

Fundamental Concepts of Spatial Data Infrastructure (SDI) and the Initiatives Taken by Africa Through the United Nations Economic Commission for Africa (UN-ECA) Under the Commission on Development Information (CODI) Framework

Kombo MWERO, Kenya

SUMMARY

This paper discusses the above topic and specifically elaborates on the real meaning of the term Spatial Data Infrastructure-SDI in very simple terms. The new approach I believe will further promote awareness raising and accelerate adaptation by countries world over. The paper will be another attempt to reach out and qualify the meaning of SDI to the majority who have failed to understand or have a clouded meaning of the underlying principles behind the concept. An example shall be drawn from the application of outdoor advertisement and its significance in reaching out to the masses. The principle in this model is to emphasize the central role played by the super structure as a base in playing host to different notices. The second aspect to be covered in the presentation is to demonstrate the efforts being made in the establishment of SDI in Africa through UNECA under the CODI framework. Details of the Kenya's SDI initiatives and the extent of compliance shall be discussed at great length. In this respect recognition be given to the National Mapping Organization (NMO) as strategic in the provision of the fundamental core data sets. In the same vein Governments prioritize in resource allocation by providing sufficient funds to increase capacity of the NMOs in support of the activities under the programme.

MUKHUTASARI - (Kiswahili version)

Mjadala huu ni kuhusu mtandao wa ardhi unaojumuisha takilishi mbalimbali, ukisimuliwa kwa njia rahisi inayoeleweka. Sina shaka nikisema jamii kote duniani itaweza kutafakari matumizi yake na kushiriki kwa shughulu hii muhimu.

Kwa mara nyingine mjadala huu unajaribu kufafanua misingi ya utandao wa spashali kwa walio wengi hali ikilinganisha na mifano ya kueleweka. Kwa mfano jarida hili litaweza kujadili mswada huu kwa kuifananisha na matangazo yanayo wasilishwa kwa njia ya mutandiko ulio tundiwa barabarani. Na kwa hali hii tandiko hilo huwafaa wanabiashara na hata mashirika fulani kuweza kuwasiliana na wateja ama wanashirika mbalimbali. Kwa njia nyengine mjadala utaweza kuchambua juhudi zilizochukuliwa na Africa kuimarisha misingi ya SDI wakisaidiwa sana na UN-ECA kwampango wa CODI. Africa imepiga hatua, na kufikia sasa mradi huu umesababisha pasuko la Africa kwa sehemu 5 kusudi turahisishwe shughulu hii. Kenya inashiriki kwa ghafula hii, na mjadala umetenga sehemu inayojadili mswada wake.

Kwa ujumla ni jukumu la Serikali kuhakikisha ya kwamba mtandao huu unastawishwa na udumu. Kwa hivyo ni muhimu ieleweke wazi kuwa bila mkazo wa Serikali na kuezeka rasilimali ya kutosha SDI haiwezi kufauli. Kwa ujumla ni muhimu sana Serikali iweze kuzingatia sana mradi kama huu kupewa umuhimu ufaao.

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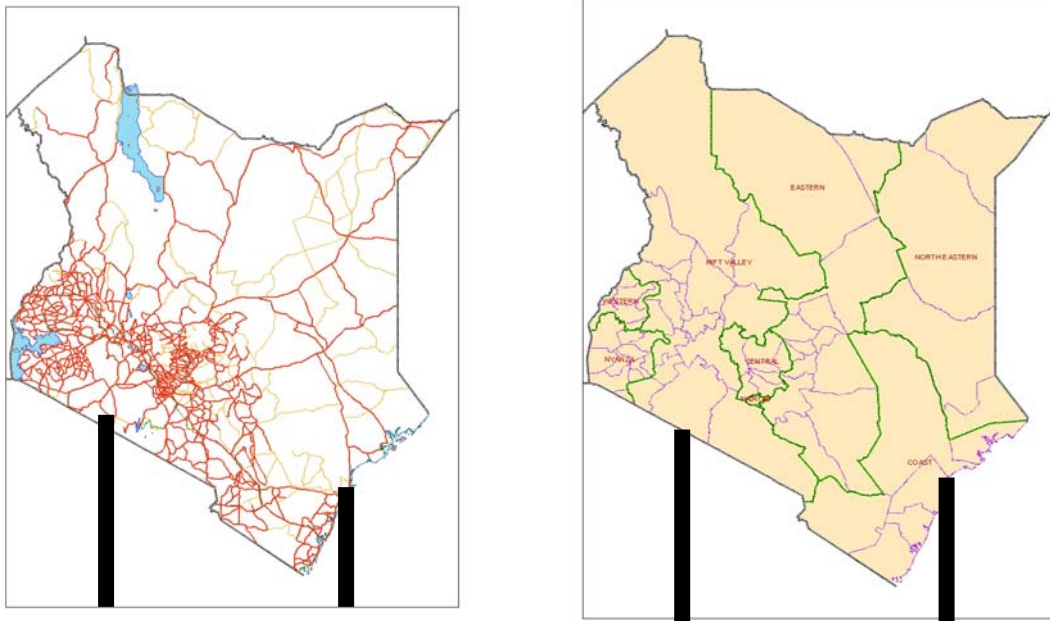
Kombo MWERO, Kenya

