

**ISO/TC 211 Geographic information / Geomatics
Newsletter No 2 October 2003**



**Revival of CEN/TC 287
Geographic information**

Comité Européen de Normalisation

**EUROPEAN COMMITTEE FOR
STANDARDIZATION**

CEN/TC 287 was operational from February, 1992 until September, 1999. It became dormant when ISO/TC 211 absorbed the European Programme of Work. As much of the original ISO/TC 211 Programme of Work has resulted in the publication of International Standards. CEN/TC 287 will decide how to adopt and apply these ISO standards to Europe.

To start the activities of CEN/TC 287 again, a meeting for all interested parties on national and European level will be organized on:

November 10 - 11, 2003

**Nederlands Normalisatie-instituut (NEN)
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Please contact before October 17, 2003.

At this meeting, it will be decided if the CEN/287 draft business plan is ready to be submitted for approval by the CEN/BT.

NEN has nominated Dr. Henri J.G.L. Aalders as Chairman, CEN/TC 287



Draft Agenda:

**Scope
Liaisons
Programme of Work
Proposed Working Groups:**

**CEN/TC 287/WG 1 - Coordination, maintenance and harmonization
CEN/TC 287/WG 2 - INSPIRE
CEN/TC 287/WG 3 - European profiles**

ISO/TC 211 Presentation - Mr. Olaf Ostensen, Chairman, ISO/TC 211

National reports on which (pre) standards are implemented and where



ISO's movers and shakers thrash out core issues in

standards development

Some 140 committee officers, principally Chairs, from throughout the world attended the **2nd ISO conference for technical committee and subcommittee chairs on 5-6 June in Geneva, Switzerland**, to examine ISO's long-range strategy and a whole series of initiatives to increase the alignment between ISO's technical work and the market requirements for them. While thousands of ISO standards provide benefits to business, government and society, the people responsible for their development largely remain in the background. This conference provided the right forum for them to bring to the open the challenges and successes of their work, while providing the ideal platform for a lively exchange of views on the recent strategic initiatives undertaken by the organization's Council and Technical Management Board (TMB) and the needs of the standards makers and other social partners. These concerned three "theme" areas: **Global relevance in ISO technical work; Inclusiveness / exclusiveness/cooperative standards development, and Time to market.**



ISO Secretary-General Alan Bryden set the scene of why there was a paramount need for networking between ISO

technical committee (TC) and subcommittee (SC) Chairs: "Approximately 35 000 technical experts on loan from business, industry, government, academia, consumer organizations and other bodies take part each year in the development of ISO standards," he said. "Each working day, there are some 17 ISO technical meetings taking place around the world. Between meetings, the experts continue the standards' development work by correspondence - increasingly by means of new information and communications technology (ICT tools). The system is extremely decentralized and the leaders of one committee rarely have the opportunity to exchange views and experiences with their counterparts from other committees."

When summing up the conference, Mr. Bryden said: "I think that what has been shown during these two days and demonstrated again is the solidarity that exists between the three constitutive elements of the ISO system, and if one is weak, the system is weak: first, of course, the experts under the leadership of our technical committee and subcommittee Chairs, then the ISO members, and finally, naturally, the Central Secretariat. So we have gathered a lot of food for thought and action for the three constitutive elements."



[2nd ISO conference for TCs & SCs chairs]



August 7, 2003

INCITS Approves Three Real-Time Locating System Standards

International Committee for Information Technology Standards (INCITS) - Washington, DC – The International Committee for Information Technology Standards (INCITS) has approved three new standards that define two Air Interface Protocols and a single Application Programming Interface (API) for Real Time Locating Systems (RTLS) for use in asset management. INCITS Technical T20 developed the INCITS 371 series of standards over a two-year period; the American National Standards Institute (ANSI) approved all three in the series as American National Standards within one week of approval by INCITS' Executive Board.

"Everyone on the Technical Committee recognized the huge business value of establishing a standard for RTLS technology," said T20 committee chairman Larry Graham, Global Manager of Manufacturing Technologies, General Motors Corporation. "We have no doubt that this standard will encourage widespread adoption of wireless location systems as the technology has already been proven to deliver tremendous bottom line cost savings for enterprises around the world."

T20 vice chairman, Tony Cataldo, who is Manager of Network Engineering and Network Operations for Ford Motor Co., added: "With real-time locating system applications running in many of the Ford factories worldwide, we were already big believers in this technology, but it was critical that a standard be developed. Now, with an international standards body backing the technology, I would expect a flood of new end users in a variety of industries—from automotive (and related) to retail to health care. With a standard in place, we will all collectively benefit from reduced infrastructure costs and increased efficiencies across the supply chain."



"As the world's leading provider of wireless solutions for tracking and managing assets, I fully expect that by supporting this technical standard WhereNet will accelerate economies of scale driven by orders from a host of new customers, partners and infrastructure providers," said Dan Doles, CEO, WhereNet. "Unlike RFID technology that has been plagued by proprietary systems that often result in integration bottlenecks, RTLS technology will now operate under a universal standard and be easily implemented across highly dynamic and complex supply chains."

Overview of INCITS 371 series

INCITS 371.1:2003, Information Technology – Real Time Locating Systems (RTLS) - Part 1: 2.4 GHz Air Interface Protocol. This document establishes a technical standard for radio frequency beacon systems that operate at an internationally available 2.4-GHz Band frequency and that are intended to provide approximate location (3m) on a regular basis (several times a minute). The standard is generally applicable to applications in which assets need to be tracked throughout extensive areas that are within range of a permanent reader infrastructure. A typical application might involve the monitoring of vehicles through a multi-station assembly line or within a delivery yard.

INCITS 371.2:2003, Information Technology – Real Time Locating Systems (RTLS) - Part 2: 433-MHz Air Interface Protocol

This document establishes a technical standard for radio frequency beacon systems that operate at an internationally available 433-Hz Band frequency and that are intended to provide presence and location data for assets that have RTLS tags affixed. The standard is generally applicable to applications in which assets need to be tracked through zones within areas that are within range of a permanent reader infrastructure. A typical application might involve the monitoring of mobile assets within a military installation.

INCITS 371.3:2003, Information Technology – Real Time Locating Systems (RTLS) - Part 3: Application Programming Interface

This document defines the Application Programming Interface (API). To be fully compliant with this standard, RTLS must comply with either Part 1 or Part 2. An API is a boundary



across which application software uses facilities of programming languages to invoke services. These facilities may include procedures or operations, shared data objects, and resolutions of identifiers.

About INCITS

INCITS [<http://www.incits.org>] is the primary U.S. focus of standardization in the field of Information and Communications Technology (ICT) encompassing storage, processing, transfer, display, management, organization, and retrieval of information. As such, INCITS also serves as the American National Standards Institute's (ANSI) Technical Advisory Group for ISO/IEC Joint Technical Committee 1. JTC 1 is responsible for international standardization in the field of information technology. INCITS is accredited by ANSI and operates under its rules, designed to ensure that voluntary standards are developed by the consensus of directly and materially affected interests.



Pre-ICC workshop on implementing standards for geographic information in Africa – and follow up activity

A workshop, jointly organised by EIS-AFRICA and USGS/EDC, was held on 10 August 2003, preceding the International Cartographic Conference, in Durban, South Africa. Over 40 participants, from 13 countries, 8 of which were African, listened to a variety of presentations and then identified some initial steps towards standardized geographic data.

Presentations focussed on the standards being developed by ISO's Technical Committee for geographic information, TC 211, especially the metadata standard, followed by African experiences in implementing standards – geodetic referencing, land cover classification, participation in Global Map, national standards development. Through



discussions, measures to support standards developers and implementers were identified, as well as actions at both the technical and organisational level. One of the decisions was that there should be sustained follow-up activities, such as the organisation of awareness workshops at conferences and other events, such as Africa GIS '03. A workshop focussing on standards has been incorporated into the Africa GIS '03 programme.

[[ICC-Stds-Wkshp-Rpt](#)] Link to Agenda & presentations [<http://www.eis-africa.org/standardsws.htm>]

Following the ICC workshop, a Standards Stakeholders Workshop was convened by the Department of the Surveyor General in Harare, Zimbabwe on 4 September 2003, at which, amongst others, the actions suggested at the pre-ICC workshop were discussed. Those who attend agreed on the need to bring more organisations on board with respect to standardization efforts. For more information on these activities in Zimbabwe, please contact Enias Chinjekure, e-mail: [echinjekure@dsg.co.zw] .

Submitted by Dr. Liz Gain [egavin@csir.co.za]

Hans Knoop, Co-Chair, ISO/TC 211 Advisory Group on Outreach and Dave Danko, ISO/TC 211 Metadata Project Leader represented ISO/TC 211 at this workshop. EIS Africa and USGS/EDC jointly developed a Geospatial Data Standards Questionnaire. [[USGS-EIS-Stds-Questionnaire](#)]



Report on the Survey for Establishing Standards for Geospatial Data in Kenya

The GSDI website [<http://www.gsdi.org>] has an extensive report done by Mr. Kubasu, Highland Surveyors Licensed Land Surveyors & Geomatic Consultants [highland@africaonline.co.ke]. It has a description of ISO/TC 211 and also includes its own national standards survey.

[[Kenya Survey Report](#)]



Developing countries appreciate ISO's new initiatives

ISO Bulletin - September 2003 by Maureen P. Mutasa, Chair of DEVCO (ISO Committee on developing country matters), and Director General, Standards Association of Zimbabwe



Globalization has moved at an alarming pace and, for some of us in developing countries, it has caught us unprepared. Globalization has changed the way we live. It has also changed the business environment in which we operate. Previously closed and protected economies such as ours are now a playing ground of intense competition. Companies are closing down because they cannot face up to the challenge. With globalization has come the changing role of standardization. Standardization now plays a key role in trade facilitation, especially regional and international trade.

Standardization not only assists in the creation of a domestic market; it also increases international competitiveness. Standardization is an excellent means of technology transfer to developing countries, assisting them in overcoming technology gaps and in becoming better integrated into the global economy. International Standards are key to improving developing countries' access to global markets. Through standardization, developing countries can reduce poverty, realize economic growth, reduce economic dependence on developed countries and improve human welfare through health and safety.

For a standard to be truly international and have global relevance, it must take into account the needs of all stakeholders without exception. It must therefore be derived from a global think tank with global knowledge and global viewpoints. International standardization bodies therefore have to nurture developing countries by creating a conducive environment for developing countries to participate in international standardization work - an environment of inclusiveness rather than of exclusiveness, an environment where developing countries have a voice, can influence and are involved throughout the standardization process.

We in developing countries not only welcome but appreciate ISO's current initiatives on collaboration



and twinning. We note with interest the collaborative initiatives with international and major standards

developing organizations, as we think it is through such initiatives that we can avoid conflicting and competing standards in the global marketplace and instead have only one standard being used internationally.

We further note with great interest the progress with the twinning arrangements. In order to arrange for the implementation of twinning arrangements, the ISO/DEVCO Secretariat has requested member bodies in developing countries to indicate whether they wish to participate in twinning arrangements and if so, to indicate the capacity in which they wish to take part in ISO standardization work through twinning. There are three possible capacities, namely: by nominating a vice chairman; by twinning with a secretariat and by twinning with a participating (P) member to ensure that developing countries' needs are taken into account by the committee. Once the specific wishes of developing countries' member bodies are known, the ISO Central Secretariat in consultation with the concerned committee secretariats will endeavour to ensure that appropriate twinning arrangements are implemented.

Requests for twinning arrangements have started to come in. We believe that these twinning arrangements, if implemented, will enhance the participation of developing countries and, at the same time, bring even more value to ISO's standards.

As developing countries, we must exploit standardization to our maximum benefit and make a difference to the quality of our lives. This we can achieve by actively and effectively participating in international standardization work. Making the international standardization environment conducive for developing countries' participation is a critical success factor.



Germany will host the ISO/TC 211 Plenary meeting in Berlin, Germany at the DIN (Deutsches Institut für

Normung) facility from October 30 – 31, 2003.

Beyond the normal working group meetings (October 27 – 29, 2003) associated with the ISO/TC 211 Plenary, the German technology exhibition will open in conjunction with the Monday evening reception. During Wednesday afternoon, the ISO/TC 211 Advisory Group on Outreach will sponsor a Class A Liaison Seminar as well as the Standards in Action Workshop. We are all looking forward to the Dinner on Thursday evening. On Friday, DIN & the Advisory Group on Outreach will co- sponsor a Standards Tutorial at the DIN facility. This is primarily intended to educate and train the German users of geographic information and technology. Dr. Hans Knoop, German Head of Delegation and his team, as well as the DIN staff, are to be congratulated for their tireless efforts to ensure another very successful week of ISO/TC 211 working group & Plenary meetings.



