

# Geospatial Data Sharing Barriers Across Organizations and the Possible Solution for Ethiopia

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**Abstract:** Geospatial data sharing across organizations is a well-recognized challenge. Due to the absence of appropriate space to share geospatial assets, they often remain scattered and locked in various sectors of Ethiopia, no data sets are maintained and updated regularly, efforts are duplicated, and finding the available data set is difficult. Exploiting the full socio-economic benefit of geospatial information is thus impossible. This paper therefore aimed to assess inter-organizational geospatial data sharing challenges; and the possible solutions in Ethiopia. Lack of coordination, poor data quality and incompatibility, institutional, legal, policy, and technological issues were identified as major challenges. ENSDI, already initiated, should be promoted more as the collaborative entity meant for effective inter-organizational geospatial data sharing. National strategy to hand over informal SDI initiatives, clear ENSDI development approach (top down), and investment on the building block of ENSDI are suggested for the successful execution of ENSDI.

## 1 INTRODUCTION

The role of geospatial information in support of the economy, and efficient decision-making is still challenged due to the absence of cross-border geospatial data sharing mechanism (Ali and Ahmed, 2013). Geospatial data sharing therefore faces a set of high-level challenges: (1) data are scattered and locked in each sectors, (2) efforts are duplicated, (3) data are not updated and maintained regularly, (4) finding the available data is too difficult, and (5) organizations are incompetent to meet their geospatial data requirement by themselves (INSA, 2015). The geospatial community therefore deprived from entertaining geospatial data sharing benefits such as reduction of duplication of efforts; accessing better-quality and complementary data; and ensuring that data are created once, maintained regularly, and used many times (Nap, 2002).

The aforementioned challenges are common in Ethiopia, and each organization could not know who is doing what and where. Thus, the exact barriers that make the sectors reluctant to share geospatial data in the country still needs to be better understood, and solutions to overcome the existing barriers and to set sound geospatial data sharing mechanisms have to be identified. This paper therefore aimed to review inter-

organizational geospatial data sharing challenges in Ethiopia and suggest the possible solutions.

## 2 GEOSPATIAL DATA SHARING CHALLENGES ACROSS SECTORS OF ETHIOPIA

Based on the reviewed resources, lack of coordination, poor data quality and compatibility, policy, institutional, legal, and technological issues are identified by this study as a principal geospatial data sharing challenges among sectors in Ethiopia.

### 2.1 Lack of Coordination Among Sectors

Different organizations in Ethiopia are engaged in collecting the same geospatial data without coordination (UNECA, 2001). This problem has been clearly observed in the network of Ethiopian Natural Resource and Environmental Metadata base (member institutions were failed to share geospatial information through the network) (UN-DESA, 2011), and between different directorates within the ministry satellite images purchased (costing US\$3.2 million)

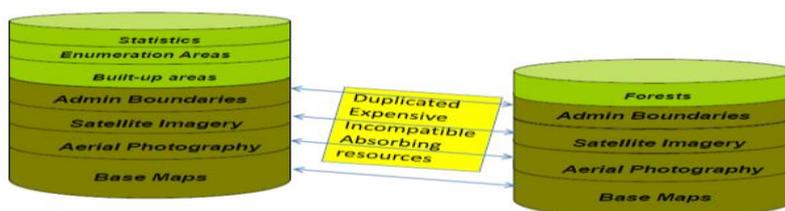


Figure 1. Information silos at various sectors of Ethiopia; A case for MoFECC&CSA(INSA, 2015).

of water, and energy (MoW, 2008). The locked by CSA for 2007 census (INSA, 2014) is another demonstration. The big issue here is: (1) other sectors couldn't know the available effort at CSA so that they perhaps enforced to purchase the same type of satellite images; and (2) CSA will continue to purchase this satellite images in every 10 years to meet its organizational demand. This implies that spatial data sets are purchased many times and used once (threat to the national economy).