1. INTRODUCTION

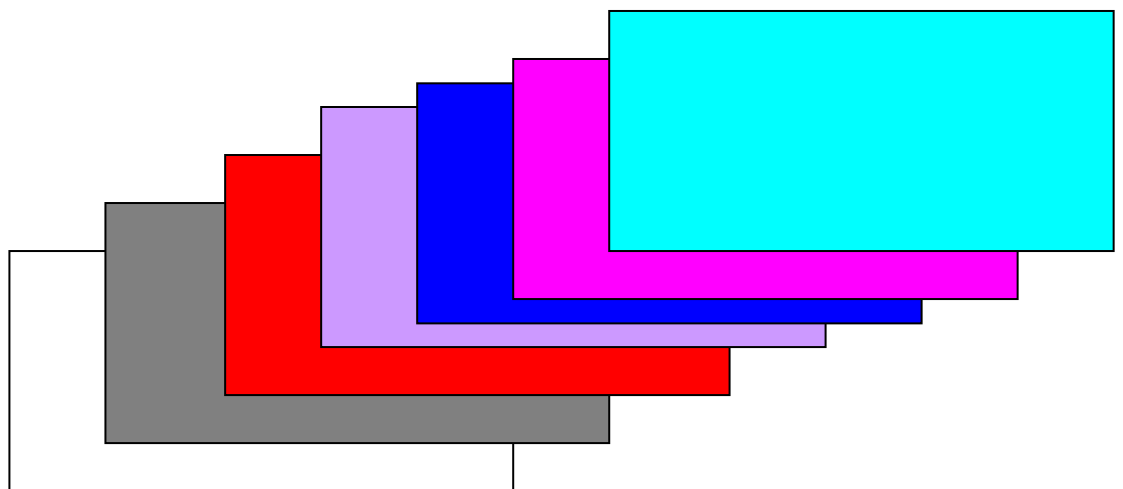
My inspiration in writing this paper is arising from the conflict of interests that are characterized by the SDI formulation in Kenya. Many organizations have invested heavily in installing GIS Equipment and are very keen to use it but find that there is no common user framework to unify and support the diverse core data sets. Most blame has been directed at the Survey of Kenya-NMO for their inability to run ahead of the rest and provide the desired leadership in core framework formulation. Running ahead of the Geoinformation society means money, money which can only flow if there is consensus by all players in recognizing the importance and concept behind the SD infrastructure. This is all that matters, because the case of SDI has never been presented in a manner that is clear to everybody. I say everybody because the SDI for all purposes affects all people in any given society. It is therefore important that Politicians and their electorate, Governors and the Governed understand the dynamics involved and the benefit of installing the SDI systems for effective resource planning, utilization/management and promotion of good governance.

My approach is to discuss the concept of SDI at its micro or basic principles. To this end I advance a simple model to demonstrate how the concept works. The model in this case is that of outdoor advertisement and its provision in giving space for multiple adverts.

Kenya is given as the structure used for the outdoor advertisement where various adverts are displayed for mass communication. In this context different themes are mounted on this structure alternately, but what is significant is the fact that the structure remains common and standard to all.



In the case of SDI however the thematic layers can be held in different digital transparent scenes or GIS models running on a background that remain common as described in the structure above. The advantage of this is that the scenes can be conveniently superimposed to generate new composite scenes revealing different and enhanced meaning. These new generic scenes are useful and facilitate decision making and promote Good Governance in resource management.