Standards Workshop - Digital Earth Conference, Brno, Czech Republic, September 21 – 25, 2003

The 3rd International Symposium on Digital Earth September 21-25, 2003 Brno, was a very well-organized international conference centered on the theme - Digital Earth: Information Resources for Global Sustainability. There were more than 250 attendees from over 34 countries. Some people came - not only in support of this concept but to also support Milan Konecny, the conference organizer and newly elected President, International Cartographic Association.

Preetha Pulusani, Intergraph Mapping and Geospatial Solutions, gave a well-focused opening plenary on Enabling Interoperable SDIs for Sustainable Development. The intellectual content for the conference was provided by Professor Michael Blakemore with his discourse on data.



Alessandro Annoni, JRC, chaired the very informative session on European Spatial Data projects which focused on INSPIRE. Ed Parson, Ordnance Survey, UK, presented very interesting and innovative technical approaches in the organizational marketing and

sale of spatial data.

Ravi Gupta's presentation on "ICTS for the Underserved Communities" dramatically demonstrated the power of GIS technology used by common people at the local level. Jeannie Foust, ESRI, gave the passionate plenary address and plea for the Digital Earth in terms of the United Nations Millennium Development Goals (MDG) and conducted an excellent ESRI Workshop on Technical Approaches to the Digital Earth featuring a fascinating new product called ArcGlobe.

The Standards Workshop, co-sponsored by ISO/TC 211, Geographic information / Geomatics and the Open GIS Consortium (OGC) was considered by many - to have the highest attendance of all the sessions.

Some people are somewhat skeptical of the viability of Digital Earth initiative. The International Symposium on Digital Earth has occurred every two years as just an international conference without a real agenda and plan of action. There are now plans for the International Symposium on Digital Earth to incorporate into an entity called - International Society on Digital Earth (ISDE). Hence, the triad of international initiatives / conferences Global Mapping, GSDI, and Digital Earth may want to consider how to coordinate, cooperate, or even consolidate.

The President of the Digital Earth Steering Committee is Yongxiang LU, China and Secretary General, Huadong GUO, China [hdguo@cashq.ac], Professor and Deputy Secretary General, Chinese Academy of Sciences.

The next International Symposium on Digital Earth will take place in Tokyo, Japan in March 2005. ISO/TC 211 & the OGC have already been invited to conduct a Standards Seminar at this symposium.



Implementing Standards for Geographic Information in Africa: Outcomes of workshop held 10 August 2003, Durban, South Africa¹

Report compiled by Kate Lance (USGS/EDC, GSDI) and Elizabeth Gavin (EIS-Africa)

Background to the workshop

A workshop focusing on standards was initiated by EIS-AFRICA and USGS/EDC, as part of a series of activities aimed at advancing the implementation of standards for geographic information in Africa. The need to standardize geographic data and information, to support wider use and reuse of data, has been a theme at many meetings in Africa. A survey on the status of standards development and implementation in Africa was initiated by EIS-AFRICA and USGS/EDC earlier in 2003.

Plans for a workshop to the advance standards development and implementation solidified with the provision of funding by UNECA, to cover travel by delegates to an “awareness workshop”. The workshop was scheduled in association with the 21st International Cartographic Congress, to be held in Durban, South Africa, in August 2003. Further synergy was possible with another Africa-focused workshop being organized by South Africa’s Department of Land Affairs, entitled “Mapping Africa for Africa”, a workshop aimed at catalyzing action from African roleplayers, especially national mapping agencies, with respect to establishing the spatial “base layers” needed for implementing NEPAD. Through alignment of funding provided by UNECA, USGS/EDC, GSDI and the Department of Land Affairs, it was possible to increase African participation at the ICC meeting, as well as at these two African focused workshops.

The workshop

The “Implementing Standards” workshop was held on Sunday 10 August 2003, and attended by people from 8 countries in Africa, and 5 countries outside Africa. (See Annex A for the list of participants.)

The first half of the day was devoted to presentations. These presentations covered international standardization initiatives, as well as the experiences of African countries with respect to developing and implementing geographic information standards. By way of introducing the workshop, the findings to date from the survey on geographic data standards in Africa were also presented. All presentations are available through the EIS-

¹ Organised and supported by Department of Land Affairs, South Africa; EIS-Africa; GSDI; UNECA; USGS/EDC.



AFRICA web-site, <http://www.eis-africa.org/> .

Discussion groups were formed for the remainder of the day, to identify specific actions to be taken to advance standards. Participants committed themselves to various tasks, summarized in the following section. In particular, they agreed to report on the status of standards development (see first point in table).

Discussion groups' outcomes

Several principles were suggested to guide the identified actions:

- Interested parties need to consider what is happening internationally, particularly in one's sub-region and neighbouring countries;
- One should ensure greater participation in projects by both public and private sectors, as well as universities (e.g. projects may be eligible for funding, provided that there is public, private and university representation on project teams);
- Standards advocates need to identify and take some first steps – even if small - towards the implementation of standards, needed for wider and more meaningful usage of spatial datasets.

The workshop participants identified actions listed in the table below, as well as items that needed further investigation at the country level. The latter are listed in Annex B.

Objective	Activities (responsible party in parentheses)	Timeframes
<i>Direct follow-up to workshop, i.e. post-workshop reporting commitments</i>		
<i>1. Compiling further information in support of national efforts to standardize geographic information</i>	Monitoring of and reporting on progress in standards development and implementation: points listed in annex B to be reported on to EIS-AFRICA and USGS/EDC	Report by end October 2003
<i>Organisational and legal foundations for standards development and implementation:</i>		
<i>2. Improve interactions with the national standards body and gain its support in GI standards development</i>	i. identify the national standards body, or equivalent ² ii. approach this body, requesting that they support/facilitate the country's efforts to develop GI standards iii. obtain a copy of guidelines and	All by October 2003

² <http://www.iso.ch/iso/en/aboutiso/isomembers/index.html>



		procedures for standards development/adoptions, from the standards body	
<p><i>3. Improve interaction of national standards body with ISO/TC 211 [by joining ISO/TC 211, you'll have access to documentation, as well as people who can provide some technical assistance].</i></p>	<ul style="list-style-type: none"> i. If your national standards body is not a member of ISO, request that it joins; ii. Request that your national standards body becomes (at least) an O-member of ISO/TC 211 iii. Apply for class A liaison status of CODI-GEO with ISO/TC211. ³ (CODI-GEO's Executive Working Group) iv. Liaise with the GSDI Association, taking advantage of its class A liaison status with ISO/TC 211 		
<p><i>4. Establish structures to ensure broad participation in standards development</i></p>	<ul style="list-style-type: none"> i. Develop (or strengthen existing) national coordinating committees involving all relevant stakeholders [these would liaise with national standards body] ii. Establish working groups/task teams to address particular aspects of standardization (e.g. development of quality standards for mapping, standards for hydrographic data) iii. Contribute to efforts of CODI-Geo standards working group (help draft terms of reference for CODI-Geo standards working group) 		<p>December 2003</p> <p>March 2004</p>
<p><i>5. Promote recognition of standardization work, to sustain interest and effort in standardization – establish incentives to</i></p>	<ul style="list-style-type: none"> i. Incorporate standards and participation in standards working groups into people's work plans and as elements of their evaluation for promotion or recognition; as a first step, 		

³ Both PC-IDEA and PCGIAP are ISO/TC211 class A liaisons.



<i>standardize</i>	<ul style="list-style-type: none"> ii. Incorporate the need for institutions' outputs to comply with standards; ii. Establish an award for standards work – to be announced at the next Africa GIS (EIS-Africa) 	
<i>6. Support standardization through policy and legal mechanisms</i>	<ul style="list-style-type: none"> i. Develop geo-information policy on standardization, i.e. the legal framework to enforce/endorse implementation of standards⁴; ii. Incorporate standardization policy into existing geo-information policy, or elaborate on this policy iii. review existing legislation and/or draft enabling legislation that could support national standardization efforts 	mid June 2004
<i>Technical activities:</i>		
<i>7. Draw upon existing standards to fast track standard development</i>	<ul style="list-style-type: none"> i. Evaluate existing standards, e.g. ISO, or country-level standards, particularly those of close neighbours, in terms of possible adoption or adaption, to speed up standardization ii. Read the GSDI Cookbook, and join the GSDI Technical Working Group 	Will need to be ongoing; convene a meeting to review and discuss at least one standard by December 2003
<i>8. Improve metadata development</i>	<ul style="list-style-type: none"> i. Enlist summer students / university students to help with metadata development [i.e. students to go to institutions, sit with people in these institutions who know their data, and capture the metadata digitally] ; ii. Establish an 'internship/attachment programme' (like e.g. Nigeria's 	Try this for at least one institution by end of 2003

⁴ Nigeria's National Geoinformation Policy or South Africa's Spatial Information Bill provide examples of this, which could be used to fast track development of national policy.



	Industrial Training Fund) and advertise internship opportunities on institutional website	
<i>9. Increase usage of metadata and clearinghouses</i>	<ul style="list-style-type: none"> i. Tailor user interfaces for clearinghouse searches to user communities (i.e. queries same database, but entry point is geared to specific users e.g., government, youth, water. etc.) ii. Produce ‘yellow pages’ equivalent (i.e. a hard copy) of the spatial data discovery portal for those who do not have internet access 	
<i>10. Identify standardization required</i>	List of standards needed at country level (this could be done in a participatory manner, through a workshop or series of standards working group meetings	A prioritised list by mid 2004
<i>11. Developing LCCS⁵ compliant land cover datasets</i>	<ul style="list-style-type: none"> i. “Translate” existing land cover maps to LCCS ii. Liaise with FAO/Africover, enquire about technical support iii. <ul style="list-style-type: none"> a. Regional Centres to prepare documents advertising the availability of Landsat Imagery, together with free tools available for developing a land cover mapping in accordance with LCCS; b. letters to be sent to all countries in their regions; c. Announcement of pre-Africa GIS workshop on Landsat imagery iv. Additional awareness-raising about LCCS with AEIN pilot countries during Africa GIS ’03 (UNEP/DEWA) v. 	October 2003
<i>Supporting standards developers and implementers:</i>		
<i>12. Make materials available that further</i>	<ul style="list-style-type: none"> i. Prepare ISO/TC211 guides for understanding individual ISO 	by next ISO/ TC 211 meeting, i.e.

⁵ Land Cover Classification Scheme – see <http://www.africover.org> for further information.



<p><i>an understanding of the framework of standards provided by the ISO 19100 standards</i></p>	<p>19100 standards (in progress – ISO/TC211 Outreach Advisory Group)</p> <p>ii. ISO/TC211 Outreach Advisory Group Outreach should enlist African colleagues to review the ‘outreach guides’/fact sheets etc, or help draft the guides to ensure that the language is understandable [Guides required in French and English]</p>	<p>October 2003</p>
<p><i>13. Virtual Forum for African standards developers</i></p>	<p>Establish Virtual Forum where countries could share experiences (e.g. South Africa could share its experience of the STANSA (Standards South Africa) / NSIF linkage with Kenya)</p>	<p>ECA to establish by end September 2003, ECA subsequently to moderate “sessions”/discussions</p>
<p><i>14. Use existing networking opportunities, where people can meet to advance standards/share experiences face to face</i></p>	<p>i. List upcoming events (e.g. Africa GIS '03) (GSDI and EIS-AFRICA);</p> <p>ii. Plan for potential standards meetings, advertise them and ensure that there is a focus on standards at all these events, even if it is through an informal meeting (GSDI and EIS-AFRICA)</p>	<p>Ongoing: Africa GIS '03 the next event (November 2003); African Association for Remote Sensing of the Environment Conference (October 2004)</p>
<p><i>15. Compile an inventory of institutions and expertise that can provide technical standardization support</i></p>	<p>Identify institutions and experts at country level; include in national SDI web-site, and provide to CODI-GEO Executive Working Group and EIS-AFRICA, for inclusion on these web-sites</p>	<p>Ongoing</p>
<p><i>16. Make available information resources relevant to standards development and implementation</i></p>	<p>i. Compile and make accessible standards materials (USGS/EDC, GSDI, EIS-AFRICA), adding to list of information resources contained in the standards questionnaire;</p> <p>ii. Regularly update list on EIS-AFRICA web-site and SDI Africa</p>	<p>Ongoing</p>