The network aiming to share and make accessible 1:250,000 scale topographic maps (Assefa and Haile Mariam, 2013), and the development of ENSDI under Ethiopian Mapping agency(EMA) were suffered by poor cooperation among sectors (Gemed, 2012). Fear of loss of control and miss-use of shared data; fear of loss of funds; and nervousness about quality makes organization reluctance to cooperate and share geospatial data (INSA, 2015). Absence of cross-border cooperation thus deprived sectors of Ethiopia from realizing the benefit of shared geospatial asset (INSA, 2015).

## 2.2 Technological Barriers

Networking cost, incompatible old systems, vendor-driven GIS system, absence of sound system architecture, and lack of system interoperability obstructs cross-border spatial data sharing (UN-DESA, 2011; and Edemba, 2012). Poor penetration rate (IDI, 2009), and downloading and uploading rate of internet (<http://www.dospeedtest.com/speedtest-result/country-statistics/Ethiopia>) in Ethiopia impedes web based geospatial data sharing. Immaturity of e-commerce (in efficient ICT infrastructure) along with the absence of file compression technology and poor internet band width limits the sharing of voluminous imagery data. Lack of skill manpower is not negligible as well (Nap, 2002; Assefa and Hailemariam, 2013). Partner organization of the Ethio-EIN initiative were challenged due to absence of automated data base, and infrastructure(UNECA hosted the node) (AEIN, Undated). Gemed (2012) also assured too low

ENSDI readiness due to poor web connectivity and telecommunication infrastructure.

## 2.3 Poor Data Quality and Compatibility

Lack of standards (Nap, 2002), geometric miss registration, and absence of common data base design (Barry, 2010), different feature definitions, model, quality specifications, datum, projections and coordinate systems (Onsrud, 2007; Sebake and Coetzee, 2008), and project specific data organization (Sieber, 2007) deters cross-border spatial data sharing. The geospatial information in many sectors of Ethiopia lacks quality, and incompatibility (INSA, 2014). Absence of digital data sets, regular preservation, and metadata inhibits geospatial data sharing among sectors of Ethiopia (Gemed, 2012). Poorly organized and outdated geospatial data affects ENSDI development (Zelege *et al.*, 2007). Ethio-EIN was also challenged due to non-standard, incompatible, and absence of digital data in most of the member institutions (AEIN, undated). Project planning and impact assessments efforts as part of the growth and transformation plan (GTP) of the country are now suffered by the lack of reliable national spatial data sets, and absence of standards (Krauer and Gete, 2015).

## 2.4 Policy Barriers

Lack of policy becomes an issue when organizational members are uncertain about the data policy and fearful of making a mistake, unsure of the intellectual property implications. In other instances, explicit policies discourage data sharing due to concerns about the inability to prevent data misuse or liability claims, uncertainty about fit for use of data, and revenue generation requirements. As a result, they often err on the side of data protection and withhold the data (Geoconnections, 2011a). The absence of data access policy deters the success full achievement of Ethio-EIN (AEIN, Undated), and ENSDI (Gemed, 2012).

## 2.5 Legislative Barriers

Lack of well-harmonized legislation on geospatial industries hampers information sharing with in the wider geospatial market .The potential security risk of making the data available, which imply miss-use and the perceived liability from the use of open data and decisions based on inaccurate and unreliable data (Abidah *et al.*, 2009; Barry, 2010), and the absences of service charge legislation hampers web based geospatial data sharing (Sebake and Coetzee, 2008). Geospatial data sharing among sectors in Ethiopia suffered by the absence of practical legal framework such as intellectual property right, custodianship, and liability(Assefa and Hailemariam, 2013; and INSA; 2015).Collaborative institutions deterred to effectively share their data in Ethio-EIN due to lack of legal frame work (AEIN, undated). Furthermore, the current Intellectual Property Right (IPR) law in Ethiopia does not explicitly entertain the ICT sectors (MCIT, 2015), and the geospatial technology and information (INSA, 2015).