In this context the structure in the NSDI scenario is a Super structure, Notice Board, Bill Board or a Warehouse or platform upon which spatial data donors may display, advertise,

post, publish or participate in sharing the data for informed decision making. The structure being so common to several situations it is important that such be centrally held and its only logical and appropriate that the process be Government driven. An analogy of the central phenomenon is given, of the National Central Bank in regulating financial players in any given country is sufficient example to further reinforce the real meaning of the SDI as described in this paper. Take a moment and imagine what would happen if the Central Bank of your country were to be privately owned; obviously a disaster would be an understatement.

2. INITIATIVES TAKEN BY AFRICA THROUGH CODI

The point of reference for the African Initiative in establishing NSDI for purposes of this paper shall be the resolutions by the Geoinformation Subcommittee of CODI as reproduced in publication No E/ECA/DSID/EWG/CODI-Geo/03 as a record of the resolutions reached at the Conference of Ministers held in the year 2003. The complete excerpts may be accessed at www.uneca.org

2.1 What is CODI

Briefly the Committee on Development Information (CODI) is one of the seven technical Committees established by the Economic Commission for Africa (ECA) Conference of Ministers during its review of the Intergovernmental machinery of ECA at its twenty-third session in May 1997. This committee took over the functions of the joint conference of African Planners, statisticians, Population and Information specialists, and the United Nations Regional Cartographic Conference for Africa, and also ensures that implementation of the African Information Society Initiative (AISII).

The CODI group meets every two years in accordance with Resolution 826 (XXXII). CODI conducts its technical deliberations under three subcommittees, namely:

- Sub-Committee on Information and communications Technologies
- Sub-Committee on statistics
- Sub-Committee on Geo-information

The long version may be found at the UN-ECA homepage

The resolution reached by CODI recognize and underscore the relevance of introducing information, policies and technology, Public-Private-Partnerships in acceleration of overall economy, fundamental infrastructure framework as the medium in which to share and showcase information and the leading role to be played by the National Mapping Organization in steering the process.

Having reached the above conclusions, Africa through CODI mandated UNECA to co-ordinate the NSDI activities in Africa. UNECA has since been on the forefront in organizing and facilitating various activities aimed at raising awareness across the continent. In this regard strategies had to be developed to realize the intended goal. The framework that has so far been adopted is to break down the continent into 5 administrative regions so as to focus and localize the concerns. Africa is therefore split into the East, South, West, North and

TS26 – Regional SDI's and Thematic SDI's

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From Pharaohs to Geoinformatics
FIG Working week 2005 and GSDI-8
Cairo, Egypt April 16-21, 2005

Central Regions. The organs that have been established to steer the process within the regions are headed by Regional Representatives reporting to CODI. The role of the representatives in this context is to sensitize the member countries within their jurisdiction to take the challenge of establishing NSDIs. Sensitization is mainly through workshops, seminars and similar forums.

At the apex of this organization lies an Executive Working Group (EWG) of the Geoinformation Subcommittee, which in a sense is overall in coordinating this continental initiative. The EWG held its first meeting on 30-31st August 2004 to review progress of the Initiative and the response so far taken by the independent countries working under this arrangement. Through this forum it has been possible to monitor efforts being made to realize the goals set by CODI as measured through paper reports and updates such as the ones described here below:

The scope covered under this analysis is grounded on the concerns as noted by CODI through CODI.3 resolution and the specific achievement made in each respective region. The EWG upholds that:

- It is extremely important to mainstream Geoinformation into various sectors of development. In this regard a publication has been produced to provide guidelines on the integration of the NSDI and National Information Communication Infrastructure (NICI) policy initiatives.
- Public Private Partnership is a viable strategy to push forward the NSDI agenda across the continent. Applications of this strategy in other sectoral development have recorded considerable successes. The envisaged Collaboration will however be in terms of depositing spatial data with the NMO to enable update the SD framework.
- There should be some balance between the “Mapping Information” and “Information Infrastructure”
- Governments should make deliberate effort and prioritize on NSDI formulation, recognizing that the Information Infrastructure is the most important asset in promoting good governance, Planning and prudent resources management.
- The principle of a resolution implementation matrix and standards to be set forth for the assessment of countries progress in GI deployment towards the NEPAD Plan of Action, the WSSD Implementation Plan, the Millennium Development Goals.