	<p>implementation web-site (when ready</p> <p>iii. Complete the SDI Africa Implementation Guide, including details about standards implementation</p>	<p>On-line, by Africa GIS '03</p>
<p><i>17. Improve communication about standards through newsletters (e.g, SDI Africa; EIS News; ISO/TC211 outreach newsletter)</i></p>	<p>People to provide news items on standards development and implementation to producers of newsletters</p>	<p>Ongoing; participants to provide one news item by end 2003</p>
<p><i>18. Involve universities and training institutions in developing standards and providing tools for standards implementation</i></p>	<p>i. Talk to university professors/training institutions about undertaking research on standards: mobilize them to have students work on standards development/issues;</p> <p>ii. List university professors / training institutions interested in standards work (countries to provide list of those as part of the post-workshop reporting requirements – see Annex B)</p> <p>iii. Establish institutional mechanism for attachments of university students to relevant agencies involved in standardization</p> <p>iv. Develop university modules that address standards</p>	<p>Approach at least one institution by end 2003</p>
<p><i>19. Provide motivation for standardization efforts in terms of development agenda</i></p>	<p>i. Review NEPAD documentation and other documents to identify implications for geospatial data standardization;</p> <p>ii. Produce paper which draws clear connection between the need to standardize geo-information and NEPAD and other development goals (EIS-AFRICA, ECA)</p>	



Future steps to promote standards for geographic information

This workshop was a step forward with respect to highlighting the “standards” component of SDI, which often only merits a sentence or two in a more general discussion on SDI. The workshop enabled participants to focus exclusively on standardization efforts and opportunities, such as institutional arrangements and processes needed to develop and promote standards. There is, however, a tendency still to think in terms of a basket of standards for geographic information, focusing on the ‘basket’, rather than considering standards individually. It is thus important that workshops focusing on standards for geographic information continue to be convened. Apart from the need for continued advocacy regarding standardization, there is also a need to provide potential standards developers with relevant information and insights, enabling them specify standards to develop and implement, and prioritize these within their particular country context.



Annex A: Workshop Participants

SURNAME	NAME	ORGANISATION	COUNTRY	E-MAIL
Abebe	Mr Gulilat	Ministry of Water Resources Ethiopian Mapping Agency	Ethiopia	gulilata1994@yahoo.com
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Gyamfi-Aidoo	Mr Jacob		South Africa	gyamfi@worldonline.co.za
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Mdwara	Mr V V	CDSM	South Africa	vmdwara@sli.wcape.gov.za



Naudé	Mr S J	SITA	South Africa	sarel.naude@sita.co.za
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Ottichilo	Dr Wilbur	RCMRD	Kenya	ottichilo@rcmrd.org
Owolabi	Dr K	MLRR	Namibia	labi@mweb.com.na
Rashopola	Ms Remina	National Spatial Information Framework	South Africa	rrashopola@csg.pwv.gov.za
Siekierska	Dr E M	N R Com Surveyor General's Department	Canada	siekies@nrcom.gc.ca
Simelane	Mrs	Survey of Kenya	Swaziland	sgd@realnet.co.sz
Sogoh	Mr J	Survey of Kenya	Kenya	kism@iconnect.co.ke
Strydom	Paul	NSIF	South Africa	pstrydom@csg.pwv.gov.za
Tsele	Mrs M M	DDPLS	South Africa	modiehit@gpg.gov.za
Une	Mr H	Survey of Kenya/JICA	Kenya	hiroune@mb.infoweb.ne.jp
van Wyk	Gaby	OSS	South Africa	gvanwyk@openspatial.co.za
Vansteenvoort	Ms L	University of Ghent Gauteng Health Department	Belgium	liesbeth.vansteenvoort@ugent.be
Venter	Mr F A	Municipal Demarcation Board	South Africa	francois@gpg.gov.za
Venter	Mrs B	Board	South Africa	belinda@demarcation.org.za
Vermeulen	Mr D	SITA	South Africa	david.vermeulen@sita.co.za
Vorster	Ms S	EIS-AFRICA	South Africa	eisafrica@csir.co.za
Wonnacott	Mr R T	Surveys and Mapping	South Africa	rwonnacott@sli.wcape.gov.za
Zakiewicz	Mr T	Surveys and Mapping	South Africa	tsakiewicz@sli.wcape.gov.za



Annex B: Reporting Commitments

*ITEMS TO 'RESEARCH/PURSUE' AND REPORT BACK ON TO EIS-AFRICA & USGS-EDC FOR FINAL REPORT OF ICC PRE-CONFERENCE WORKSHOP 'Implementing Standards for Geographic Information in Africa'
August 10, 2003, Durban, South Africa*

Please email to Liz and Kate, egavin@csir.co.za, klance@usgs.gov

- a) GI standards and relationship with national standards body (between now and AfricaGIS, can you agree to meet with your national standards body; discuss GI standards and ISO TC211; obtain existing guidelines for standards development/adoption)?
- b) Status of NSDI committees in your country, with specific information on standards working group (provide details of activities of the standards working group; identify linkages between standards working group and training institutions; provide details of existing sub-working standards groups in specific datasets or sectoral needs); between now and AfricaGIS, can you hold one of more meetings of the standards working group?
- c) Existing project that can be used as 'vehicle' or 'mechanism' to advance standards. [report should include details of the existing partnerships in the identified projects – specifically with respect to public, private and university partnerships]
- d) Regional centers need to report back on their recent acquisitions of satellite imagery, metadata for this imagery, and activities relating to implementation of LCCS. Also, regional centers efforts to promote SDI/awareness raising.
- e) Existing expertise? (inventory of institutions with expertise for standards work – this can be done by both country and regional center representatives)
- f) Status of land cover classification in your country? Can you promote 'translation' of existing land cover classification to GLCN/LCCS?
- g) Status of Global Map work in your country?
- h) Existence of GI specialist certification initiative?
- i) Existence of 'industrial training funds' (e.g., Nigeria) or 'required civil service assignments' that could be directed towards metadata work (or other work in support of standards/SDI)?



j) Investigate further and compile existing standards (de facto, in-house, national) documents and minutes from meetings (make these available on a website in-country and also contribute to SDI Africa: an implementation guide – e.g., South Africa Unique Identifier Standard, Zambia Data Catalog, Zimbabwe National Standards, Burundi Geonames).

k) Names of professors/university departments who could supervise students to work on standards development/tool development.

l) Circulate ICA Standards Workshop report with colleagues in your institutions and your national SDI committee.

m) Provision for standards development in existing draft policy/strategy documents (provide details on what is mentioned about standards in existing geospatial data policies/strategy documents).

Please email to Liz and Kate, egavin@csir.co.za, klance@usgs.gov



GEOSPATIAL DATA STANDARDS QUESTIONNAIRE

Background and purpose:

EIS-AFRICA and USGS/EDC both advocate the development and use of common geospatial data standards in Africa, in order to facilitate the harnessing of geo-information in decision-making. Geospatial data standards are generally regarded as a vital component of Spatial Data Infrastructure. However, one often gets the impression, that while people talk about the need for standards, there is less activity than talk about it - perhaps rather like other unpleasant chores (such as updating metadata, or tidying a desk) – something to be put off for another day. But perhaps this is not true; maybe there is many success stories relating to defining and implementing geospatial data standards in Africa, of which the geographic information community is unaware. Or perhaps people while keen to implement standards face very real difficulties.

In order to address the situation, we believe it is critical to gather the wisdom and perspectives of people who are working with geographic information on a daily basis. So, in an effort to improve capacity building efforts with respect to data standards in Africa, we are asking for your assistance in identifying

- existing standardization activities and priorities (both formal and ‘de facto’ standards);
- specific barriers to data standard development and implementation;
- interventions which will assist in overcoming these barriers, i.e. concrete ideas on what can be done, to increase standards activities within the geospatial community.

We (EIS-AFRICA and USGS/EDC) will synthesize the responses to this questionnaire, publish the results on various websites, and provide recommendations for advancing geospatial standardisation (both national and trans-national concerns). We hope to provide the first draft by August 2003. The results and recommendations will also be e-mailed directly to all respondents to the questionnaire.

Thank you for your time in completing this questionnaire as fully as possible. We welcome all responses, i.e. more than one response per country, so it's not a problem if your compatriot has already completed a copy of this questionnaire.

The questionnaire has been designed to facilitate a rapid completion, through selection of the appropriate “tick box” wherever possible, and there are only 20 questions. However, space is provided for additional comments, should you have any. Should the space provided on the form be inadequate, please feel free to provide additional information on a separate sheet or in a separate document. Similarly, if you have any reports, which would be helpful in achieving a better understanding of what is needed to advance the development and implementation of standards for geoinformation, EIS-AFRICA and USGS/EDC would be grateful to receive these additional materials and input. The last page of the questionnaire is an information sheet, which you may keep.

Please return your responses, if the response is in hardcopy, to Liz Gavin or Kate Lance in person, or if completed electronically, via e-mail to both Liz Gavin, EIS-AFRICA, egavin@csir.co.za and Kate Lance, USGS/EDC, klance@usgs.gov.

If you feel that someone else might be able to complete this questionnaire more fully than you can, please identify that person. We would still appreciate it, if you would complete the questionnaire to the best of your ability. We will follow up with the suggested person by e-mail.

Other person: (Name/agency/email) _____

1. Details of respondent (and alternate contact, if possible, for further information or clarification or to communicate information in the future):

	Primary Contact	Alternate Contact
Name:	_____	_____
Organisation:	_____	_____
Country:	_____	_____
Phone No:	_____	_____
Fax No:	_____	_____
Email:	_____	_____
URL:	http:// _____	http:// _____

2. **Do you have a national policy on geoinformation, which prescribes data standards to be implemented?**

Yes

Please specify when it became operational _____

Please provide a copy¹ when you are able (we'll be sure to send you a reminder if need be!).

No

Draft policy in progress

Additional comments? _____

3. **Is there currently a working group (or groups) focusing on some aspect of data standards?**

Yes

No (skip questions 4-9)

Additional comments? _____

4. **If the answer to question 3 is 'Yes', when was the working group on standards initiated?**

Year: _____

5. **If the answer to question 3 is 'Yes', what is the primary aim of the standards working group?**

6. **If the answer to question 3 is "Yes", which of the following standards are being developed/have been addressed by the working group? (If they apply only to certain data sets, please specify which data sets these are)**

Data Content (Applies to the following datasets: _____)

Data definitions and classification of features (Applies to _____)

Symbology/data representation (portrayal)(Applies to _____)

Data Transfer Protocols (Applies to _____)

Data Exchange Formats (Applies to _____)

Data Quality (Applies to _____)

Metadata

Spatial referencing using co-ordinates/place names

Other (please specify) _____

¹ This may be e-mailed as soon as you are able to do so.

Additional comments?) _____

7. If the answer to question 3 is 'Yes', how many organisations are represented in the standards working group?

Additional comments? (e.g, types of organizations – governmental, non governmental, universities, etc)

8. If the answer to question 3 is 'Yes', does the working group have linkages with any of the following? If yes, please describe level of participation.

- A national standards organisation or body: _____
- ISO/TC211: _____
- GSDI: _____
- ISCGM / Global Map: _____
- OpenGIS Consortium: _____
- Other: _____

9. If the answer to question 3 is 'Yes', with what frequency (on average for the year) do members of the standards working group meet?

