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**A Guiding Framework for the
Development of Capacity in Geospatial
Information Management: the case of Africa**

Version 01 *

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1. Introduction

The full potential of geospatial information management (GIM) as a driver of economic growth and development can only be realized if data are available in recognizable formats to the user base, with access to public decision-makers and leaders in civil and private sectors. Efforts to build capacity in GIM must therefore adopt an integrated approach, one which meaningfully addresses issues related to data, communications, partnerships, standards, technology, and—most importantly—users (Ezigbalike, 2001). Efforts to build capacity in GIM in Africa over the past 20 years have been supply driven, and have typically reflected the mandates of mostly external actors. Local, national and regional applications of GIM have continued to expand in scope and relevance, but without a strong demand-driven agenda for building capacity in GIM, the outcomes of such efforts will continue to fall short of their true potential. In particular, efforts to develop capacity in GIM in Africa have been largely piece-meal, short-term, and context-dependent.

A handful of nations have implemented comprehensive GIM platforms, which have demonstrated the great potential for spatial data to support planning, natural resource management, transparency in government, and economic development in general. Examples include the Lake Victoria Region Water and Sanitation Initiative (LWATSAN), Kenya Open Government Data Portal, and South Africa’s National Spatial Information Framework. Despite the huge potential for catalysing progress in development, however, examples of comprehensive GIM platforms on the African continent are scarce. This is not due to lack of interest or effort, but rather is a factor of the large investment needed to launch GIM initiatives, and the substantial coordination problems that such efforts must overcome. This is why the development of capacity is necessary—to support the operative requirements of GIM initiatives. Additionally, capacity ‘building’ must break free of traditional models that focus solely on training of technical specialists, and must build institutional capacity and an enabling environment.

The paper discusses the subject of capacity development using the United Nations Development Group (UNDG) Capacity Development methodology overlaid with the Africa Union (AU)/New Partnership for Africa’s Development (NEPAD) Capacity Development Strategic Framework (CDSF)¹. It emphasises a shift from stop-gap, supply-driven measures to ‘build’ capacity, to a more comprehensive, holistic, vision-driven, long-term transformative development process that had internal energy to sustain itself over time.

2. Review of GIM capacity building efforts in Africa

Efforts to build capacities for managing geospatial information in Africa span over more than three decades. Traditionally much of the ‘capacity building’ had been by way of training of a few professionals, mainly from the Surveyor-General departments, and equipping these organisations in map-making and related activities. In the mid-1970s there was an impetus and proliferation in geo-information production and management activities in the wake of the earth resource satellite programmes. While a few of these initiatives were very successful in terms of their objectives, most of them remained project-focused and did not address long-term

¹ The Capacity Development Strategic Framework (CDSF) serves as a common reference for capacity development, ensuring continuity and synergy between regional and national level activities. It also offers both a transformative and integrative approach to CD, and attempts to address the problem of fragmentation by forging a common approach, and with needs as defined by Africans. It was been endorsed by the Africa Union Assembly of Heads of State in February 2010.

integrated development information needs. A legacy of these programmes include regional training centres (RECTAS, RCMRD, etc.) which still run training and service programmes to support member governments.

The environment movement in the '80s put considerable pressure on governments to take steps for the effective management of the environment. The shift in thinking regarding the environment and sustainable development triggered a huge demand for environmental information. The UN system, led by the United Nations Institute for Training and Research (UNITAR) and the United Nations Environment Programme (UNEP), responded to this need to expand the capacity base in 'geographic information' development and application to the management of the environment. Training programmes were established both at the global and regional levels.

While these programmes created a new cadre of personnel in the environment and natural resource management sectors, they did not generate the critical mass of capacity needed to address the challenge of the time – improving the availability of land-related information across Africa. In 1990, the World Bank proposed a broad-based multi-donor approach to addressing the challenge (Falloux, 1989), which was supported by a broad coalition of stakeholders. It led to the launch of the Program on Environment Information Systems in Sub-Saharan Africa (EIS Program), the first Africa-wide initiative to facilitate capacity building in spatial information management at a scale sufficient to have a long-lasting impact (Gavin and Gyamfi-Aidoo, 2001).

The AfricaGIS and the African Association of Remote Sensing of the Environment (AARSE) conference and exhibition series were launched as part of the knowledge exchange and learning process associated with the Program. The Program also spawned off several sub-regional initiatives aimed at strengthening capacity, including the Southern Africa Development Community (SADC) EIS Programme launched in 1993; the Regional Environmental Information Management Programme for Central Africa in 1998; and the Regional Integrated Information System of the Inter-Governmental Authority on Development in 1999.