ECA has continued to provide very generous leadership in the following:

- *Coordination in the production of "SDI-AFRICA: An Implementation Guide":*
- *Mainstreaming of GI into the other divisions of ECA:* A full Web mapping station is in operation, allowing GI services and products to be used by the other divisions. ECA is also providing room for "Country Space" on the server for metadata clearinghouse node hosting for countries interested but who do not have the facilities.

- *Other capacity building efforts:* Workshops on metadata and clearinghouse are being organized for the five sub regions in collaboration with UN Water/Africa.
- *Provision of a discussion facility as a forum for EWG members to exchange and share SDI related ideas.*

Most regions and specific countries have made progress towards NSDI development but there are many obstacles being experienced, as you will note in the case of Kenya being described here below as I reflect on the experiences encountered in Kenya.

3. GEOINFORMATION AND NSDI ACTIVITIES IN KENYA IN LINE WITH CODI RECOMMENDATIONS

NSDI initiatives in Kenya are being co-ordinated by the Survey of Kenya the NMO responsible for National Surveying & Mapping and its activities are well defined in the Survey Act (cap299) of the Laws of Kenya.

3.1 Mission

To produce, custody, maintain and distribute accurate geographical data to ensure security of land tenure and territorial integrity of the nation.

The Department through the reforms under Structural Adjustment Programmes was able to identify the following core functions:

- Establishment and Maintenance of National Spatial Data Infrastructure (NSDI)
- Production and distribution of accurate geographical data
- Preparation and maintenance of Registry Index Maps (RIM) and Preliminary Index Diagram (PID) to support land registration and controls
- Inspection and maintenance of national and international boundaries
- Quality control and assurance of geographical data produced by other organizations
- Production of Photo enlargement to support Adjudication programmes
- Mapping
- Establishment of a National Digital Topographical Data Base framework
- Depository and custodian of all Spatial data originating from diverse sources

Based on the above mandates, and in response to the CODI Agenda SOK undertook to implement the **NSDI** programmes in conformity with the aspirations agreed upon.

The establishment of NSDI is one of the most important and core responsibilities of the Survey Of Kenya. As earlier stated SOK is responsible for the production, depository, custody, maintenance and distribution of accurate spatial framework data, or fundamental core geographical datasets, that forms a basis for all other thematic data users. The expected fundamental core data sets include National Geodetic Control networks, National Digital

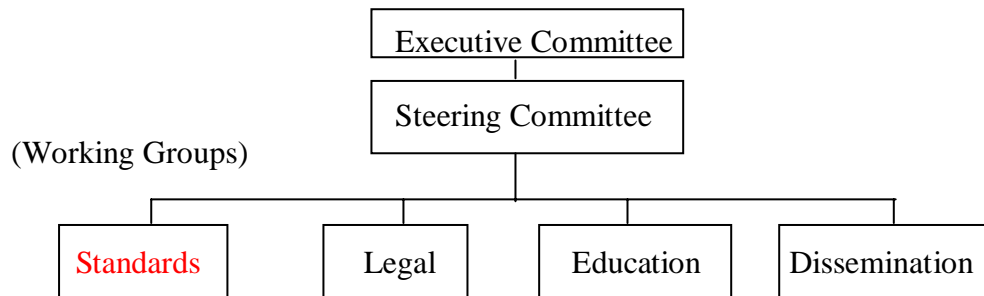
Topographic Data Bases (NDTDB) for digital mapping framework and National Cadastre Data Bases (NCDB) for registration framework.

It is now an accepted idea that the establishment of NSDI is a strategy to support the nation's socio-economic growth.

3.2 Kenyas National Spatial Data Infrastructure Initiatives

Collaborative efforts have been taken by Survey of Kenya with Japan International Cooperation Agency (JICA) to bring stakeholders together to discuss and agree on the subject matter. Several forums were held to establish structures that would push the process forward as here below:

Structure for Kenya NSDI Adopted at the Second Workshop



The country has specifically engaged in the establishment of Spatial Data framework for the City of Nairobi. The project objectives are to:

- I. Prepare topographic maps and digital spatial data framework covering priority areas of the City of Nairobi at the scale of
 - A. 1:2,500 (approx. 170km²) and
 - B. 1:5,000 (approx. 415km²).
- II. Create a Model GIS as a case study. The GIS database is to support 12 thematic layers
 - Administrative Boundaries
 - Road network
 - Property boundary
 - Water supply line
 - Sewage line
 - Manholes
 - Education facilities
 - Medical facilities
 - Social facilities
 - Vegetation cover
 - Wetlands
 - Land use

3.2.1 Global Mapping

In addition Kenya has successfully completed its Global Mapping at a small scale of 1:1m and published its 1st release in September 2002.

