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Data poverty: A global evaluation for 2009 to 2013 - implications for sustainable development and disaster risk reduction

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ABSTRACT

The article presents a time series (2009–2013) analysis for a new version of the "Digital Divide" concept that developed in the 1990s. Digital information technologies, such as the Internet, mobile phones and social media, provide vast amounts of data for decision-making and resource management. The *Data Poverty Index* (DPI) provides an open-source means of annually evaluating global access to data and information. The DPI can be used to monitor aspects of data and information availability at global and national levels, with potential application at local (district) levels. Access to data and information is a major factor in disaster risk reduction, increased resilience to disaster and improved adaptation to climate change. In that context, the DPI could be a useful tool for monitoring the Sustainable Development Goals of the Sendai Framework for Disaster Risk Reduction (2015–2030). The effects of severe data poverty, particularly limited access to geoinformatic data, free software and online training materials, are discussed in the context of sustainable development and disaster risk reduction. Unlike many other indices, the DPI is underpinned by datasets that are consistently provided annually for almost all the countries of the world and can be downloaded without restriction or cost.

1. Introduction

The divide in Information and Communication Technology (ICT) provision, between different countries or regions of the world, is referred to as the global digital divide (Norris, 2001). Development programs, international funding agencies and qualified decision making (i.e., decision making that is based on facts, measurements and maps) require standardized indicators to measure the impact of their programs and decisions (Desiere et al., 2015). Poor quality data affects even high-profile international development efforts, such as the Millennium Development Goals (MDGs), set by the United Nations (UN). However, according to a report by an independent UN advisory group published on November 6th 2014, the figures used to track progress are unsteady. The availability of data on 55 core indicators for 157 countries has never exceeded 70% (The Economist, 2014). Tools and methods to monitor the progress in achieving the MDGs have been limited. This is an issue that needs to be addressed with the Sustainable Development Goals of the Sendai Framework for Disaster Risk Reduction (2015–2030): an improved index is required to enable reliable, effective monitoring (Griggs et al., 2013).

2015 was important for global policy, due to three UN processes: (i) the search for a long term agreement on dealing with greenhouse gases, (ii) the finalization and adoption of the Sustainable Development Goals; and (iii) the development of a successor to the Hyogo Framework for Action as a global disaster risk reduction plan. There is a link for all of them with respect to sustainable development, poverty, vulnerability, and disasters (Kelman et al., 2015). Current and emerging socio-economic and social-ecological system dynamics require a new set of easy to apply monitoring tools (Griggs et al., 2013; Benson and Craig, 2014). When assessing poverty, specifically data poverty, indicators ideally follow the SMART criteria: Specific, Measurable, Available cost-effectively, Relevant and Timely available (European Evaluation Network for Rural Development, 2014).

In the past few decades Information and Communication Technology (ICT) has profoundly altered societies around the world, with people and information becoming ever more connected (Buys et al., 2009). The evolving trends in access and consumption of ICT provide a useful metric of global development. Access to mobile phone networks, the Internet and social media have more recently had significant influence, not just for general social interaction, but also in sustainable development and disaster management appli-

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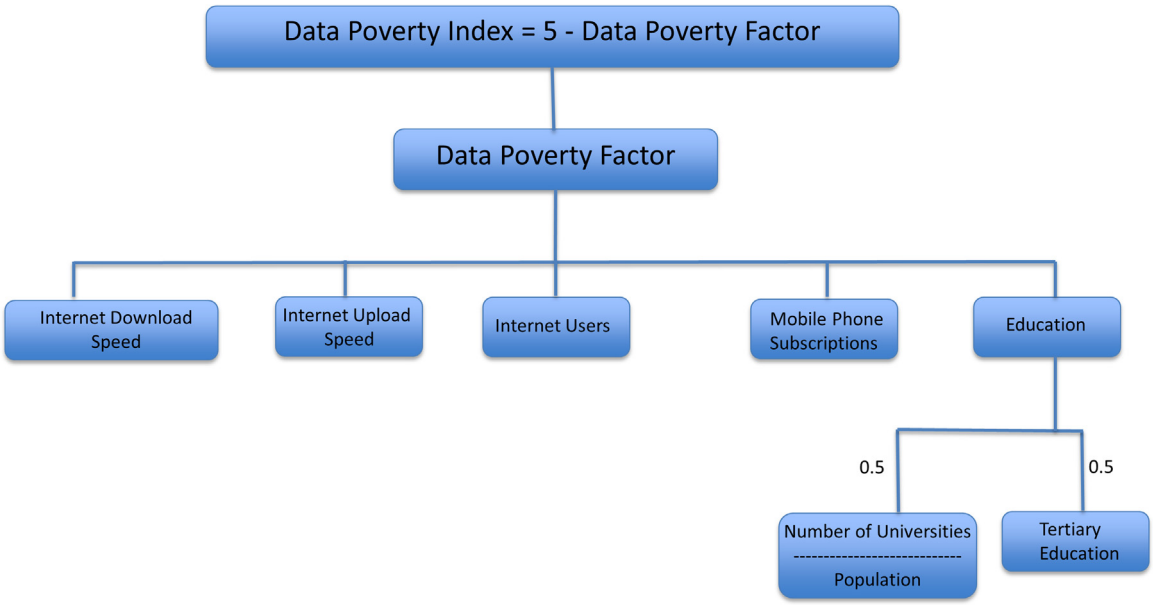