The EIS initiative spun off many new agency- and mandate-related capacity building initiatives in the '90s. Notable among these were:

- UNEP's ***Environment and Natural Resources Information Network*** programme, which enabled "developing countries and countries with economies in transition to improve their capacity for the effective use of environmental information, and hence improve policy development"(UNEP, 1997);
- the ***AFRICOVER*** initiative launched by the Food and Agriculture Organisation (FAO) in 1994 to build capacity to establish and maintain, for the whole of Africa (at sub-national, national and regional levels), a digital geo-referenced database on land cover and a geographic referential base including: geodesy, toponomy, roads, and hydrography (FAO, 1998); and
- UNITAR's implementation of the ***Environmental Information System on the Internet*** initiative, a capacity building programme on integrated management of data and information to implement multilateral environmental instruments (ITU/UNITAR, 2004).

These were the days before the emergence and use of the term 'spatial data infrastructure' (SDI). However, by its very nature EIS was a 'native SDI'. The EIS concept had emerged from

various initiatives to promote the more efficient use of data, statistics, and other documents that enabled managers to identify and quantify specific environmental resource categories, and to determine their optimum utilization. Emphasis was placed on a *demand-driven approach* which required that the production of information had to correspond to priority needs of users at various levels. As the early pioneers worked their way around difficulties and challenges networks (or information communities) of data producers and users evolved; the need for data producers to construct a *data infrastructure* became paramount, and so was the importance of describing existing data or *metadata*; community members also learnt it was important to establish a common data architecture which would ensure that data could be used ‘off-the-shelf’ (Prévost & Gilruth, 1999). Eventually the formalised concept of national SDIs brought much needed order to a chaotic world of competing GISes; many African countries went on established National SDIs.

These initiatives did yield significant capacity outcomes. Among these were the following: A cadre of GIS/EIS professionals emerged across Africa from a wide variety of backgrounds and application areas;

- a) Existing institutions were strengthened and new institutions were created for the purpose of training and providing geospatial information services;
- b) In some countries policy frameworks to support the development, exchange, and application of geospatial data were put in place;
- c) Institutional arrangements to facilitate the production and exchange of harmonized geospatial datasets were put in place;
- d) An active, pan-African network or community of geospatial information practitioners emerged;

UNECA’s position paper on “The Future Orientation of Geoinformation Activities in Africa” (Ezigbalike, 2001) was a very important milestone. It formally marked the transition in Africa from EIS as an institutional and technical response to the need to improve the role and benefits of information in environmental management, to SDI as it is widely understood and used today. The paper provided guiding principles for advocacy and recommendations for the development of SDI as the appropriate mechanism for making reliable information easily available for policy, investment, planning, management, monitoring and evaluation purposes at the regional and sub-regional scales.

3. Capacity for what?

Current ICT tools provide a very dynamic infrastructure for managing, accessing, and using all kinds of information, including the ability of IT infrastructure to handle location-specific data in open, standard ways. Geospatial data has now become the raw resource for creating location-specific information, and the collection and use of geospatial data is no longer the exclusive preserve of GI specialists. ‘Map’ data more easily/freely available; map-enabled applications (location services) have become commonplace; and GPS and navigation tools almost taken for granted. "Looking around, the evidence of change is striking" (Sonnen, 2005).

What do these technological shifts mean for geo-information management in Africa? What kind of personnel, institutions and institutional arrangements, and systems (including infrastructure) are needed in order for Africa to make the most of these technologies in the area of geo-information? The good news is that the current environment also provides opportunities

never seen before for achieving wider and more effective use of geospatial information. Computing platforms and devices are more diverse, increasingly more powerful, while becoming more portable and cheaper. New players, partnerships, and financial models have also emerged, and there are more intuitive ways to share information and transfer knowledge.

One may wonder why, with all the investments in geospatial information ‘capacity building’ cited above, the subject of ‘capacity’ is still relevant and ever so prevalent in Africa. In the first place, capacity ‘development’ ought to be an on-going process in a constantly changing world. In the area of human resources, for instance, there will always be need for training and education to replace personnel who move on for one reason or the other. Secondly, and more importantly, capacity is not developed in a vacuum. To be of use it must be rooted in a broader development objective, for instance, in a national development strategy, a plan for economic or social empowerment, or an initiative with a particular theme such as GIM. Thus, it should be recognised that ‘capacity’ is contextual.