- once a week
- bi-weekly
- once a month
- once every 3 months
- once every 6 months
- once a year
- other (please specify) _____

Additional comments: any particular reasons for this meeting frequency? _____

- 10. Have you experienced difficulty in integrating geospatial datasets or using different geographic datasets together, because of a difference in the following standards? Please indicate how often you encounter this type of problem using a rating of 1-5 (1: hardly ever, 5: often)**

	Infrequently				Often
	1	2	3	4	5
Data content (e.g. one dataset on “waterbodies” includes both natural and artificial bodies of water, while another includes on natural waterbodies)					
Data definitions and classification of features (e.g. what appears as “shrubland” in one landcover dataset, appears to have been classified as “woodland” in another)					
Symbology/data representation (portrayal) (e.g. confusion of different types of roads, because different symbols are used)					
Data transfer protocols (e.g. FTP, SOAP, RPC)					
Data exchange formats (e.g. VPF, shape files, image formats, DXF)					
Data quality (e.g. missing features or attributes, patently false attribute values)					
Metadata (e.g. “date” in one metadata record refers to a publication date, while “date” in another refers to the date at which the image used to generate the data was captured)					
Co-ordinate systems (e.g. the co-ordinates in two datasets simply do not co-incide where they should)					
Place names (e.g. the same location is referred to by different place names, or the same place name is used to refer to different locations)					
Other (please specify):					

- 11. Based on your experience in managing digital geographic data, what are the 5 most important data standards to implement in your country? You may choose items from the list below, or provide others. Please rate these, on a scale of 1-5 (1: low priority, 5: high priority)**

Data standards prioritisation:

	Low priority			High priority	
	1	2	3	4	5
Land cover classification					
Data dictionary					
Geographic names/ Gazetteer					
Coding for the administrative divisions					
Coding for river names (hydrological network):					
Coding for road classification					
Metadata					
Co-ordinate systems (spatial referencing by co-ordinates)					
Data quality					

12. **Data standards activity in general: please mark the standards for which there has been activity in your country, and provide a description of what has been done or is in progress, or indicate the status of progress using A, B, C or D (A: still in consultative/information gathering phase, B: defined but not yet implemented, C: implemented by some but not all agencies, D: implemented by all relevant agencies)**

- Data dictionary (feature catalogue): _____
- Land cover classification: _____
- Place names / Gazetteer: _____
- Coding for the administrative divisions: (if there has been work, down to what level of administrative division?) _____
- Coding for river names (hydrological network): _____
- Coding for road classification: _____
- Metadata: _____
- Geodetic Network: _____
- Data quality: _____
- Other: Please specify: _____

Please e-mail copies of final or draft standards, where available, when you are able to do so.

13. **Please describe any projects, or donor support, for advancing data standards development over the past five years.**

14. **Please outline any other major activities or events related to the acquisition and management of geoinformation that have occurred in the last five years (e.g., mapping campaigns, map digitisation, data harmonisation, conferences/workshops, establishment of coordination office or committee, capacity building, database creation, equipment acquisition)**

Attach additional documentation to provide details as necessary:

- a. _____
- b. _____

- c. _____
- d. _____
- e. _____

15. On a scale of 1-5, how would you rate the level of awareness of the need for data standards among the geospatial data users and producers in your country?

Little awareness		Considerable awareness		
1	2	3	4	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional comments? _____

16. On a scale of 1-5, how do you rate your level of satisfaction with the amount of effort going into the arena of geospatial data standards in your country?

Dissatisfied		Quite Satisfied		
1	2	3	4	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional comments? _____

17. On a scale of 1-5, rate how much institutional change is needed to implement spatial data standards in your country?

Very little change		Considerable change		
1	2	3	4	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional comments? _____

- 18. What are the most pressing current challenges for standards developments in your country?**
(E.g. resources to do the work, training in standards development, institutional co-operation ?)

- 19. What are the most pressing current challenges for standards implementation in your country?**
(E.g. resources to do the work, training in implementing standards, institutional co-operation ?)

- 20. Do you have specific topics that you would like to see SDI specialists in Africa study to support standards development in Africa?**

Once again, thank you for completing this questionnaire!
Please return your responses to Liz Gavin, EIS-AFRICA, egavin@csir.co.za and Kate Lance, USGS/EDC, klance@usgs.gov



SOME RESOURCES ON THE WORLD WIDE WEB ON STANDARDS FOR GEOGRAPHIC INFORMATION

Please feel free to retain this page, for your further use.

<http://www.isotc211.org/>

The web-site of ISO's Technical Committee ISO/TC211 (see <http://www.iso.org/> for general information on ISO), dealing with the standardization of Geographic Information/Geomatics. The TC is and has worked on more than 40 work items. Some documents are available to members only. See also <http://www.iso.ch/iso/en/commcentre/pdf/geographic0107.pdf> for a newsletter (July 2001) on the expanding agenda of geographic information standards.

<http://www.opengis.org/>

The Open GIS Consortium, or OGC, is an international industry consortium of 254 companies, government agencies and universities participating in a consensus process to develop publicly available specifications.

<http://www.iscgm.org/qm-specifications11.pdf>

Specifications for Global Map datasets.

<http://www.africover.org/LCCS.htm>

<http://www.lccs-info.org/>

A standard Land Cover Classification System (LCCS)

http://www.swisstopo.ch/fig-wg71/task/fig_suncity99.pdf

Report of the Results of the FIG Questionnaire on Standards

<http://www.asprs.org/asprs/resources/standards/photography.htm>

Draft Aerial Photography Standard (ASPRS)

http://gai.fgdc.gov/girm/GIRM_SDI2002.ppt

The Geospatial Interoperability Reference Model (GIRM) references geospatial standards and specifications within a highly structured model, to help decision-makers choose standards to facilitate interoperable geoprocessing.

<http://www.fgdc.gov/standards>

Standards under development for NSDI (USA)

<http://www.fgdc.gov/metadata/contstan.html>

Content Standard for Digital Geospatial Metadata, probably the most widely implemented metadata standard for geospatial information

<http://mapping.usgs.gov/standards/>

National Map standards (USA)

<http://www.geo-one-stop.gov/Standards/index.html>

Geospatial One Stop Standards (USA)

<http://www.nsif.org.za/standards>

The page of South Africa's NSIF covering the development of national standards.

<http://www.auslig.gov.au/mapping/specs.htm#about%20the%20specs>

GeoScience Australia Specifications for Topographic Maps and Data (Updated: 17 October 2002)

<http://apollo.ogis.state.me.us/standards/GISStandards2002.rtf>

Data Standards for Maine Geographic Information Systems (2002)

http://www.mnplan.state.mn.us/pdf/1999/lmic/nssda_o.pdf

Positional Accuracy Handbook: Using the National Standard for Spatial Data Accuracy to measure and report geographic data quality

<http://support.esri.com/index.cfm?fa=downloads.dataModels.intro>

<http://support.esri.com/index.cfm?fa=downloads.dataModels.gateway>

ESRI Data Models, ESRI data content templates

<http://support.esri.com/index.cfm?fa=downloads.dataModels.design>

Design Templates in GIS (ESRI)

<http://www.gis-t.org/yr2001/GIS->

[T2001Latest/gist2001powerpoint/2.1%20LRS%20SOFTWARE%20A%20NEW%20GENERATION/2.1.1.ppt](http://www.gis-t.org/yr2001/GIS-T2001Latest/gist2001powerpoint/2.1%20LRS%20SOFTWARE%20A%20NEW%20GENERATION/2.1.1.ppt)

INTRODUCTION

1.1 BACKGROUND

More than ever before, there is real need for various institutions (government, private) to share geospatial information so as to increase their efficiency and effectiveness in their operations. This means that institutions will focus more on their main objectives by obtaining their geospatial information needs from other institutions without need for initiating an independent data collection exercise. In this way duplication of data collection efforts are minimized as far as possible and business activities for geospatial information and services will be induced. This sharing of geospatial information should involve as many institutions as possible including government departments, private institutions, the academia and the entire citizenry. The primary objective of a National Spatial Data Infrastructure (NSDI) is to ensure that users are able to acquire, at the right time, adequate, complete and consistent datasets.

However, for NSDI to be realized, a number of issues must be addressed. The issues are quite varied but we have grouped them for the sake of this report as institutional, legal and political, technical and finally socio-cultural.

Institutional issues are generally believed to pose the greatest challenge to the development of NSDI (WCMC, 1996; EIS-AFRICA, 2001). Institutional issues include determining who (institutions) to be involved, how the NSDI is to be organized (i.e. the organization structure), who is to be “in-charge”; how appropriate the measures of success are.

The legal and policy issues to be addressed in establishing NSDI include the legal status and political backing of NSDI, public access to government-held information, commercialization of public geospatial information, privacy and protection of personal information, liability, integrity of the geospatial information, copyright and others.

Data sharing between institutions is not only hindered by institutional constraints but also by technical constraints. To have efficient data sharing within the NSDI, two obstacles must be overcome; Technical non-interoperability and semantic non-interoperability (Harrison, 2002).

Technology with regard to NSDI includes the hardware, software or simply the networks that make possible the discovery and evaluation of geospatial data. Therefore technical non-interoperability is where different kinds of processing systems and different processing systems do not work well together while semantic non-interoperability is where different groups do not define features, structures and their metadata the same way. Interoperability is defined as the ability of a system or components of a system to provide information sharing and inter-application co-operative process control (Groot and McLaughlin, 2001). Interoperability therefore is a key concept for integrating the various kinds of information stored in different and differing repositories.

Apart from technical issues, the success or failure of NSDI depends also on socio-cultural conditions in a given country. Socio-cultural issues include for example the willingness to share information, and more generally the social acceptability of geospatial technologies or NSDI for that matter. The cultural acceptability relates to functionalities such as communication and information sharing, strategic planning, operational planning and management and monitoring and evaluation (ibid). In general therefore the way each country perceives the NSDI concept and how it believes its citizens may restrict the acceptance, desirability and economic traffic of government-held information. Therefore because of diversity in cultures, Kenya cannot afford to just copy NSDI applications from elsewhere, instead the establishment of NSDI should consider the prevailing and anticipated cultural conditions.

Over and above, there are other challenges that countries in Africa must contend with. As espoused by Mulaku (2002), they include low teledensity, lack of sufficient funds among others.

1.2 GEOSPATIAL STANDARDS

In actual practice (especially in Kenya), interoperability is absent in spatial data handling due to incompatible software products, inadequate data formats, semantic misconceptions and heterogeneous data models. This according to Thannasis makes interoperability a dream for users and a nightmare for system developers (Thannasis et al, 2000).

It is now common knowledge that standards facilitate sharing of information and computer resources within and between organizations and in that regard standards have become popular in geospatial information because of the need to share information and resources. However, standards are not an end in themselves but the foundation to help information systems and databases easier to use and maintain (Groot and McLaughlin, 2001). Therefore legislation and policy recommendations are not suitable for imposition of standards. The reasons for embracing a standard as stated by Thannassis (2000) are:

- i) It exists and it is complete across the area of interest.
- ii) It is simple to access and use.
- iii) It does the job.

Standards generally solve particular problems such as how to represent data efficiently. They are important for various reasons (ESRI, 2001) they facilitate the following:

- i) The exchange of information (portability).
- ii) Comparison of similar measurements.
- iii) Analysis of information across disciplines.
- iv) Reduce life cycle expenses.

Standards can generally be grouped as independent and de-facto standards. Independent standards are formally approved by a recognized body through a well-defined consensus setting, in which multiple interested parties have participated. For example, standards approved by the International Standards Organization (ISO), the American National Standards Institute (ANSI), the British Standards Institute (BSI) and the Kenya Bureau of Standards (KEBS) fall in this category. De-facto standards on the other hand, are those standards that become accepted because of their broad popularity and use, but are not necessarily accompanied by formal approval by an independent standards organization. In most cases de-facto standards arise from the I.T industry, in other words, the development of digital geospatial technologies and I.T. has awakened the need for standards. For De-facto standards, one company or group of companies may develop specifications or standards associated with

a set of products and with sufficient market share, these standards are accepted by a large segment of the user community.

Efforts at developing standards for digital geospatial data have been made and will continue to be made through national, international and industry efforts. Some of the countries that have developed standards include the United States of America (USA), the United Kingdom (UK) and Japan, just to name a few. Besides the country level, internationally, a lot of comprehensive work has been undertaken in this field. In 1992, a decision was made to establish a committee, the Comité Européen de Normalization (CEN). The committee is referred to as CEN Technical Committee (CEN/TC 287) on Geographic Information (EIS Africa-2001). In 1994, ISO/TC 211, was formed under the International Standards Organization to oversee the development of standards for digital geospatial data.

The internationally recognized standards for digital geospatial data that are of broad international scope as already mentioned are the CEN/TC 287 and ISO/TC 211. ISO/TC 211 was formerly ISO 15046.

1.3 THE ISO STANDARDS

The International Standardization Organization (ISO) is a worldwide federation of national standards bodies from some 140 countries, one from each country. ISO is a non-governmental organization (NGO) established in 1947 and its chief missions are to promote the development of standardization and related activities in the world with a view to facilitating international exchange of goods and services and to develop co-operation in spheres of intellectual, scientific, technological and economic activities (ISO, 2003a). ISO's work results in international agreements, which are published as international standards.

ISO is made up of members divided into three categories namely: member body, correspondent member and subscriber member. A member body is the national body 'most representative of standardization in its country'. Thus only one member in each country may be admitted to membership of ISO. Member bodies are entitled to participate and exercise full

voting rights on any Technical Committee (TC) and policy committee of ISO. The Kenya Bureau of Standards (KEBS) is Kenya's member body to ISO.