Fig. 1. Data inputs used to calculate the Data Poverty Index.

cations (Houston et al., 2015). The metrics derived from these elements could also provide a better understanding of global development and new insights into variations in the vulnerability of societies.

The term '*digital divide*' first became widely known through a U.S. Department of Commerce report, "*Falling through the Net: A Survey of the 'Have Nots' in Rural and Urban America*" (National Telecommunications and Information Administration, 1995). Today the term '*data poverty*' is often linked to economic growth (World Bank, 2006; Buys et al., 2009; International Telecommunication Union, 2012). '*Digital divide*' is, in general, defined as the gap between those who have good access to computers, digital data and information via the Internet, and those who do not (Van Dijk, 2006). Huang and Chen (2010) and Hilbert (2011) provide a fairly recent discussion about the various aspects of the global digital divide. Baban et al. (2004, 2008) used a similar term, '*information poverty*', in the context of a lack of effective and reliable data and information, for hazard assessment and decision-making in low-income countries.

To compare differences between countries in access to digital data, Leidig and Teeuw (2015a) developed the Data Poverty Index (DPI). In this article we use the DPI to analyse access to data and information in a time series from 2009 to 2013. The DPI focuses on technological aspects, but also considers the provision of university education as a measure of the level of possible sophistication of information usage. We carry out time series analysis on the Data Poverty Index to examine the dynamic state of the digital divide. While there is a general trend with regard to the income classification of the World Bank, there are further trends, sometimes conflicting, when considering individual nations or when analysing the trends from regional perspectives.

1.1. Methodology

The approach used here to evaluate and monitor national-scale changes in data poverty is based on the methodology of Leidig and Teeuw (2015a). However, that method had to be simplified because some of the indicators, such as information about households with a PC, or mobile phone network coverage, are not freely available for the entire period analysed (2009 – 2013). The input data for the time series of the Data Poverty Index proposed here is entirely derived from freely available sources. The majority of the data sets used were obtained from the World Bank (World Bank data-website, 2014), which provides data that are more up-to-date than data from the UN (United Nations data-website, 2014). The Data Poverty Index has five factors (Fig. 1):

1.2. Internet speed

(i) download and (ii) upload – a reliable and fast Internet connection is needed to download data; to share and/or upload data; to view or contribute to social media and Volunteered Geographic Information (VGI) initiatives, such as crowd-source mapping (Yin et al., 2012; Yates and Paquette, 2011; Goodchild and Glennon, 2010); the data was derived from the Net-Index website (http://www.netindex.com/) to ensure politically independent data.

(iii) Internet users: – the percentage of individuals of a country using the Internet. This indicates the proportion of a national population familiar with the Internet and how many people who are likely to benefit from Internet-delivered resources.

(iv) Mobile Phone Subscriptions (per 100 people): In some countries, particularly in Africa, mobile device usage is more widespread than Internet usage, which should be taken into account when developing social media and VGI applications or preparing training materials. Subscriptions may also provide a measure of the potential of a country to get early warnings and contribute to disaster response efforts, for instance following the Haiti earthquake (Yates and Paquette, 2011).

(v) Education – derived from the tertiary education enrolment ratio (World Bank data) and the quotient of the number of universities in a country, relative to the population of that country. This variable indicates the level of 'computer literacy' and hence provides an indication of the understanding of geoinformatic data and technologies, such as GIS or GPS.

Factors such as the number of Internet Users and Mobile Phone Subscriptions have been used in indices before. For instance the UN World Risk index (2011–14), or the 2012 International Telecommunication Union report (International Telecommunication Union, 2012) on measuring the information society. The 2012 ITU report linked information technology variables to national gross domestic product (GDP), rather than to the possibility of a country accessing data for disaster preparedness or response. The ITU report