3.2.2 National Digital Topographic Data Bases – Large Scale

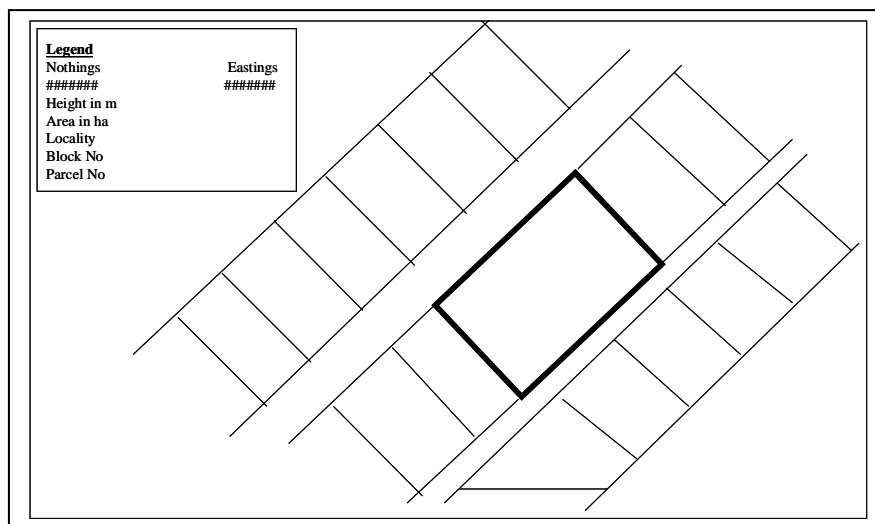
Survey of Kenya has embarked on the development of Digital Database for all the analogue maps covering various mapping scales. Digital maps being developed under the Programme include: -

- 1:1,000,000 Global Map covering the whole country,
- 1:250,000;
- 1:50,000 and
- Other larger scales.

Update of maps under this programme will basically depend on most players participating in the NSDI programme volunteering Spatial Data to SOK for capture and enriching the Digital Kenya Map (framework). To this end the Kenya Government has directed that all stakeholders deposit all form of survey data to the Director of Surveys to enable regular update SDI and revision of the line maps.

4. EXAMPLES OF SDI APPLICATION

A practical example under reference is that of title registration based on Cadastral parcel data defining the size, shape and unique geo-referenced turning points marking position of the plots on the ground. In this case the NMO generate the cadastral base data framework, which is cross-referenced with the ownership segment sourced from the Commissioner of Lands to complete the entry of the registry in support of the land title. Of significance however is the fact that the base map that defines and makes property unique is the base framework that remain constant unless or until the parcel is mutated. Other utility information such as sewer line, water system and even gas line may be overlaid onto each other on the same base framework for planning, analysis and decision making.



The analogue systems that have served Kenya over the years were generally acceptable in defining the different roles played by different Institutions. However with the advent of the GIS systems, suddenly competing interests have occasionally emerged and therefore misleading the society. GIS experts are no longer patient and are not prepared to wait for Spatial data framework updates undertaken by the NMOs, simply because the official processes are slow and lack the financial muscle to sustain regular revisions. The bottom line is that the role of the SOK remains as before even when the tools, systems and operations become computer based. This as I observe is the real challenge that most GIS operators have to comprehend and contend with as they wait for the NMO to show the way in the leadership of this process. It is at this cross road that the Private sector is supposed to supplement the capacity of the NMO by surrendering spatial data to be used in composing/compiling a comprehensive framework, uniform to all users.

5. NSDI POLICY

The Cabinet is being petitioned to authorize deposit of Spatial Data from all known stakeholders with the Director of Survey for all implemented projects/programmes. Meanwhile the Nairobi Digital Mapping project will be used to demonstrate the power of using standardized spatial data framework, show its immediate benefit for decision-making and attract further funding for development of other geospatial data sets. Capacity building and technology transfer is also a major component of the project.