A correspondent member is usually an organization in a country, which does not yet have fully developed national standards activity. Correspondent members do not take an active participation in technical and policy development work, but are entitled to be fully informed about any work of interest to them. Finally, a subscriber member is for countries with small economies. These members pay reduced membership fees that nevertheless allow them to maintain contact with ISO.

1.4 HOW STANDARDS ARE DEVELOPED

ISO standards development is based on three principles namely: consensus, industry-wide and voluntary. ISO standards are developed by Technical Committees (TC) and Sub-Committees (SC) in a six-stage process as here briefly presented. ISO (2003a) gives a detailed procedure.

a) Stage one (Proposal stage)

If an item is needed, it is proposed and submitted for vote by the relevant members of the TC/SC to determine the inclusion of the item in the Working Group (WG) Programme. The proposal is accepted if the majority of the Participating members (P-members) of the TC/SC vote in favour. At this stage, a project leader for the work item is appointed.

b) Stage two (Building expert consensus)

A Work Group of experts is set up by the TC/SC for the preparation of the working drafts. Successive working drafts are considered until the WG is satisfied that it has developed the best technical solution to the problem being addressed. At this stage, the draft is forwarded to the WG's parent committee for consensus building phase.

c) Stage three (Consensus building within TC/SC)

As soon as the first draft is available, it is registered with the ISO central secretariat. It is distributed for comments and if required, voting by the participating members of the TC/SC is done. Successive drafts may be considered until consensus is reached on the technical content.

Once consensus has been attained, the text is finalized for submission as the Draft International Standard (DIS).

d) Stage four (Enquiry on DIS)

The DIS is circulated to all ISO member bodies by the ISO central secretariat for voting and comment within a period of five months. It is approved for submission as a Final Draft International Standard (FDIS) if 2/3 majorities of the P-members of the TC/SC are in favour and not more than ¼ of the total number of votes cast are negative. If these criteria are not met, the text is returned to the originating TC/SC for further study and a revised document is again circulated for voting and comments as FDIS.

e) Stage five (Formal voting on FDIS)

The FDIS is circulated to all ISO members by the central secretariat for final Yes/No within a period of two months. If technical comments are received within this period, they are no longer considered at this stage, but registered for consideration during a future revision of the standard.

f) Stage six (Publication)

Once the FDIS has been approved, only the minor editorial changes if any and where necessary, are introduced into the final text, which is then sent to the ISO central secretariat, which publishes the international standard. All ISO standards are reviewed at least every five years by the responsible TC/SC. A majority of the P-members of the TC/SC decides whether international standards should be confirmed, revised or reviewed. Any party/person interested in a particular ISO standard can obtain it by ordering for the same through his/her member body.

1.5 THE ISO/TC 211 – Geographic Information/Geomatics

The ISO/TC 211 is a family of standards in the field of digital geospatial information/Geomatics. The technical committee was established in 1994 and so far six International Standards (IS) and two Technical Reports (TR) have been approved, while one, the metadata standard is a FDIS and thirteen others as DIS. This family of standards is

intended to contain information concerning objects or phenomena that are directly or indirectly associated with a location relative to the earth. The standards may specify for geospatial information, methods, tools and services for data management (including definition and description), acquiring processing, analyzing, accessing, presenting and transferring such data in digital form between different users, systems and locations. This family of standards also links with appropriate standards for information technology and data and also provides a framework for the development of sector specific applications using geospatial data.

The standards in this family include the following (ISO, 2003b)

- a) International Standards and Technical Reports (TR)
 - i) ISO 6709: 1983 standard representation of latitude, longitude and altitude for geographic point locations
 - ii) ISO 19101: 2002 Geographic information-Reference model
 - iii) ISO 19105: 2000 Geographic information-conformance and testing
 - iv) ISO 19108: 2002 Geographic information-Temporal schema
 - v) ISO 19111: 2003 Geographic information-Spatial referencing by coordinates
 - vi) ISO 19113: 2002 Geographic information-Quality principles
 - vii) ISO/TR 19120: 2001 Geographic information-functional standards
 - viii) ISO/TR 19121: 2000 Geographic information-imagery and guide and data

- b) Draft International Standards (DIS)
 - i) ISO/FDIS 19115: Geographic information-Metadata

- c) Draft International Standards (DIS)
 - i) ISO/DIS 19104: Geographic information-Terminology
 - ii) ISO/DIS 19106: Geographic information-Profiles
 - iii) ISO/DIS 19107: Geographic information-Spatial schema
 - iv) ISO/DIS 19109: Geographic information-Rules of application of schemata
 - v) ISO/DIS 19110: Geographic information-Feature cataloguing methodology

- vi) ISO/DIS 19112: Geographic information-Spatial referencing by geographic identifiers
- vii) ISO/DIS 19114: Geographic information-Quality evaluation procedures
- viii) ISO/DIS 19116: Geographic information-Positioning services
- ix) ISO/DIS 19117: Geographic information-Portrayal
- x) ISO/DIS 19118: Geographic information-Encoding
- xi) ISO/DIS 19119: Geographic information-Services
- xii) ISO/DIS 19125-1: Geographic information- Simple feature access-part 1: Common architecture
- xiii) ISO/DIS 19125-2: Geographic information-Simple feature access part-2: SQL option

Standards of importance to geospatial information users range from the details of computer hardware and networks to design of databases and map products. The standards for digital geospatial data and information will generally cover topics such as data quality, data classification, metadata, data transfer and other related topics.

In a country where digital geospatial technology is gaining widespread use such as Kenya, the development of standards is mandatory in order to achieve economics of scale with digital geospatial data. The wisdom in the industry today is that user and producer organizations must adopt standards to deploy and support use, maintenance and sharing of geospatial information. From Sub-Saharan Africa, only South Africa is a participating member of ISO/TC 211, while Zimbabwe and Kenya are Observing members (ISO, 2003b). In the majority of countries little or no work at all on standardization for geoinformation is being carried out.

It is for this reason that this preliminary study to determine the current situation of digital geospatial data in Kenya as regards the level of acceptance of digital geospatial data; the organizations that are involved; accessibility and sharing of geospatial data between organizations; legal issues and sale of geospatial data. And also to determine the statuses of specifications of major geospatial data producers in Kenya.

1.6 OBJECTIVES OF THE STUDY

The study was commissioned with the objectives as spelt out in the Terms of Reference (TOR) in Annex 1, these are:

- 1 To collect information on current situation of digital geospatial data production in Kenya in general.
- 2 To present statuses of specifications of major geospatial data producers in Kenya
- 3 To analyze the findings and preparation of recommendations for establishing Kenyan standards for geospatial data.
- 4 Preparation of the final report

Significance of this preliminary study is that status of specifications of major data producers and users will be determined, which will then define the starting point for standards development for digital geospatial data. The development of such standards is invaluable in the NSDI development efforts.

THE RESEARCH METHODOLOGY

In order to achieve the objectives of this study, a survey of data producers and users was done using a suitable questionnaire. The questionnaire contained both closed and open-ended questions and was structured to obtain information about the institutions and their specifications for geospatial data. The questionnaire was administered by way of interview.

2.1 SAMPLING

The entire population of institutions who produce and use geospatial information in Kenya is quite varied and it was not possible to visit each of them individually. The best possible sampling was therefore done across the government, the private and the academic sectors. Some international/regional institutions that are within Kenya were involved as well. A sample frame of the institutions that were visited is in annex 2. In general 32 institutions responded to the survey, however more than this number were approached, but due to time constraint and lack of co-operation from some of them, no response was forthcoming from the rest. Of the 30, 9 were government departments, 8 government parastatals, 3 educational, 7 private and 5 international/regional.

2.2 QUESTIONNAIRE CONTENT

The questionnaire (with sample in annex 3) was divided into four sections i.e.

(A) Institutional Details

Under this section, the information that was to be captured include

- The name of the institution
- Full address
- Telephone numbers
- Physical location
- Contact person

(B) Description

- When the institution was set up
- Number of employees
- Number of staff working with spatial data
- Opinion regarding use of standards for geospatial data

- Description of the institution
- Level of operation
- Core business

(C) Information management

- Significant geospatial datasets
- Standards/specifications used
- Quality evaluation

(D) Partnerships

- Data exchange
- Partnerships planned in the near future
- Contribution of the institution toward NSDI
- Benefits from NSDI

QUESTIONNAIRE RESULTS

The survey responses were analyzed using the Statistical Programme for Social Scientists (SPSS) software.

(i) Description of organizations

Although the institutions surveyed were generally grouped into five categories, the respondents described the institutions in various ways. Figure 1 shows how the respondents described the institutions.

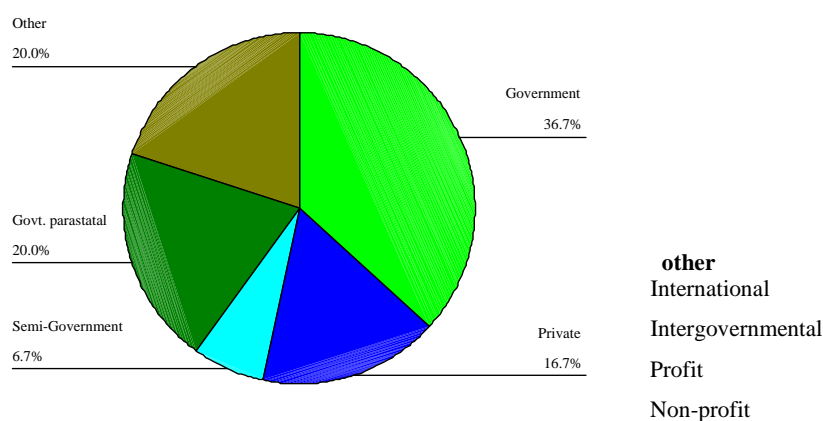


Figure 1: Organizations

In general terms, the organizations indicated who the users of their products are. Although this item was meant to sample the disciplines where geospatial information is being applied, most of them were instead general in their responses. Government departments, parastatals and international institutions responded that their customers are other departments within, other government institutions, learning and private institutions, while the private and the academic institutions have government parastatals and the private sector as their customers.

(ii) Information management

The NSDI has its foundation on framework datasets. These are datasets, which have common-use and are of national and trans-national importance, Government departments’ response (mean demand) for the geospatial framework data is presented in figure 1.

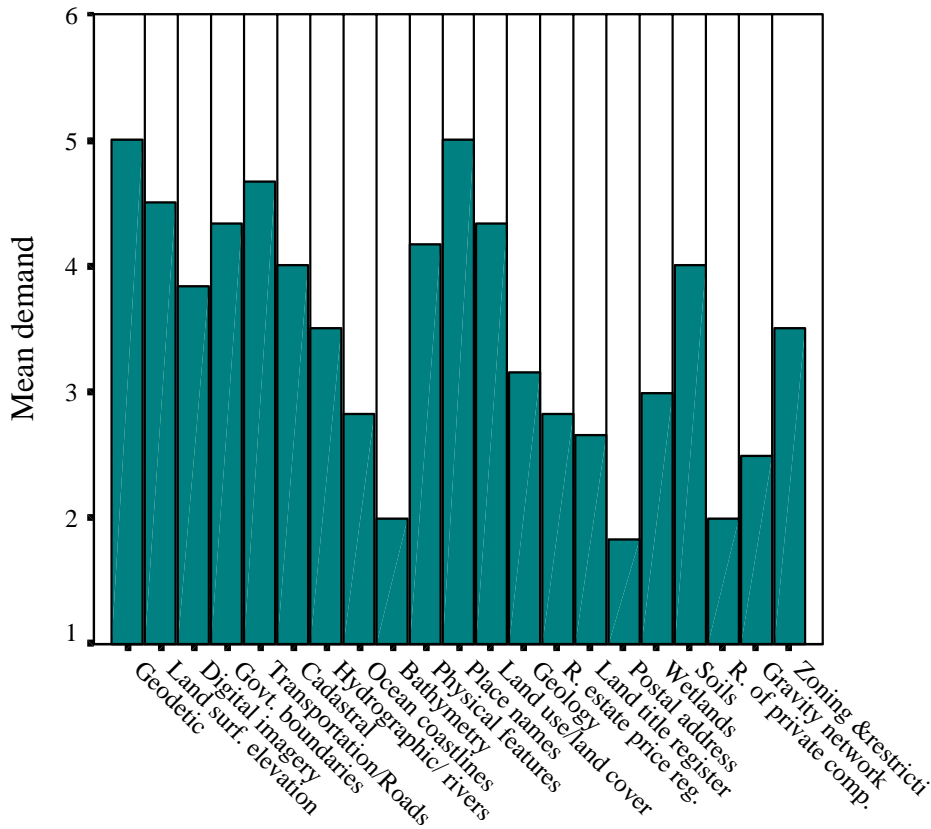


Figure 2: Demand for various geospatial data

This item was meant to determine the representative national demand for geospatial data. In comparison with what has been suggested in various literature (Douglas, 2001; EIS-Africa, 2001), the candidate framework datasets are:

- Cadastral information
- Geodetic control
- Geographic feature names
- Orthoimagery
- Elevation
- Transportation
- Hydrography
- Government units

The Government demand for geospatial information has the highest number of candidate datasets, followed by the academic institutions. It is therefore suggested that the government departments and the academia be used to determine the true national demand. Government parastatals may have some bias considering that they are mission specific.