## 2.6 Institutional Barriers

Fear of exposing data of poor quality, and bad experiences on the use of others data along with unequal institutional commitment, conflicting priorities, institutional disincentives, differing risk perceptions, (Onsrud, 2007), and absence of information sharing culture (Sebake and Coetzee, 2008) make organizations reluctant to share their geospatial assets. Absence of formal institutional arrangements, is a basic limitation in Ethiopia to bring together institutions to keep up their effort to be networked and shared their resources (Gemed, 2012; AEIN, undated) .Lack of institutional budget, awareness, and strong leadership are the major causes observed for the failure of different networks (including SDI) in Ethiopia (Lance, 2003; and Eelderink *et al.*, 2008). Weak institutional operational capacity is a common problem in Ethiopia (Gemed, 2012).

## 3 THE POSSIBLE SOLUTION

### 3.1 Geospatial Data Sharing through National Spatial Data Infrastructure (NSDI)

Collaborating institute (NSDI) facilitate geospatial data sharing amongst organization (Ali and Ahmed

2014). Hence, many of the governments in the world developed NSDI to encourage geospatial data sharing among organization (Moeller, 2001).

Considering this collaborative geospatial data sharing entity (NSDI) is therefore noteworthy. Indeed, SDI is not a new concept in Ethiopia, and dated back to the establishment of Ethio-GIS since 1999 (Gemed, 2012). EMA takes the initiative formally since 2002 (Mulaku *et al.*, 2006) as the frame work of policies, standards, technologies, and institutional arrangements that promote data sharing. But, ENSDI was failed under the remit of EMA due to the obstructions mentioned from subsection 2.1-2.6, and principally EMA was not legally mandated for the development of ENSDI (INSA, 2015). INSA restarted the ENSDI by mandate, and various activities such as preparation of geospatial information and technology policy, standards, and geo-portal development (in progress) have been done (researchers concrete information)

However, ENSDI development is still in an infant stage, and the researcher disclosed his fear as if further promotion and campaign in need, and recommends (1) clear ENSDI development approach (top down ), (2) informal SDI initiatives hand over strategy, and (3) collaborative investment on the building blocks of ENSDI.

#### 3.1.1 Setting Clear ENSDI Development Approach (Top Down)

This study suggests a top down approach of ENSDI development. This is because; ENSDI development under EMA and other informal SDI initiatives were practically suffered from getting the buy-in of the government for the last decade. Besides the above, world wide experience revealed that the successful implementation of NSDI totally relays on the political will of the government. For instances, the initiative like Infrastructure for Spatial Information in Europe sponsored by European Commission ,and an executive order to force the cooperation among agencies for the execution of NSDI of USA signed by president Bill Clinton (<https://books.google.com.et/books>) demonstrates the power of getting the political will at first for the success of NSDI.

#### 3.1.2 Informal SDI Initiatives Handover Strategy

The presence of clear national strategy to handover different informal SDI initiatives helps the efforts invested from being wasted when the initiatives comes to completion. Different informal SDI initiatives come up with a great effort to derive

ENSDI were observed in Ethiopia (Gemed, 2012), but their efforts were wasted and continued to be wasted due to the absence of clear hand over strategy. Hence, this study recommends an assessment of the ongoing informal SDI initiatives, and building on the existing effort by team up with them for the success full development of ENSDI.

### 3.1.3 Investment on the Building Blocks of ENSDI

Collaborative investment on: (1) legislations including IPR, custodianship, and liability,(2) telecommunication infrastructure, (3)standardization ,(4)development of the institutional operational capabilities ,and (5) policy entailing data access, sharing, and service charge among others should be done to complement what is already in place for hard infrastructure

## 4 CONCLUSION

In Ethiopia, absence of the full buy-in of the government is the under laying cause for the failure of formal and informal SDI initiatives for the last decade. Hence, unlocking the economic potential of geospatial information, and creating geospatially enabled community through geospatially networked environment is still neglected. Clarifying the ENSDI development approach, top down, setting clear informal SDI initiatives hand over strategy, and collaborative investment on the building block of ENSDI are suggested in this paper as the promising solutions to reinforce the already initiated ENSDI as a collaborative cross-border geospatial data sharing mechanism.

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