Effective capacity development responses should begin with fundamental questions, answers to which would shape the design of each capacity response according to the specific priorities and issues at stake. The first of these questions that should always be asked is: “capacity for what?” To what end do we need to develop this capacity? What will be its purpose? For the present discussion, it is strongly argued that on-going development of capacity is needed to meet new emerging challenges; as new technologies and new processes are developed, so is there need to re-skill people, and to re-tool organisations to adapt and deal with, or function effectively in the new circumstances. Failure to do this renders both knowledge and systems obsolete, creating a capacity gap. Kufoniyet. al (2005) point out that the lack of provision for continuing education and training for African geoinformatics lecturers make them rapidly out of date and therefore unable to sustain a dynamic curriculum, and that “many of the same few institutions are [still] running obsolete programs”

To set the context for the capacity challenge the NEPAD program provides a clear agenda appropriate for a demand-driven, pan-African geospatial information programme for which capacity needs to be developed. Africa requires ‘*transformational capacities*’ across all sectors in order to respond to its renewal, security, integration, and growth agenda. Geospatial information that is harmonised across national boundaries is fundamental for the realisation of this agenda, with a critical need to address the capacity for the production and management, dissemination and access, utilisation and application, knowledge generation, and entrepreneurship development in geospatial information. There is a great need in the capacity to innovate, to build a new professional cadre, as well as management models that are appropriate for Africa. There is also an urgent need to create a supportive environment for geospatial information activities to flourish and adapt to a rapidly changing landscape.

4. Levels of capacities

The UNECA Position Paper (2001) clearly articulates capacity building measures to address personnel and skills development for geospatial information management in Africa. It also underscores the “utility infrastructure” (reliable electricity and telecommunications) needed to be in place to support geospatial information development, management and utilisation. However, as much as these are key inputs, the changed and still evolving ICT landscape of today requires new capacities, a different kind of holistic capacity that sustains itself.

The UN Development Group approach to capacity development provides a systematic methodology that is very appropriate for analysing the multi-dimensional aspects of, and

identifying holistic interventions for addressing the capacity challenge in geospatial information management in Africa. The UNDG methodology identifies three points where capacity should be grown and nurtured: within **individuals**, in **organizations**, and in the **enabling environment**.

These three levels influence each other in a fluid way, and the strength of each depends on, and determines, the strength of the others. This approach goes beyond the traditional capacity ‘building’ through training and technical assistance. An essential ingredient (and outcome) in this approach is **transformation**, and for an activity to meet this standard it must **bring about transformation that is generated and sustained over time, and from within**. Transformation of this kind goes beyond performing tasks (UNDP, 2009).

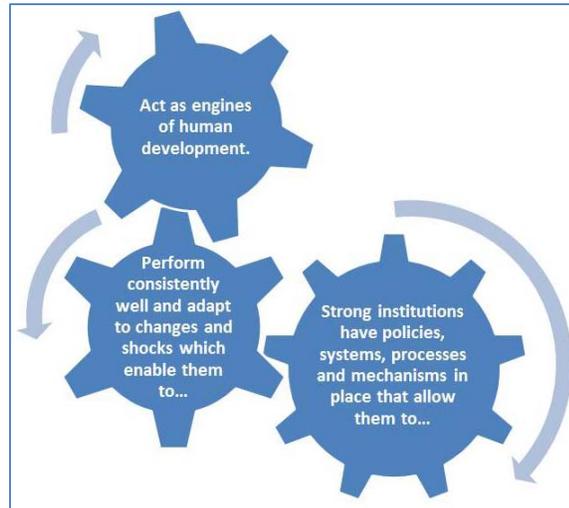
Individual level:	Skills, experience and knowledge that allow each person to perform. Some of these are acquired formally, through education and training, while others come informally, through doing and observing. Access to resources and experiences that can develop individual capacity are largely shaped by the organizational and environmental factors indicated above, which in turn are influenced by the degree of capacity development in each individual.
Organizational level:	Refers to the internal structure, policies, systems (including technology and infrastructure), processes, and procedures that determine an entity’s effectiveness. It is here that the benefits of the enabling environment are put into action and a collection of individuals come together. The better resourced and aligned these elements are, the greater the potential for growing capacity.
The enabling environment:	The broad social system within which people and organizations function. It includes all the rules, laws, policies, power relations and social norms that govern civic engagement. It is the enabling environment that sets the overall scope for capacity development.

Adapted from “Capacity Development: A UNDP Primer (UNDP, 2009)

Applying the 3-tier ‘integrated system’ and the transformation ‘lens’ to the capacity building efforts over the past decades it would appear that the area where more permanent and visible results were achieved from the investments in geospatial information management is at the **individual** level. This is not in any way to deride the achievements that was made with regard to the other two levels; after all one very important outcome was the strengthening of (a few) key institutions or the establishment of new ones. However that fact remains that not the same level of investment was made at the two other levels, and much less sustained efforts and success have been recorded particularly at the level of the **enabling environment**. Success in investments in individual capacities did not always translate into transformative policies backed by legislation, systems and processes, institutionalisation of knowledge, innovation, and entrepreneurship.

Individuals are important cogwheels in the overall system; knowledge originates from individual minds. Individual capacity-building must focus on creating and sharing knowledge, through education and training initiatives. However, there is always a risk that knowledge residing in an individual’s would become lost to the organisation when the individual is not available. Thus, brain-drain in any form is a significant obstacle to the future success of GIM. Individuals function and indeed are more effective as the backbone of institutions.

