuring and interpreting indicators related to the digital divide as well as the process of verifying, validating and updating the raw data drawn from various sources. A series of second-level computations have been used to derive index-based rankings and benchmarks, which eventually led to the formulation of a Research and Education Networking Development Index (REDI).

The findings of the study include the following:

- There is a sizeable number of countries on the wrong side of digital divide.
- Countries on the wrong side of the digital divide have poor performances in any of the five sub-indices. The top-ranked countries exhibit high values in one or more of the sub-indices, but hardly in all five, with only a handful notable exceptions.
- There seems to exist some correlation between the GDP per capita and the REDI. However, for a number of countries this correlation is not as strong as one would expect: several NRENs (e.g., Slovakia, Hungary, Slovenia and the Czech Republic) have quite a good REDI ranking but have a relatively low GDP per capita.

- There seems to exist a very strong correlation between the REDI ranking and the Internet tariffs in the countries under study. The Internet tariff is an exceptional indicator of the market competition in a country. Open and competitive markets seem to play a significant role in the NRENs' development.
- Slovakia has an available average of 40 kb/s per NREN user, while Armenia lags behind by at least 4 orders of magnitude, scoring merely 1.66 b/s per user.
- Dutch researchers have 4 orders of magnitude higher average capacity than Syrians or Azerbaijanis, 2 orders of magnitude higher than Georgians and 1 order of magnitude higher than Italians. The last 20 or so NRENs considered in the study are expected to encounter significant difficulties to access cutting-edge research and education applications and services over their international connections.
- Iceland has up to 5 orders of magnitude higher access bandwidth per user compared to the countries at the end of the spectrum. Furthermore, although "ten-new-member-states" is outperforming any other index-average, the next one in line is the SEEREN average which climbs higher than either "EU-25", "EU-27" or "EU-15".
- Comparing for a given country the NREN's international bandwidth per user with the commercial international Internet bandwidth per inhabitant yields noteworthy findings. A significantly better performance of the NRENs would generally be expected, given their cutting-edge infrastructure and the application needs of research and education. However, this is not the case even for widely regarded advanced countries of considerable size and GDP.

There are certain aspects of national and regional development plans which, if they continue not to be addressed, will limit the prospect of digital inclusion for the regions that are still lagging behind. The "usual suspects" for the existence and/or widening of the digital divide include limited budgets, relatively uncompetitive telecommunications markets, uncertainty of subsequent phases of planning and support, ineffective NREN management structures etc. "Limited financial resources" (either at NREN and/or at country/GDP level) are the most frequently invoked reason for the existence of the digital divide in a region.

However, the study has shown that digital divides also exist in otherwise well-developed and well-resourced countries, either at the overall country level (as the REDI revealed in several cases) or in regions within a country. Additionally, it was demonstrated that the availability of technological breakthroughs makes it possible for "greenfield" regions and developing countries to leapfrog and catch up or even surpass (see the progress of the new EU member states). By taking advantage of dark fibre, several NRENs in the European Union have dramatically increased their network capacities and are now leaders in the NREN community.

Given the above, it is quite possible that the single most important hurdle that is still faced by NRENs today and that needs to be overcome - irrespective of their REDI ranking and irrespective of whether they are based in a developed or in a developing country - is the perceived priority and importance of (national) research and education (networks) compared to other activities or objectives within a certain country or region. Usually this (mis)perception of lower priority and importance is initiated and sustained at the national level of government, but it is also left unresolved due to limited pressure both from the NREN and at the European level.

The NREN support usually falls short in the promotion and management aspects, failing to convince national authorities of the immediate impact on macro-level wellbeing, prosperity and economic development of a country stemming from research and education networking. Similarly, despite the EU-wide support actions for several ongoing regional efforts to convey to the public at large the significance of NRENs as a key element for the creation of economic prosperity and innovation, the results are still mediocre. This is mostly because a central mandate and policy is missing (as, for example, there was for telecommunications deregulation and broadband access) that would dictate the NREN's development at national level. Instead, in many cases there is only a short-term intervention in the form of project-based efforts (regional or pan-European) when a more permanent 'institutionally based' model for NRENs operating on contributions from the national budget – potentially "frozen" for a period of 5 to 7 years as a percentage of GDP - would have a lasting impact and a sustainable structure.

The unresolved deficiency mentioned above also affects overall EU innovation performance indices, which, compared to other areas around the world, still exhibit a low investment in R&D (in particular private funds) as a percentage of GDP. This "innovation atrophy" that continues to affect the EU, characterised by a high level of risk avoidance in R&D activities, reveals that lessening the digital gap in the NREN environment at EU level and beyond is eventually a matter of priority setting.

Backtracking recent developments in digital-divide-related bridging efforts and exploring the applicability of the REDI as a policy tool, the study has formulated a first set of recommendations aimed at the stakeholders. These recommendations include:

- Monitor, benchmark and publish/disseminate the research and education networking development status on an annual basis via the REDI index, in Europe and the neighbouring countries.
- Seek support from the European Commission and the European Parliament for guaranteed funding of NREN activities out of national budgets, in combination with assigning an official institutional role to NRENs, especially in the cases of countries which show a low REDI ranking.
- Assess the progress and sustainability achieved in the course of EC-subsidised research and education networking projects, on the basis of the REDI indices.
- Accommodate online data measurements across NREN network infrastructures.
- Strengthen the sustainability of NRENs through continuous investments and upgrading of NRENs' infrastructures, achieving high-quality life-long training and retaining the excellence of their technical staff, while providing competitive, user-friendly and state-of-the-art services to the research and education community and the public at large.

#### **For discussion**

Do you agree with the recommendations above? What would you like to change? Are there any other recommendations that you would like to add? Which of the recommendations are the most important ones that should be incorporated and highlighted in the overall Summary Report of the EARNEST Foresight Study?