International/regional institutions may indicate a regional /international demand, which may not reflect the national demand, for instance cadastral information. Private institutions might only indicate demand for datasets that they have handled. Finally the academic institutions as expected indicated almost a uniform demand for all the candidate datasets.

Since the government department will determine the success or failure of NSDI, the demand for framework data by Government departments and academic institutions will indicate generally the national demand. From this analysis, the following are recommended as key framework data for Kenya.

- Geodetic
- Place names (gazetteer)
- Transportation
- Government boundaries
- Land surface elevation
- Physical features
- Land use/land cover
- Cadastral
- Digital imagery
- Hydrographic

(iii) Use of standards/specifications

Generally, there was a very positive response with regard to the establishment and setting up of standards for geospatial data. As shown in figure 2, Out of the 30 responses 87% indicated that they were in strong agreement with the idea, while 13 % indicated that they only agreed,

none indicated that they either weren't sure, or in disagreement or total disagreement with the idea.

The respondents gave various reasons with respect to the establishment of standards. Some of the reasons advanced include the following:

- Ease of conversion and comparison (to determine reliability) of data sets
- Ease of integration and sharing of data with other organizations
- Standards ensure that all stakeholders develop data sets at acceptable (e.g. quality) and on common reference
- With standards duplication is minimized
- It is a national mandate
- They enhance effectiveness of digital geospatial data.

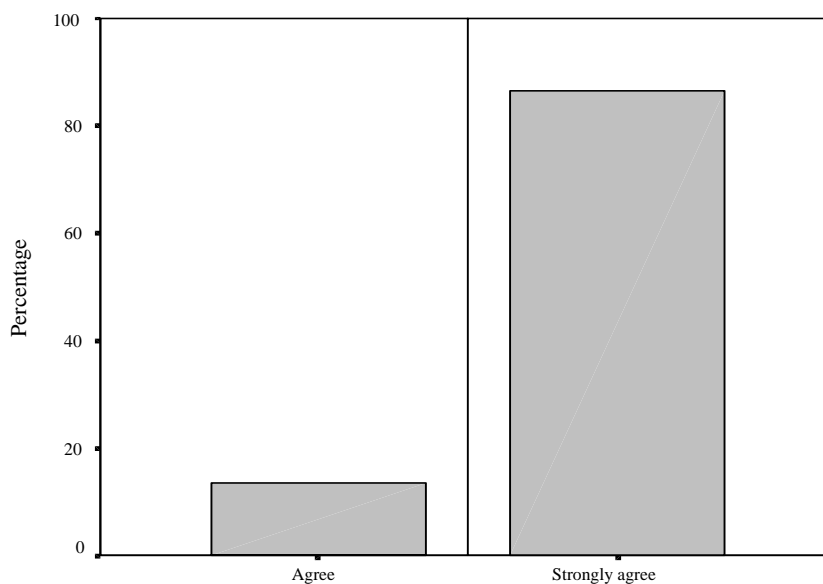


Figure 3: Use of standards

This overwhelming positive response therefore implies that the question to be addressed is not whether to establish or adopt standards for geospatial information but what standards are to be established or adopted?

Though standards impacting Spatial Data Infrastructure range from hardware and networks to design of databases and map products, this study was more biased towards the high-level standards. These are standards that deal with the development of geospatial information systems, which include among others the design of databases, establishing procedures for data exchange among others.

To determine whether any specifications or standards for geospatial data are used at all, a related item required the respondents to indicate whether they use any specifications for particular items and to indicate the specifications if any. A total of 13 items were under investigation. The items under investigation generally covered five areas: data format, data compilation and update, product presentation, production distribution and certification and qualification of personnel.

Overall, the responses to all these items ranged from 69.0% to 93.1%. With qualification and certification of personnel getting the least response while the catalogue receiving the highest response. Table 1 gives in summary the responses, while Annex 3 contains the comprehensive response on this item.

The items with their percentage responses (percentage of the valid responses) are presented below. Generally the responses are grouped into three categories. The first category (A): those who indicated that they do not use any standards or specifications. The second category (B): those who indicated that they either have some internal specifications, use specifications as required by a given project or limited to what the particular software provides and finally, the third category (C): those who use some national or international standard.

Item	A	B	C
<i>Geospatial data format (valid response 90.0%)</i>	29.6	66.6	3.7
<i>Data content (valid response 83.3%)</i>	20.0	60.0	20.0
<i>Data coding and classification (valid response 80.0%)</i>	29.2	50.0	20.9
<i>Data exchange (valid response 80%)</i>	37.5	58.3	4.2
<i>Geospatial metadata (valid response 80%)</i>	58.3	33.4	8.3
<i>Data collection and compilation (valid response 90.0%)</i>	22.2	70.3	7.4
<i>Spatial referencing (valid response 86.7%)</i>	23.1	7.6	69.2
<i>Quality evaluation (valid response 86.7%)</i>	30.8	50.0	19.1
<i>Map design (valid response 86.7%)</i>	26.9	34.5	38.4
<i>Map symbology (valid response 90%)</i>	14.8	25.9	59.2
<i>Fees schedule for products and services (valid response 70.0%)</i>	61.9	28.6	9.2
<i>Qualification and certification of personnel (valid response 66.7%)</i>	45.0	15.0	40.0

Table 1: response for specifications**A. Data formats:**

This includes Geospatial data format, data content, data coding and classification, data exchange, geospatial metadata. What this pattern of response clearly reveals is that for geospatial data formats, producers and users have no option but to depend on what the available software provide for, or what a particular project specifies. The majority of the institutions define their data content dependent on the project together with what the available software provides for. Data coding and classification are in most cases influenced by international organizations such as the World Meteorological Organization (WMO), the Food and Agricultural Organization (FAO). For data exchange most institutions use software options and for vector data, DXF was cited most as the specification for data exchange, but this depends much on the software. Finally, for metadata, majority of organizations do not know what metadata is. To have NSDI that is effective, this is one item that must be taken seriously for it is the one that ideally makes data discoverable and enables evaluation.

B. Data compilation and update

The items here define the acceptable techniques for capturing and compiling data, accuracy and quality standards. They include data collection and compilation, spatial referencing, quality evaluation. For data collection, the institutions that deal with land survey cited the specifications as provided in the Survey act, while those that deal with soil survey indicated FAO soil survey specifications.

A majority of the respondents use UTM/Geographic co-ordinate system, but the majority of them again obtain basic geoinformation from Survey of Kenya, which are based on UTM/Geographic. GPS was also included in this category, but during the interviews, most respondents expressed the need to have pillars with known WGS84 co-ordinates.

C. Product presentation

This covers specifications for production of standard maps and other output products. Though many organizations do not have map production as their main business, at one point or another, they produce maps. The standards here include accepted map layout (Sheet format, scale, margin and legend designs), standards for accepted point and line symbology and for other products.

For map design, the response is almost uniform, indicating that the design of maps has various specifications. The high response for map symbology ideally refers to International cartographic specifications.

D. Product distribution

This entails any established programmes for external distribution and sale of geospatial data, products and services. Most institutions have no specifications for geospatial products and services. Those who deal with land survey use specifications as provided in the survey act. But for digital geoinformation, unrealistically high fees characterize the industry. This is

because some institutions will want to benefit as much as possible before digital geoinformation gets widespread use in Kenya.

E. Qualification and certification of personnel

This is one item that may not have gained a lot of popularity in Kenya and generates a lot of interest for discussion. 45% do not have any specifications, 15% and the remaining 40% use internal and GoK scheme of work/ESRI specifications respectively. But one interesting thing is that the way this particular item is addressed will determine the direction the development of geospatial technologies will take.

(iv) Quality evaluation

Since people from many disciplines outside the traditional professions are involved in the production and use of geoinformation, quality of the geoinformation is one item that must be addressed, if the data is to be used effectively and efficiently. Quality of a dataset generally defines the overall fitness or suitability of a data for a specific purpose. Geospatial data quality can be described both by qualitative and quantitative parameters.

This item required respondents to indicate the quality parameters they use and those that they test for. Table 3 summarizes the responses. Use means that the item is only used to indicate quality, while test is validating the element.

Out of 21 elements, 16 of them (with more than 50%) had no response. This item was the most difficult to administer, with most respondents saying that it was too academic. What this pattern of response indicates is that quality evaluation for geoinformation in Kenya has not gained much popularity.

Pertaining to the delivery of products with quality results, 60.0% of the respondents deliver their products with quality results, 10.0% don't, while 30.0% did not respond.

Quality element	Use %	Test %	Test and use %	No response %
<u>Non-quantitative quality element</u>	=====	=====	=====	=====
Purpose	13.3		13.3	73.3
Usage	16.7		10.0	73.3
Lineage	=====	=====	=====	=====
• <i>Source</i>	40.0	3.3	13.3	43.3
• <i>Process step</i>	26.7	3.3	16.7	53.3
• <i>Producer organization</i>	33.3	3.3	6.7	56.7
• <i>User guide</i>	23.3	3.3	23.3	50.5
<u>Quantitative quality elements</u>	=====	=====	=====	=====
Completeness	=====	=====	=====	=====
• <i>Omission</i>	26.7	3.3	36.7	33.3
• <i>Commission</i>	16.7	3.3	26.7	53.3
• <i>User guide</i>	16.7		23.3	60.0
Logical consistency	=====	=====	=====	=====
• <i>Topological consistency</i>	16.7	6.7	20.9	56.7
• <i>User guide</i>	16.7	16.7		66.7
• <i>Domain, Geometric, semantic consistency</i>	16.7	3.3	23.3	56.7
Positional accuracy	=====	=====	=====	=====
• <i>Absolute accuracy</i>	23.3	3.3	30.0	43.3
• <i>Relative accuracy</i>	20.0	3.3	36.7	40.0
• <i>Raster data positional accuracy</i>	3.3	6.7	20.0	70.0
• <i>User guide</i>	13.3		16.7	70.0
Temporal accuracy	=====	=====	=====	=====
• <i>Last updated</i>	23.3	3.3	13.3	60.0
• <i>Temporal validity</i>	16.7	3.3	36.7	43.3
Thematic accuracy	=====	=====	=====	=====
• <i>Accuracy of spelling</i>	20.0	3.2	36.7	40.0
• <i>Likely misclassification</i>	16.7	6.7	26.7	50.0
• <i>Quantitative and qualitative classification correctness</i>	13.3	6.7	26.7	53.3

**Table 2 : Quality evaluation
(v) Partnerships**

Apart from the NSDI, other groups/committees with respect to geospatial information identified during the survey include the GIS Kenya, the Land Surveyors Board, International Federation of Surveyors (FIG), Food and Agricultural Organization (FAO), World Meteorological organization (WMO) and Environmental Information System (EIS).

Despite the fact that there is no NSDI already in place, it cannot be denied that there is sharing of geospatial data between organizations. The table 4 shows in summary the arrangements for sharing geoinformation by the institutions surveyed.

Arrangement	Get %	Give %
Formal	43.3	23.3
Informal	6.7	6.7
Formal and informal	26.6	40.0
None	3.3	10.0
No response	20.0	20.0

Table 3: Sharing of geoinformation

(vi) Contributions to and benefits from NSDI

To realize the benefits of NSDI, each of the participating institutions should contribute in one way or another. Annex 5 contains a list of the organizations indicating what their contribution would be. The following is a sample of their responses.

- Provide framework data
- Provide application data
- Planning and implementation
- Setting up of standards
- Preparation and collection of framework data
- Provision of software
- Development of metadata
- Development of clearinghouse
- Provide data portals and links and facilitate data exchange

- Co-ordination of NSDI for member countries

In the same vein the institutions indicated what they expect of and from the NSDI. The following is a sample of their responses.