Organizational capacity development is necessary for the continuity and sustainability of the GIM knowledge base; strong and stable organizations are important in supporting applications of GIM. Therefore it is important to institutionalise knowledge (and capacity) through, for instance, the establishment and investment in centres of excellence.



When there are well developed institutions, supported by knowledge structures and clear accountability mechanisms, institutions are stronger – resilient, adaptable, efficient and high-performing. Strong institutions are the pillars of capable states. And capable states are better able to weather external shocks and bounce back faster when hit by external shocks, no matter what these shocks are.

Governments create the enabling environment for the development initiatives and application of GIM through provision of financial and political support. In Many countries in Africa aid agencies and the international community play a vital role in supporting this process. A defining characteristic of such organizations is their broad agendas and the trade-offs which they must consider in allocating support to wide variety of competing initiatives. For this reason, engagement with government agencies as well as international organizations is critical, and must be framed in ways that justify political or financial investment in GIM initiatives. Cost-benefit analyses are needed to demonstrate the value of investment in GIM. One model is the effort underway to develop an SDI in Uganda, which began by budgeting the total investment needed to establish an SDI, as well the estimated benefits (Geo-Information Communication and ESRI Canada 2010). Integrative efforts are essential, and there is great merit in integrating GIM into national ICT policy, as has been done, for instance, in Ghana. In addition, the incorporation of geospatial information as core to census and national statistics in general would be a major policy shift and driver for creating an environment for GIM activities to flourish.

5. Key levers of change

‘Capacity’ has many dimensions and variables, depending on the context. The interplay among these can be complex, and attributions and/or contributions to successful outcomes are not always linear. Therefore in seeking to address capacity challenges it is helpful to identify and clearly articulate so-called “core issues” which addressed would have the greatest impact on capacity development outcomes at the different levels described above.

From empirical evidence and first-hand experience UNDP (2009) identifies four core issues that seem to have the greatest influence on capacity development; it is in these four domains that the bulk of the change in capacity happens. An attempt is made to relate some core (non-exhaustive) issues in geospatial information capacity to these in the matrix below:

Core Issue	Description	Geospatial information Issues
Institutional arrangements	The policies, practices, and systems that allow for effective functioning of an organization or group. These may include ‘hard’ rules such as laws or the	<ul style="list-style-type: none"> ▪ ICT policy frameworks & legislation ▪ Data producers, custodians& brokers ▪ Stakeholder engagement mechanisms

Core Issue	Description	Geospatial information Issues
	terms of a contract, or ‘soft’ rules like codes of conduct or generally accepted values [and norms].	<ul style="list-style-type: none"> ▪ Data standards, protocols and norms ▪ Data and information access/exchange policies, mechanisms, and procedures ▪ Institutional strengthening/reforms ▪ Resourcing (skill sets, financial) ▪ Human resource management ▪ Infrastructure to support the discovery, access and applications of geospatial information
Leadership	The ability to influence, inspire and motivate others to achieve or even go beyond their goals. It is also the ability to anticipate and respond to change. Leadership is <u>not necessarily synonymous with a position of authority</u> ; it can also be informal and be held at many levels; it also exists within the enabling environment and at the organizational level.	<p><u>Visionary leadership</u> that creates an imperative and space for various actors to engage, innovate, and chart a clear course for the development and application of geospatial information in new ways. Examples:</p> <ul style="list-style-type: none"> ▪ The leadership and authority for the establishment of the US Federal Geographic Data Committee in 1990 ▪ Leadership demonstrated by Google in democratizing geospatial information
Knowledge	Knowledge, or ‘literally’ what people know, underpins their capacities and hence capacity development. Seen from the perspective of the three levels of capacity (identified above), knowledge has traditionally been fostered at the individual level, mostly through education. But it can also be created and shared within an organization, such as through on-the-job training or even outside a formal organizational setting through general life experience, and supported through an enabling environment of effective educational systems and policies.	<p>Knowledge <u>systems</u> that provide for:</p> <ul style="list-style-type: none"> ▪ Maintaining relevance of(policy-oriented)content, and for generation and production ▪ Mechanisms and facilities for the capture, utilization, and exchange of knowledge, as well as incentives for innovation in geospatial information technologies and services ▪ Mechanisms for the access, acquisition, and transfer of knowledge (including appropriate institutional <u>frameworks and capacities</u> for geospatial information training, education, and research) ▪ Geospatial information products and services (e.g., metadata, spatial data directories, atlases, on-line cadastral-based services, community resource centres) ▪ Geospatial information management toolkits ▪ <u>Planning & decision support tools</u>
Accountability	Accountability exists when rights holders are able to make duty bearers deliver on their obligations. From a capacity development perspective, the focus is on the interface between a service provider and its clients or service providers and oversight bodies. More specifically, it is about the willingness and abilities of [service-oriented]institutions to <u>put in place systems and mechanisms to engage [user] groups, capture and utilize their feedback</u> , as well as the capacities of the latter to make use of such platforms. Accountability is important because it allows organizations and systems to monitor, learn, self-regulate and adjust their behaviour in interaction with those to whom they are accountable. It provides legitimacy to decision-making, increases transparency and responsiveness, and helps reduce the influence of vested interests.	<ul style="list-style-type: none"> ▪ More dynamic, less structured, and service-oriented relationship between data users and data suppliers ▪ Direct engagement between industry actors and user communities that include civil society ▪ Stakeholder engagement mechanisms (including capturing and utilization of ▪ Open engagement with engagement with non-traditional users, civil society ▪ Demand-driven products and services ▪ Interactive stakeholder feedback to make geospatial information more demand-driven and service-oriented ▪ Collective learning and creation of demand-side capacity through awareness creation and user-oriented products and services (through collaborative computing – wikis, social networks, etc.)