6. CONSTRAINTS AND CHALLENGES FACED IN NSDI DEVELOPMENT

General ignorance of the diverse roles that need to be played by different stakeholders in implementing the NSDI resulting to wastages in the form of:

- Competition
- Duplication

7. CONCLUSION

The NSDI model described in this paper is a perfect and practical example for explaining and assigning the real meaning of NSDI. The approach taken by Africa under CODI through UNECA is quite elaborate enough to realize SDIs in the entire continent. The separation of roles sighted in the case of the Kenyas NSDI development initiative is most ideal model for effective and optimum resource utilization.

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- ECA, 2004: CODI resolutions on SDI development
- Mwero K. 2004: NSDI as a tool for secure tenure, Paper presented the Expert Working Group meeting held at UN Centre, Nairobi-Kenya.
- Mwero K. 2004: Initiatives towards SDI Development, Paper presented the Global Mapping Workshop held at RCMRD Centre, Nairobi-Kenya.

BIOGRAPHICAL NOTES

Substantive appointment and progression

1. Director of Surveys – 26 January 2005
2. Deputy Director of Surveys – 24 November 1999
3. Deputy Principal , Kenya Institute of Surveying and Mapping – 2nd June 1997

Professional accreditation

1. Licensed Land Surveyor (K) No. 156
2. Certified Land Surveyor (EA)

Professional affiliation and leadership

1. Chairman: Land Surveyors Board
2. Chairman: Standing Committee on Geographical Names
3. Alternate Chair: East African Land Surveyors Examination Board (EALSEB)
4. Member: Governing Council of the Regional Centre for Mapping of Resources for Development (RCMRD)
5. Member: International Steering Committee for Global Mapping (ISCGM)
6. Full Member : Institute of Surveyors of Kenya (ISK) –

Task forces and committee

- Chairman: Executive Working Group of the United Nations Economic Commission of Africa (UN-ECA) Committee on Development Information; CODI- GEO, Africa.
- Chairman: Kenya National Hydrographic Commission (KNHC) –
- Member: Delimitation of the Exclusive Economic zones –
- Member: Steering Committee of the NATIONAL land Policy Formulation Process

Major professional forums attended

- Global Mapping workshop- RCMRD, November 2004
- Expert working Group on Secure Land Tenure – UN, November 2004
- Land in Africa conference – Church House London – November 2004
- 5th African Association of remote Sensing for Environment – UN Centre Nairobi, October. 2004
- Executive Working Group – CODI-Geo, Addis Ababa – Ethiopia
- International Federation of Surveyors (FIG)Conference on Spatial Information – Kenya School of Monetary Studies, Nairobi 2-5 October 2001
- 5th Africa Geographical Information Systems (GIS) Forum – UNEP Centre Nairobi 5-9 November, 2001
- South Africa and Islands Hydrographic Commission – Swakopumund – Namibia, 2003
- International Hydrographic Organization (IHO) Conference – Monte Carlo – Monaco, 2002.
- International Society of Photogrammetry & Remote Sensing (ISPRS) – Vienna, Austria, 1997

Administrative and management skills development

- Achieving outstanding performance, Witwaters Rand, Johannesburg, South Africa – 2002
- Strategic planning & Leadership for Mapping and Land Information organization, Gavle-Sweden 2000
- Senior Management Seminar – KIA,

Publications

- 1989: An economic assessment of small boat fixing by sextant and short range Electronic Position Fixing EPF Systems as part fulfilment to my Post Graduate Diploma examinations in Hydrographic Surveying
- 1996: Kenya Institute of Surveying and Mapping, presented during XVIII International Society for Photogrammetry and Remote Sensing (ISPRS) Congress that took place in Vienna, Austria from 9th to 20th July 1996.
- 2004: Initiatives Towards National Spatial Data Infrastructure development, paper presented during the Global Mapping workshop held at the RCMRD Nov 2004
- 2004: Spatial Data Infrastructure as a tool for secure land Tenure, paper presented during the Expert working group workshop, held at the UNEP, Nairobi-Nov 2004.

CONTACTS

Kombo MWERO
Chair, CODI-Geo, Africa
Director of Surveys
Survey of Kenya
Ministry of lands and Housing
P.O. Box 30046
Nairobi-00100
KENYA
Tel: +254(20) 2718050
Fax: +254(20) 2717553
Email: Official sok@gt.co.ke
Private kombo-mwero@excite.com
Website: www.landpolicy.or.ke