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NSDI-BR - A historical and contemporary analysis

Rogério L. R. Borba[1,2], Wesley Silva Fernandez[3], Julia C. M. Strauch[1], Jano M. Souza[2]

rogerio.borba@ibge.gov.br, wfernandes@anp.gov.br, julia.strauch@ibge.gov.br, jano@cos.ufrj.br

[1]*Federal University of Rio de Janeiro (UFRJ). Institute Alberto Luis Coimbra of Postgraduate Studies and Research in Systems Engineering and Computing Program – Rio de Janeiro, RJ – Brazil*
[2]*Geography and Statistics Brazilian Institute (IBGE) – Rio de Janeiro, RJ – Brazil*
[3]*National Agency of Petroleum, Natural Gas and Biofuels (ANP) – Rio de Janeiro, RJ - Brazil*

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1. NSDI-BR: Background information and relevant polices

Recognizing the importance of geospatial information in decision-making and the formulation of public policies, the National Spatial Data Infrastructure (NSDI) was established in Brazil, through the 6,666 decree, in November 2008. The presidential decree that created the NSDI had the following objectives (CONCAR, 2008):

1. Take care of the management, production and dissemination and use of geospatial data across all levels of government;
2. Promote and target the use of standards and norms approved by the National Commission of Cartography (CONCAR) for the production of geospatial data by public institutions in the federal, state, district and municipal spheres.
3. Avoid duplication of efforts and waste of resources to obtain geospatial data from public administration, through the dissemination of metadata relating to such data available in the public institutions of all levels of government.

However, for the establishment and implementation of the NSDI several factors, milestones and activities preceded its implementation, for example:

1. In 2001, a National Cartographic Plan was prepared by CONCAR, a collegiate body of the Planning and Budget Management Ministry (MOP), aiming at the integration of cartographic plans of public institutions producing geospatial information (CONCAR, n.d.);
2. Creation of specialized committees aimed at standardization of geospatial data and metadata, as in many cases the production of geospatial data and metadata were not following common standards (DELOU, 2006; CAMBOIM, 2013);
3. Some antecedents and parallel activities in public institutions and academia to promote, research and adopt Free and Open Source Software (FOSS) and development IDEs (CÂMARA *et al*., 2006);
4. Legal framework of the NSDI and action plan for the implementation of the NSDI that not only aimed at management, but also guide the implementation and maintenance of the NSDI through well-defined cycles (CONCAR, 2010).

The following relevant policies are enumerated:

1. The very decree establishing the NSDI, which requires all federal institutions to share their spatial data and metadata and follow the standards, set for the NSDI and the rules

on the National Cartography. In addition, follow the Electronic Government Interoperability standards (e-PING, n.d.);

2. Brazil is a signatory of the Open Government Partnership (OGP) treaty aimed at giving more transparency to actions taken by governments, empower citizens, fight corruption, and harness new technologies to strengthen governance (OGP, 2011);
3. The OGP treaty influenced the enactment in 2011 of the Law of access to information (Law No. 12,527) at the federal level, which established a series of disclosure obligations of public information on the Internet from government agencies (federal, district, state and municipal) and citizen service procedures;
4. The civil framework of the internet provides that the Internet should treat equally any data packets, regardless of content, origin and destination of the service. In addition, this law removes the responsibility of sites on the content generated by third parties (Marco civil da internet, 2014). One consequence of this law is that it favors the establishment of more participatory and collaborative SDIs to society, as it removes the legal uncertainty because of content generated by third parties;
5. Creation of the National Open Data Infrastructure (INDA) which was also based on the NSDI. INDA is the government policy on open data (INDA, 2012).

2. A description of how open source, standards and open data are implemented in the SDI

The CONCAR, in its mission of coordinating the implementation of the National Cartographic Policy, has among its responsibilities to approve norms and standards for NSDI (CONCAR, 2008). Currently there are five specialized committees in CONCAR (CAMBOIM, 2013):

1. National Digital Cartographic Library Structuring Committee (CEMND): aiming at structuring a National Digital Map Library (MND), shared use, in which the reference mapping products would be made available by the various components agencies of the National Cartographic System (SCN).
2. Geospatial Metadata Structuring Committee (CEMG): aims to standardize metadata. For this, a Brazilian geospatial metadata profile was created. It is noteworthy that the Brazilian profile is a subset of the ISO standard 19115.
3. Geographic Names Committee (CNGEO): promotes and disseminates the standardization of geographical names in the territory, as well as of foreign names.
4. Standardization of Cadastral Mapping Committee (CNMC): works towards the creation of norms and standards for cadastral mapping.
5. National Spatial Data Infrastructure Implementation Committee (CINDE): develops the necessary actions and activities for the implementation of NSDI, as the proposed courses of action in its action plan.

In relation to the creation or use of geospatial free/libre/open source software (FOSS), Brazil has good experiences as presented by CÂMARA *et al*. (2006). For example, TerraLib is a FOSS that allows its use in the development of various GIS tools. In addition, research and work has been done in other institutions such as IBGE using OGC standards and several FOSS technologies (BORBA *et al*., 2007) and later served as basis for recommendation and use of free software adherent to OGC standards for NSDI (CONCAR, 2010). Also a symbol library was proposed to NSDI, taking into account FOSS, national and OGC standards, in-

cluding Symbology Encoding (SE) and Styled Layer Descriptor (SLD) (FERNANDES, 2013).

Currently, most of the institutions that are part of the NSDI use FOSS adherent to the OGC standards. For example, the Brazilian Institute of Geography and Statistics (IBGE), the main information provider of the country (IBGE, n.d.) and manager of the Brazilian Directory Geospatial Data (DBDG) of the NSDI (CONCAR, 2008) is one of the NSDI nodes using software such as I3geo (Mapserver- for viewing), GeoServer (for services), Geonetwork (for metadata) and PosgreSQL / PostGIS (Spatial-DBMS).

Finally, following the open data policy, geospatial data is made available as open.

3. An evaluation of the motivators, benefits, barriers and challenges concerning implementation of open source software, standards and open data

INDE-BR had also as inspiration other SDI initiatives as evidenced in chapters one and two of the action plan (CONCAR, 2010). This was a result of the first and second initiatives of SDIs that served as reference (WILLIAMSON *et a*l., 2003) and there is no doubt that the recommendation and use of FOSS and open standards in building the NSDI-BR brought several advantages. On the other hand, there are many challenges that must be faced for NSDI-BR to thrive (BORBA *et al*., 2014). For example, with some exceptions, there is no active society participation, since FOSS employed does not provide characteristics that allow the effective society engagement. There are also criticisms and controversies involving some Brazilian standards as technical specifications for Geospatial Vector Data Structuring (EDGV). There is concern with the support and development of FOSS as pointed out in (CÂMARA *et al*., 2012). For this, new business models need to be proposed and implemented to give support to these initiatives.

Some policies and initiatives related to the use of open data, open source and open standards clearly show the path adopted by NSDI-BR. However, after seven years of existence, there is still much to be done.

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