Adapted from “Capacity Development: A UNDP Primer”, (UNDP, 2009).

The three levels of capacity and the core issues taken together breaks from the piece-meal, supply driven capacity building measures founded on training and technical assistance. They provide a comprehensive, robust, and holistic framework to guide the assessment of capacities and formulation of interventions to deal with capacity development in a manner that is self-sustaining over time. The model implies that geospatial information capacity cannot, and

should not, be isolated from the environment (broader social context) within which geospatial information is applied. For instance, experience to date has amply shown that, even with perhaps thousands of trained personnel in geospatial information management in Africa today, the development and/or growth of geospatial information technology has been severely curtailed by the lack of capacities in other areas of the political economy of countries – electricity and telecommunication infrastructure being the most frequently cited.

The model also embraces more stakeholders, from political leadership, to state institutions, and non-state actors (civil society and private sector) alike. It therefore creates space for effective partnerships through which the assets of the partners can be leveraged effective collective capacity, and additional gaps identified and dealt with. Partners bring intellectual capital, expertise, content, material and technical assets, as well as financial resources for mutual benefits.

6. Capacity for Whom?

The collection, processing, management, analysis, usage, and distribution of geospatial information involve several actors operating at various levels. GIM must therefore be addressed through the development of SDI which, by definition, requires buy-in from a diverse group of stakeholders. These stakeholders include GIM experts/technicians, users of geoinformation, and policy-makers/decision-makers in public agencies, private corporations and civil society organizations (Molenaar 2002). Capacity development must shift its focus from training of technical specialists, to engaging with the full spectrum of the stakeholder network.

Each of the various actors needs to be ‘capacitated’ to varying degrees. Typically, however, the process of ‘building capacity’ under project conditions is selective, and emphasis has tended to be placed on technicians (specialists), managers. Sometimes reference is made to policy- or decision-makers, however often very little investment is made in ‘building’ the capacity of this category of actors. In order for geospatial information activities to truly take off there has to be a concerted effort to target kingpins in the political economy in Africa; otherwise Africa will continue to lag behind and not fully benefit from the full potential of geospatial information and related technologies.

In the context of Africa’s transformation agenda it is instructive to look to the AU/NEPAD Capacity Development Strategic Framework (CDSF) for guidance with respect to the questions:

- Whose capacities need to be developed? Which groups or individuals need to be empowered?
- What kinds of capacities need to be developed by these groups or individuals to achieve the broader development objectives?

The CDSF is founded on six cornerstones which inherently identify broad groups of actors to be involved in all capacity development activities:

Cornerstone	Description	Suggested GI CD Target
Leadership Transformation	Leaders at political and technical levels committed to collective transformation and performance while fostering the growth and development of African human potential.	Senior sector policy makers Legislature (Parliamentary Committees) Industry leaders
Citizen	Well-informed and empowered citizenry to	Professional associations, e.g., Institutes

Cornerstone	Description	Suggested GI CD Target
Transformation	foster and claim accountability for quality services, while taking full ownership of the development agenda and processes alongside state and non-state actors.	of Surveyors, Engineers, Architects, etc.; Trade Associations (Chambers of Commerce, Mines, etc.) Providers of location-based services
Evidence-Based knowledge and Innovation	Knowledge-based and innovation-driven processes that enhance evidence-focused decision making and encourage increased investment in knowledge, and science and technology, including scientific institutions.	Academics Technicians and earth scientists Researchers
Utilizing African potentials, skills and resources	Mobilizing African financial and human resources for development and transformation – nationally, continentally and globally	Experts in thematic application areas Management and professional staff ICT sector professionals
Capacity of Capacity Developers	Adaptive capacity development institutions driving a progressive agenda for capacity development and producing an entrepreneurial client-oriented product.	Technical support staff
Integrated Planning and Implementation for Results	Integrated and coordinated approaches for planning and implementation of development programmes/projects within and across levels aligned to key sustainability principles, to promote development results.	Planners Policy-makers Mid-level development managers Technical support staff

All these target groups need an appreciation, understanding, and knowledge that is specific to their line of work. It is therefore important that space for engagement is created to allow them identify their specific interests, opportunities, and incentives for investing in the development of their own capacities. Governments and current the currently established leadership in geospatial information activities have a responsibility to bring this about; once opportunities and incentives are identified it most likely that the interest groups will put in place appropriate mechanisms to sustain their interest, including developing their own self-serving strategies.