- Interoperable data
- A dedicated network updated regularly
- Collaboration
- Specifications of major geospatial data

(vii) Total number of employees and number of people working with geospatial data

Some organizations did not respond to this item, and for those that responded, the figures are largely approximate. Considering the multidisciplinary nature of geospatial information, now more people outside the traditional professions handle geospatial information. Because of this, in some cases the people reported referred to surveyors, cartographers and anyone who could handle geospatial data. The individuals involved in the interview fell in one of these categories.

(viii) Human capacity requirements

Of the 30 organizations visited, their responses on human capacity (personnel dealing with geospatial information) needs were as in figure 4.

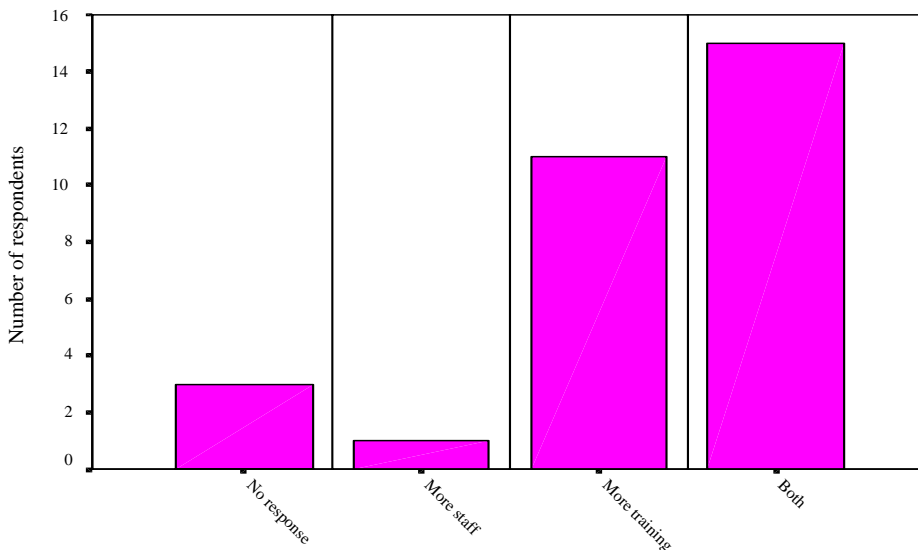


Figure 4: Human capacity requirements

The following are the number of institutions and what they indicated their human capacity requirements are.

- 14 – more staff plus upgrading (training) the existing staff
- 11 – indicated that they need training of the existing staff, while
- 1 – indicated that only need more staff, while
- 3 – did not respond

In the case of no response the interviewee was not in a position to respond to this item.

Changes in workforce of the geospatial personnel were also investigated. According to table 4, 53.3% of the organizations indicated that they have experienced changes. However, during the interviews most respondents indicated that the changes were largely within the country. On the other hand, 36.7% indicated that they have not experienced any changes while 10.3% did not respond.

Changes in workforce

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	16	53.3	59.3	59.3
	No	11	36.7	40.7	100.0
	Total	27	90.0	100.0	
Missing	System	3	10.0		
Total		30	100.0		

Table 4: Staff changes

(ix) Opinions regarding what institutions should do to enhance the management and use of geoinformation.

The following is a collection of opinions regarding what institutions should do.

(a) Your organization

- Make data more available
- Work towards using more digital data
- More staff and additional training
- Sensitize decision makers
- Accept and accommodate change
- More awareness

(b) Educational institutions

- Liaison with the industry
- Offer GIS training to practicing professionals
- Structured and standardized GIS training
- Broaden curriculum to reflect the 21st century needs.
- Equip GIS labs

(c) Private sector organizations

- Interact more with other organizations
- Arrange for GIS fora
- Develop user friendly applications
- Make accessible their data

- Have partnerships with the government
- Open up
- Need to be transparent

(d) Telecommunications

- Telecommunication facilities should be increased between govt. departments
- Expansion of services to accommodate for example image data
- More teledensity
- Lower tariffs

(e) Government

- Co-ordinate and guide policy framework set up
- Embrace LIS for taxation, revenue collection and in local authority management
- To be sensitized on the need for geospatial data
- Implementation and funding for NSDI
- Change with time and encourage modernization
- Reduce bureaucracy in obtaining geoinformation
- Create conducive environment
- Encourage communal GIS to spread costs of common GIS projects

(f) Non-Government groups

- Open up

(g) Foreign aid agencies

- Assist in acquisition of more hardware and software
- Assist government to develop capacity
- Sponsor projects and support initiatives

(x) Systems

Systems in this context comprise of the main facilities accessible by organizations to enhance production, publication and distribution of geospatial information. These include communication facilities, computer hardware and software and data input and output devices. Annex 6 contains an inventory of systems in the surveyed organizations. The inventory (in alphabetical order) contains the information as supplied by the respondents. The table below shows the percentages of the institutions with the facilities/ systems.

Communication facilities (telephones, fax, e-mail and internet) have facilitated the exchange of information worldwide but from the opinions of most respondents, there is need to increase their density, reduce tariffs and ensure their availability. At least 80% of the respondents have Internet access points, mainly for Internet communication.

In the NSDI institutions (especially government institutions) will be assigned roles, particularly for collection and development of specific datasets. The institutions will be assigned say duties to develop topographic information, climate information, and soil information, vegetation and land use information etc. these institutions are termed as node in terms of equipment and logistics. These nodes can only be interoperable if the systems are based on common standards say Z39.50 standard. Common specifications will enhance the efficiency of systems.

From the survey, most institutions (63.3%) use ArcView and other related ESRI packages like Arc/Info, ArcGIS. Other GIS packages in use include MapInfo, ILWIS, IDRISI, SGD, GEOVIS, ACT, HalhMapper.

Ms Access is the most common database software used, with 63.3% of the respondents indicating so. Other database software includes dbase, Oracle, Filemaker, Postgress. Dominant image processing software used as it emerged during the interviews was Erdas, but most GIS packages like ILWIS, IDRISI have image processing modules incorporated.

Survey for establishing standards for digital geospatial data in Kenya

Facility	Percentage (%)
Telephone	96.7
Fax	96.7
LAN	73.3
E-mail	83.3
Internet access point	80.0
Pentium I-IV	90.0
Windows 3.1/3.11/95/98/2000/NT/XP	100
UNIX	13.3
Macintosh	10.0
Novel NT	3.3
Vax VMS	3.3
Centralized	43.3
Distributed	40.4
PC ArcInfo	30.0
Workstation ArcInfo	36.7
ArcView	63.3
Mapinfo	30.0
ArcGIS	33.3
ILWIS	30.0
IDRISI	23.3
GEOVIS	3.3
SGD	3.3
Healthmapper	3.3
ACT	3.3
Ms Access	63.3
Oracle	16.7
dbase	3.3
Filemaker	3.3
Postgress	6.7
Image processing	40.0
CAD	46.7
Digitizing tables	40.0
Scanner	43.3
Plotters	46.7

Table 5: Facilities

DISCUSSION AND RECOMMENDATIONS

Since the introduction of digital geospatial technologies in Kenya in 1992 with UNEP as the pioneer institution, a number of institutions have adopted this technology. These institutions were described in various ways. Although the description may have largely been determined by the sampling, it nevertheless indicates the general situation in Kenya that Government departments and parastatals represent a significant portion in the geoinformation industry. What this in effect means is that the success or failure of NSDI will depend much on government departments and parastatals. This is because most of public information is in their custody, and this is the information that should be made accessible as much as possible.

Overall, there is a widespread use of digital geospatial technology in Kenya although most of these are in Nairobi. Though not all the institutions in the sample frame like Telkom Kenya and the Electoral Commission of Kenya (ECK) have GIS installations, they however indicated that they are in the process of putting up such installations. Therefore their inclusion in the study was significant because they will contribute towards the development of the NSDI in one way or another.

Since the government department will determine the success or failure of NSDI, the demand for framework data by Government departments and academic institutions will indicate generally the national demand. From this study, the following are recommended as key framework datasets for Kenya.

- Geodetic
- Place names (gazetteer)
- Transportation
- Government boundaries
- Land surface elevation
- Physical features
- Land use/land cover
- Cadastral
- Digital imagery
- Hydrographic

Technologically, these institutions have what one might say is sufficient at least for their own GIS operations in both hardware and software. For data sharing with other institutions however, the study revealed that only one or two institutions have purely formal arrangements, while the majority of institutions have a mixture of both informal and formal arrangements.

Some institutions in Kenya participate in the Environmental Information System (EIS)-Africa, which is a forum for data sharing environmental data and their involvement institutions is participatory. The members from these groups are therefore expected to provide expertise during the development of NSDI.

All institutions interviewed are in agreement with the idea of establishing standards so as to facilitate conversion and comparison, integration and sharing, to minimize duplication and more generally to enhance the effectiveness of digital geospatial data. This response leads to a significant challenge: what standards are to be established and adopted?

A survey of specifications used by these institutions indicated that for most items, the majority use internal, project specifications or specifications depending on the software they have and use. This clearly indicates that there are no common specifications between the institutions. It is in spatial referencing that most institutions seemed to have a common specification, UTM and geographic co-ordinate systems. However, the use of the Global Positioning System (GPS), which is based on WGS84, seems to have introduced more confusion. Within the institutions, they depend on what the software provides or what the project requires and indeed minimal internal specifications. This scenario generally reveals that though there could be project specifications, national specifications for digital geospatial data are absent and this is likely to complicate the data sharing between organizations.

In the NSDI policy, the NSDI standards to be developed should have much input where possible from international standards that are already in existence like the content standard for Federal Geographic Data Committee (FGDC) and ISO/TC 211.

From this study, it is here recommended that a Working Group under NSDI responsible for the establishment of standards be established, and it should be as inclusive as possible to have a wide representation of all the interested parties.

The standards that are of international scope are at generic and at GIS application independent level. Kenya should make use of her ISO membership to benefit from these standards. With this in mind and with the fact that there is no hardware or software development for GIS going on, it is here recommended that for NSDI, much effort be focused on developing standards at application level. This however does not need to be an independent exercise, but borrow experience from other countries.

In very general terms, we further recommend first the establishment of standards for framework datasets for Kenya as determined by demand (figure 2). The focus should be on the development of uniform standard for database construction and should address the following and more aspects.

- i) Geospatial data formats
- ii) Data exchange formats
- iii) Data dictionary/Data content
- iv) Geospatial metadata
- v) Data coding and classification

For data compilation and quality assurance, the issue to addressed include

- vi) Data collection and compilation
- vii) Spatial referencing
- viii) Quality evaluation (map accuracy)

For product presentation

- ix) Map design
- x) Map symbology

For product distribution the issues include

- xi) Fees schedule for products and services

Lastly, qualification and certification of personnel should be addressed in order to guarantee integrity in the anticipated NSDI. In their response to human capacity requirement, most institutions indicated that the existing staff needs more training and more staff with geospatial expertise is required. Therefore this is one item that will definitely need special and urgent attention.

From the survey most hardware and software come from other countries, this can be taken to mean that in Kenya there is not much hardware or software development in relation to digital geospatial data. This has the implication that in the meantime, Kenyan institutions may not have much say in the design of the systems, therefore the way forward is for the individual organizations to prepare specifications that will guide the procurement of systems that are interoperable with others in the NSDI. These specifications should include both hardware and software and are to be derived from the NSDI policy.