A multi-stakeholder approach helps to overcome the coordination problems, creates momentum on a broad front rather than a in piecemeal fashion, and ensures harmonised processes including interoperability of data and systems. In this regard, capacity development in GIM can benefit from the experience of ICT capacity builders, who have seen success in overcoming issues related to the coordination, including legal and privacy restrictions on sharing information; organizational barriers between agencies that operate as separate silos; incomplete grasp of what services exist, which are needed and how they will be governed; legal and management constraints on cross-agency service agreements; resistance to perceived loss of control over information and processes; absence of business managers to steer the development of interoperability; resistance to perceived loss of intellectual property; resistance to perceived loss of business opportunities; fear of fierce competition; and security considerations (Kaplan 2005).

7. Elements of GIM Capacity Development

It is emphasised that the use of the term ‘capacity development’ in this paper is deliberate, and in this context the term is not synonymous and interchangeable with capacity ‘building’ which “commonly refers to a process that supports only the initial stages of building or creating capacities and alludes to an assumption that there are no existing capacities to start from.” (UNDP, 2008). The development of capacity that becomes **institutionalised** and brings about improvements in performance, stability and adaptable institutions and institutional frameworks requires a fundamental shift from a supply-driven stop-gap paradigm to a demand driven, transformative process that is founded on the following:

- a) Facilitates multi-stake-holder engagement;
- b) Facilitates access to knowledge;
- c) Promotes participatory policy dialogue and advocacy;
- d) Reflects and integrates with the broader development context; and
- e) Creates space for learning by doing.

Capacity development, in contrast with project-oriented capacity building often implemented through technical assistance, is therefore not a one-off activity, but an on-going process of transformation and enhancement of abilities. Several definitions of ‘capacity’ and ‘capacity development’ exist; this paper adopts definitions used for the development of the Tanzanian Capacity Profile (Daima Associates, 2009):

“Capacity is defined as the ability of people, communities, organisations, and societies to perform functions, solve problems and set and achieve targets within an institutional setting or enabling environment. In more concrete terms is the ability of an entity to do the following:

- a) Scan and analyse its environment;
- b) Identify complex problems, issues, needs and opportunities;
- c) Formulate strategic and operational strategies to deal with these problems, issues, needs and to seize opportunities;
- d) Design plans and programmes of action;
- e) Develop effective communication and information-sharing in society
- f) Assemble and effectively and sustainably use resources to implement, monitor and evaluate the plans and use the feedback to learn lessons acquired through the process.

“Capacity development is [therefore] essentially a process of enhancing the institutional, human and organizational abilities to perform core functions, solve problems and seize opportunities, organize communication and information sharing, define and achieve objectives in a sustainable manner. The implication of this broad definition is that one may need to distinguish between capacity development for organizations, for institutions and for state building to the extent that these different levels may require different approaches involving different actors. It is important to realize that capacity development is not an end in itself; it is a means to achieve objectives and goals set by society at its respective levels (groups, communities, sectors or whole societies).”

In the context of geospatial information management the foregoing implies substantial investments in: a) establishment and maintenance of the full range of SDI-related elements, and b) meaningful engagement with a diverse group of stakeholders to ensure a broad user group and access to people and organizations that can implement policies and initiatives. There should be a holistic strategy to address the following key elements²:

- **Data** availability and accessibility (including mechanisms for discovery) in the form(s) that users require;

²Based on Feeney, M-E.F., Williamson, I. P., & Bishop, I. D. (2002). The role of institutional mechanisms in spatial data infrastructure development that supports decision-making. *Cartography*, 31(2), 21-37 (<http://repository.unimelb.edu.au/10187/1455>)

- Establishment or strengthening and maintenance of **GIM service centres** to provide support and expert advisory services;
- **Skills** to collect, build appropriate datasets, manage, and interpret data, including building the capacity of consumers to make appropriate use of analytical tools and data sets;
- **Technology**, including hardware and software systems and processes for storing, accessing, analysing, transforming, and sharing/exchanging information, supported by the appropriate infrastructure in the context of current as well as evolving computing environment;
- **User-oriented products, tools and services** to facilitate the flow of information between custodians and users of data, to assist the interpretation of data according to user requirements, and to support decision-making in the national development context;
- **Credibility**, including protocols for security, intellectual property and management of documentation of knowledge and supporting processes; GIM service centres should have credibility in their business practices, with protocols for marketing, distribution of funds (with appropriate return of royalties and licensing fees), etc.

The strategy should have a clear financing plan, with defined roles for the various stakeholders and mechanisms to deal with the obstacles and difficulties imposed by the need to foster cooperation among stakeholders. In addition to engagement with a broader group of stakeholders that have been involved in previous capacity building initiatives, strategies must explicitly seek to build partnerships with individuals and organizations from fields that have not formally been aligned with GIM in the past. This might include census agencies and custodians of national statistics data. Other partners may include representatives of the open source community who have developed comprehensive datasets in many regions, sophisticated infrastructure platforms for disseminating data, and extensive networks for engaging researchers and policy-makers.

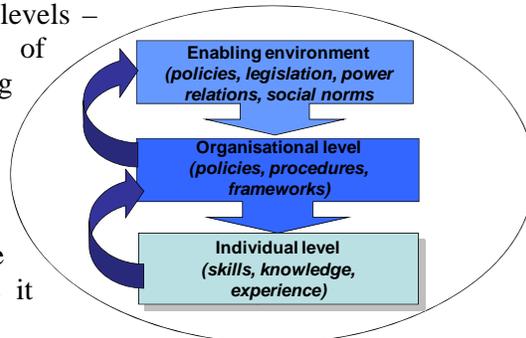
The ICT community is a particularly attractive partner for practitioners of GIM capacity development. ICT initiatives have been well integrated into public, private, and civil society organizations, and have quickly gained the institutional support necessary for long-term support and development (Kufoniyi, 2010). ICT initiatives would benefit significantly through greater integration with GIM and SDI, and vice versa.

A capacity development strategy for GIM activities should have a strong partnership component. The private sector has been the primary driver in the uptake and near-ubiquity of geospatial information applications as we know them today, and national strategies should build Public-Private Partnership in order to benefit from the expertise and resources from such partnerships. Partnerships should be driven by the goal of improving the availability and accessibility to high quality geo-information.

Incentives for being a partner should be clearly articulated, including a common vision which creates or adds value to/for partners should commit to support the development and use geo-information for development. With the right incentives and opportunities private-sector partners would be encouraged to support and facilitate capacity development, including **demand-side capacity**, through more awareness creation, learning by doing, coaching, formal training and education, sharing best practices and lessons learned.

Partners should commit to facilitating access, working at local, national, regional, and global levels to reduce the barriers that constrain the flow of geo-information. They should work to strengthen networking among experts, policymakers, civil society and the public, and strengthen linkages between local, national, regional and global institutions, systems and efforts.

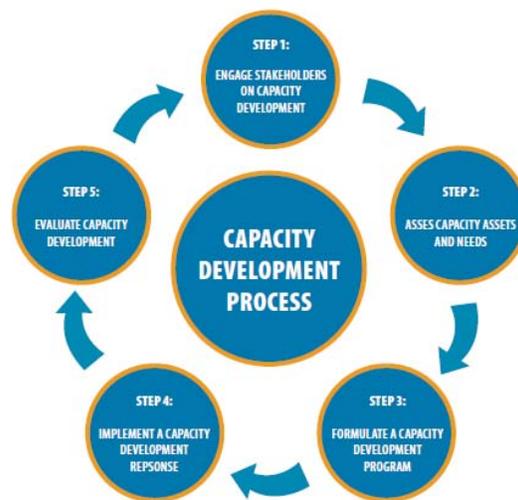
As indicated above capacity exists at different levels – within individuals, as well as at the level of organizations and within the enabling environment; these form an integrated system. Attention must be paid to this inter-relatedness, implying that any strategy and intervention to assess or develop capacity necessarily for geospatial information activities needs to take into account capacity at each level; otherwise it becomes skewed or ineffective (UNDP, 2008).



8. Capacity Development Process

Transformative capacity development keeps the focus on development results and institutions, fosters broad national ownership, and ensures alignment with national development priorities, strategies, processes and systems. It addresses **technical** and **functional** capacities; defines stakeholders and beneficiaries; and includes response and support strategies for investments in long-term education and learning, strengthened public systems, mechanisms for engagement and accountability between citizen and state, and necessary institutional reforms that ensure responsive public and private sectors that manage and deliver services to those who need them most.

It is instructive to start the capacity development process with a clear understanding of the context, challenges, existing capacity assets as well as opportunities, and gaps. In this context **technical capacities** refer to subject-matter knowledge, such as geodesy, surveying, remote sensing, etc.; these are ‘skills’ required to provide necessary information, techniques and approaches for problem analysis, and identifying and implementing solutions. **Functional capacities**, on the other hand, may be considered as the essential catalytic and management skills that allow for planning, implementing and monitoring and evaluating initiatives for growth. The latter is at the heart of transformation and drives the process.