Over and above, government institutions should be willing to share geoinformation in their custody, if there is a policy framework. However, for private institutions, and some government institutions, as it emerged during the interviews should be encouraged to share. Their reluctance to even indicate what geoinformation they have to some extent indicates lack of clarity of mandates and copyright laws. This must of necessity be addressed in the NSDI policy

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ANNEX 1

ANNEX 2

SAMPLE FRAME

1. Department of Survey, Ministry of lands and settlement
2. Department of Physical Planning, Ministry of lands and settlement
3. Ministry of Water Development
4. Ministry of Roads and Public Works and Housing –Roads
5. Ministry of Roads and Public Works and Housing -Building
6. Department for Urban Development, Ministry of Local Government
7. Department of Resource Surveys and Remote Sensing (DRSRS)
8. Central Bureau of Statistics (CBS)
9. Electoral Commission of Kenya (ECK)
10. Kenya Wildlife Service (KWS)
11. National Museums of Kenya (NMK)
12. Regional Centre for Mapping of Resources for Development (RCMRD)
13. United Nations Environmental Programme (UNEP)
14. International Livestock Research Institute (ILRI)
15. International Centre for Insect Physiology and Ecology (ICIPE)
16. International Centre for Research in AgroForestry (ICRAF)
17. Kenya Medical Research institute (KEMRI)
18. Kenya Forestry Research Institute (KFRI)
19. Kenya Soil Survey
20. Meteorological Department
21. Kenya Power and Lighting Company
22. Department of Surveying, University of Nairobi
23. Department of Geography, University of Nairobi
24. Kenya Institute of Surveying and Mapping (KISM)
25. Telkom Kenya
26. Norken Kenya Limited
27. GIBB Africa
28. National Housing Corporation (NHC)
29. Highland Surveyors
30. Geometer Surveys
31. Oakar Services
32. Ground Water Survey

ANNEX 3

SAMPLE QUESTIONNAIRE

Name of organization _____
 Full address _____
 Telephone Number(s) _____ Fax _____
 Physical location _____ Website _____ E-mail _____
 Contact person _____ Designation _____

1. When was your organization set up?
2. What is the total number of employees in your organization?
3. What is the number of staff working with spatial data?
4. Who are the users of your organization's products?
5. Please indicate (with a tick) your opinion regarding the establishment and use of standards for geospatial data. Please answer on a scale 1 (strongly disagree with the statement) to 5 (strongly agree)
 1(Strongly disagree).....2(Disagree).....3(Not sure).....4(Agree).....5(Strongly agree)

6. Give a reason/reasons for you choice in 5.

7. Which of the following best describes your organization?

Government Private Profit Semi-governmental Non-governmental
 Non-profit Local Authority Charity Other (specify)

8. At what level does your organization operate?

International Regional National Local Community Other (specify)

9. What is the core business of your organization?

Trade Co-ordination Policy Research Industry Law Education
 Regulation Service Administration Consultancy Lobbying Environmental
 protection Resource management Other (specify)

INFORMATION MANAGEMENT

10. Indicate how you consider the following types of data to be important for any of your applications.

Choose a number ranging from 1 to 5, with 1 indicating not fundamental and 5, extremely fundamental

TYPE OF DATA	1	2	3	4	5
Geodetic					
Land surface elevation/topographic					
Digital imagery (orthoimagery)					
Government boundaries/administrative boundaries (Government units)					
Transportation/Roads					
Cadastral /land ownership					
Hydrographic/rivers and lakes					
Ocean coastlines					
Bathymetry					
Physical features/buildings					
Place names					
Land use/land cover/vegetation					
Geology					
Real estate price register/ Land valuation					
Land title register					
Postal address					

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Wetlands					
Soils					
Register of private companies					
Gravity network					
Zoning and restrictions					

11. Do you use any specifications (standards) for the following items? If so, indicate the specifications.

	Yes	No	Specification
Data collection and compilation			
Content specification			
Geospatial data format			
Data coding			
Data exchange			
Map design			
Map symbology			
Spatial referencing			
Geospatial metadata			
Catalogue			
Fee schedule for products and services			
Qualification and certification of personnel			
Quality evaluation			

12. Indicate with a tick (✓) in the following, which quality elements you use and those that you test your spatial data for.

Quality element	Use	Test
<u>Non-quantitative quality element</u>	=====	=====
Purpose		
Usage		
Lineage		
<ul style="list-style-type: none"> • Source • Process step • Producer organization • User guide 	=====	=====
<u>Quantitative quality elements</u>	=====	=====
Completeness	=====	=====
<ul style="list-style-type: none"> • Omission • Commission • User guide 		
Logical consistency	=====	=====
<ul style="list-style-type: none"> • Topological consistency • Domain, Geometric, semantic consistence • User guide 		
Positional accuracy	=====	=====
<ul style="list-style-type: none"> • Absolute accuracy • Relative accuracy • Relative horizontal accuracy • Relative vertical accuracy • Raster data positional accuracy • User guide 		
Temporal accuracy	=====	=====
<ul style="list-style-type: none"> • Last updated • Temporal validity 		
Thematic accuracy	=====	=====
<ul style="list-style-type: none"> • Quantitative and qualitative Classification correctness • Accuracy of spelling • Likely misclassification, 		

13. Do you deliver your products with quality results?

PARTNERSHIPS

14. Please provide details of the most important networks/ steering committees or groups with which your organization is involved. In addition indicate the kind of involvement (whether coordination, facilitation, participation or support)

15. Estimate how many organizations regularly provide and receive data from your organization, specifying whether it is through formal agreements or informal arrangements.

	Number	Arrangement
Provide		
Receive		

16. Please state any partnerships, which are being planned in the near future.
17. How could your organization contribute most effectively to NSDI?
18. What could you expect from such a network?
19. Are more staff needed with geospatial expertise, or do existing staff need more training (or both).
20. Have you experienced changes in workforce of geospatial personnel in your organization?
21. What changes do you expect (in approach and attitude) at the following levels to enhance the use of spatial data by decision makers and the public?
- I. Your organization
 - II. Educational institutions
 - III. Private sector organizations
 - IV. Telecommunications
 - V. Government
 - VI. Non-Government groups
 - VII. Foreign aid agencies

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SYSTEMS

Indicate whether the following facilities are used in your organization and also state their number

	Yes	Type/Version	No	Number
Communications Telephone Fax Local Area Network Email accounts Internet access points Other (specify)				
Computers (speed and memory) 386 or lower Pentium I Pentium II Pentium III Pentium Iv UNIX workstation Other (specify)				
Operating system DOS Windows 3.1/3.11/95/98/2000/NT UNIX Macintosh Other (specify)				
Database Centralized Distributed Other(specify)				
Geographic Information System Software PC ARC/INFO Workstation ARC/INFO ArcView MapInfo ArcGIS ILWIS IDRISI Other (specify)				
Database Management System Access Oracle Other (specify)				
Related software Image processing CAD software Other (specify)				
Data input/output Digitizing tables Scanners Plotters Printers Other (specify)				

ANNEX 4

Frequency Tables

Data collection and compilation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	6	20.0	22.2	22.2
	Survey of Kenya	2	6.7	7.4	29.6
	Internal	11	36.7	40.7	70.4
	Project specific	7	23.3	25.9	96.3
	various	1	3.3	3.7	100.0
	Total	27	90.0	100.0	
Missing	System	3	10.0		
Total		30	100.0		

content specification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	5	16.7	20.0	20.0
	Survey of Kenya	2	6.7	8.0	28.0
	Internal	7	23.3	28.0	56.0
	Project specific	8	26.7	32.0	88.0
	International cartographic conventions	2	6.7	8.0	96.0
	GK	1	3.3	4.0	100.0
	Total	25	83.3	100.0	
Missing	System	5	16.7		
Total		30	100.0		

Geospatial data format

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	8	26.7	29.6	29.6
	Internal	3	10.0	11.1	40.7
	Project specific	3	10.0	11.1	51.9
	Depends on software	12	40.0	44.4	96.3
	International	1	3.3	3.7	100.0
	Total	27	90.0	100.0	
Missing	System	3	10.0		
Total		30	100.0		

data coding

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	7	23.3	29.2	29.2
	Internal	7	23.3	29.2	58.3
	Project specific	2	6.7	8.3	66.7
	various	1	3.3	4.2	70.8
	Depends on software	2	6.7	8.3	79.2
	National	1	3.3	4.2	83.3
	International	4	13.3	16.7	100.0
	Total	24	80.0	100.0	
Missing	System	6	20.0		
Total		30	100.0		

Data exchange

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	9	30.0	37.5	37.5
	Project specific	2	6.7	8.3	45.8
	Depends on software	12	40.0	50.0	95.8
	International	1	3.3	4.2	100.0
	Total	24	80.0	100.0	
Missing	System	6	20.0		
Total		30	100.0		

Map design

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	6	20.0	23.1	23.1
	Survey of Kenya	7	23.3	26.9	50.0
	Internal	5	16.7	19.2	69.2
	Project specific	3	10.0	11.5	80.8
	Depends on software	1	3.3	3.8	84.6
	International	3	10.0	11.5	96.2
	cartographic conventions				
	None	1	3.3	3.8	100.0
Total	26	86.7	100.0		
Missing	System	4	13.3		
Total		30	100.0		

Map symbology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	4	13.3	14.8	14.8
	Survey of Kenya	7	23.3	25.9	40.7
	Internal	4	13.3	14.8	55.6
	Project specific	1	3.3	3.7	59.3
	Depends on software	2	6.7	7.4	66.7
	International	8	26.7	29.6	96.3
	International	1	3.3	3.7	100.0
	Total	27	90.0	100.0	
Missing	System	3	10.0		
Total		30	100.0		

Spatial referencing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	6	20.0	23.1	23.1
	Internal	1	3.3	3.8	26.9
	Project specific	1	3.3	3.8	30.8
	UTM and Geographic	16	53.3	61.5	92.3
	GPS	2	6.7	7.7	100.0
	Total	26	86.7	100.0	
Missing	System	4	13.3		
Total		30	100.0		

Geospatial metadata

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	14	46.7	58.3	58.3
	Internal	6	20.0	25.0	83.3
	Project specific	1	3.3	4.2	87.5
	Depends on software	1	3.3	4.2	91.7
	FGDC	1	3.3	4.2	95.8
	ISO	1	3.3	4.2	100.0
	Total	24	80.0	100.0	
	Missing	System	6	20.0	
Total		30	100.0		

Catalogue

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	10	33.3	37.0	37.0
	Survey of Kenya	1	3.3	3.7	40.7
	Internal/Lists	13	43.3	48.1	88.9
	Depends on software	2	6.7	7.4	96.3
	FGDC	1	3.3	3.7	100.0
	Total	27	90.0	100.0	
Missing	System	3	10.0		
Total		30	100.0		

Fee schedule for products and services

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	13	43.3	61.9	61.9
	Survey of Kenya	1	3.3	4.8	66.7
	Internal	6	20.0	28.6	95.2
	Survey of Kenya	1	3.3	4.8	100.0
	Total	21	70.0	100.0	
Missing	System	9	30.0		
Total		30	100.0		

Qualification and certification of personnel

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	9	30.0	45.0	45.0
	Internal	3	10.0	15.0	60.0
	GK Sheme of work	6	20.0	30.0	90.0
	ESRI certification	1	3.3	5.0	95.0
	University of Nairobi	1	3.3	5.0	100.0
	Total	20	66.7	100.0	
Missing	System	10	33.3		
Total		30	100.0		

Quality evaluation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	8	26.7	30.8	30.8
	Survey of Kenya	1	3.3	3.8	34.6
	Internal	12	40.0	46.2	80.8
	Project specific	1	3.3	3.8	84.6
	ISO	1	3.3	3.8	88.5
	International	2	6.7	7.7	96.2
	ESRI certification	1	3.3	3.8	100.0
	Total	26	86.7	100.0	
Missing	System	4	13.3		
Total		30	100.0		

ANNEX 5

Organization	Contribution
Survey of Kenya (SOK)	Facilitate development of NSDI
Department of Physical planning	Provide framework for planning data
Department of Roads- MORPWH	Provide accurate road network information
Department of Buildings	Paper maps for government facilities which can be scanned
Ministry of water	Provide information on water resources
Department of Resource Suveys and Remote Sensing (DRSRS)	Exchange of information and giving expertise
Department of Urban Development-MLG	We have information of urban centres
Kenya Meteorological department	Provide meteorological information
Electoral Commission of Kenya (ECK)	To create a website to be able to share our data (constituency boundaries)
Kenya Soil Survey (KSS)	In standardization
National Museums of Kenya (NMK)	
Kenya Wildlife Service	Provide biodiversity conservation areas information
Kenya Power and Lighting Company (KPLC)	
Kenya Forestry Research Institute	Provide forest information
Telkom Kenya	N/A
National Housing Corporation (NHC)	
United Nations Environmental Programme	Providing central data portals and links, and facilitate data exchange

(UNEP)	
International Livestock Research Institute (ILRI)	To provide market access data
World Agroforestry Centre (ICRAF)	To data
Regional Centre for Mapping of Resources for Development	Co-ordinate NSDI for member states
Oakar services	Provide software, setting standards, metadata development and gateway/clearinghouse development
Geometer surveys	To collect and analyse data on behalf of other organizations
Highland Surveyors	Data provision
GIBB Africa ltd.	
Norken ltd	Supply ground control undertaken by us
Wellcome Trust Research Laboratories	
Ground Water survey	
Department of Surveying, UON	By participating in the planning and implementation of NSDI
Department of Geography, UON	Training and in quality control
Kenya Institute of Surveying and Mapping	Development of standards and metadata