An assessment of capacity is therefore an essential first step in the capacity development process. In previous capacity building efforts the focus of assessments tended to be on (data) user needs; the capacity of the data provider, usually a government agency, was defined and limited to training and equipment. In the more comprehensive approach being proposed a broad range of issues have to be determined and an analysis of desired capacities compared with existing capacities need to be undertaken. A **capacity assessment** therefore offers a systematic way to collect information and knowledge regarding assets and gaps in capacity.

The information and knowledge generated would then be used to formulate capacity development responses that will allow the strengthening of capacities in areas that are necessary or the optimisation of use of existing capacities

Ideally, it would be useful to undertake a capacity assessment before any investment is made. However since the approach to capacity development assumes that some capacity exists already assessments can be undertaken at any point in the development cycle; it is not always necessary to start afresh with a comprehensive assessment. Indeed it is best to identify an “entry point” based on what exists already, using that to identify and understand issues related to capacities at the three levels: individual, organisational, and enabling environment.

No matter where the process starts, however, the identification of, and effective engagement with, stakeholders are key steps. The assessment process should itself offer a platform for dialogue with stakeholders. Given the variety of ways in which people use geospatial information today it is important that ‘stakeholders’ should be defined as widely as practically possible, particularly including the youth and women groups. A good assessment should also assist in validating priority areas for action; defining a point of departure for the formulation of strategies and responses; and enhancing understanding of operational issues for implementation of interventions that would be proposed.

User-driven approaches will better identify needs and related capacity issues. Not only will user-driven approaches increase the likelihood that initiatives will be successful through wider engagement with end-users, but will also provide a critical feedback mechanism that will help GIM leaders identify the most productive uses of geospatial information (ranging from which data to disseminate to the structures of SDI).

Interventions must also focus on strengthening linkages between education and training organizations on the one hand, and research and implementing organizations. This will not only counter brain drain, but will also increase the immediate impact of human capacity building on the realization of development objectives, as well engender innovation.

Regional network organizations, such as EIS-Africa and the African Association of Remote Sensing of the Environment, have played, and are still playing, key roles capacity development in geospatial information, by facilitating the transfer of knowledge, resources among individuals and among organizations. In turn, to further increase the effectiveness of these efforts, a comprehensive capacity development strategy must not neglect network organizations, but rather integrate and complement the effort of such organizations.

9. Change and Change Readiness

Introducing information systems often requires, and causes changes. Societies that have understood developed or and adapted policies, legislation, systems, and business processes to this reality have, and continue to, benefit from challenges and opportunities from ICT. The domain of ICT is constantly changing, and the ICT movement has become highly adaptive and capable of responding and contributing to advances in technology in ways that create wealth and improve decision-making.

Geospatial technologies have also advanced rapidly and have become fully integrated and institutionalized throughout the principal sectors of many countries through geospatial information management and SDI. While African countries have fully embraced ICT, the case cannot be made for geospatial technologies. Rather, instances of geospatial information

development have been piecemeal, ad hoc, and largely uncoordinated with a few important exceptions (e.g., NEPAD, the Kenya Open Government Data Portal, among others). The experience in North America and numerous European countries demonstrates the potential for geospatial information and SDI to drive economic development.

Capacity development itself also entails change — a change from one state to another that is more desirable, and should therefore be managed as such. In order for Africa to benefit fully from the opportunities provided by geospatial information it is necessary develop and/or strengthen capacities to embrace **change, innovation, and adaptation** in the realm of the constantly changing ICT environment. ICT is a logical partner for geospatial information, and greater integration of both types of initiatives would prove mutually beneficial.

However this requires a fundamental rethinking of capacity development. It requires capacity development that is much more than supporting training programmes and the use of national expertise. Training will provide skills, and there are many examples of highly trained skilled individuals who are unable to function at their full potential because the organisational and enabling environments are not ‘conductive’ to productivity.

Thus it is the combination of the skilled personnel with an enduring and credible vision, a comprehension of the application context, existence of appropriate infrastructure, availability of IT technology and adherence to IT policies and procedures, open-minded and positive attitudes in using the related technology, that gives information and knowledge its strategic importance, brings about innovation and adaptation, without which capacity is transient and unsustainable.

In addition “business processes” need to be changed. For the present discussion this implies that ‘location’ and geospatial information should become part of the way individuals, groups, and the entire society is structured and work; this is already happening, driven by ‘external’ interests and forces, including the private sector. Without appropriate national ICT policies that create space for responsive procedures and associated processes to be designed and implemented to facilitate, encourage and even force such changes in behaviour, potential benefits to economies from geospatial information would remain a pipe dream.

This implies that the whole society needs to be capacitated in order to bring about change. This requires that the capacity development strategy for geospatial information should not only address technician and policy makers, but people across and at all levels of society – thought leaders, knowledge workers, as well as all categories of implementers (doers) alike. A broad base of stakeholders should be exposed to and be part of the capacity development process which creates space, infrastructure, engaging process and capacity for change to become an information society that is spatially enabled.

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