Review of International Geographical Education Online © RIGEO
Vol. 2, No. 1, Spring 2012

Distance Education and Spatial Citizenship in Africa– Challenges and Prospects

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Abstract

The relevance of GIS for sustainable development in Africa is undisputed. One web 2.0 application which plays a particularly strong role within local governance structures in Africa is PGIS (Participatory Geographical Information System). In fact, Spatial Citizenship education is the basis for the empowerment of the indigenous capacity for using PGIS. This article will introduce the concept of Citizenship and address the question: What are the conditions in Africa that enhance Spatial Citizenship through distance education? Consequently, the relationship between ICT, distance education, e-government, geographic information technologies, and PGIS in Africa is of central interest. These interrelationships have been studied within the context of a meta-analysis of already published data and qualified studies of these topics. One of the results of this investigation is that there is no lack of distance education materials for GIS and PGIS; even so, all are being developed for the post-secondary education sector and not for primary and secondary education. In addition, online-based distance learning is not accessible for all African citizens due to a lack of skills, technical equipment, and financial means. As a solution for this problem, m-learning approaches need to be advanced.

Keywords: GIS, spatial citizenship, distance education, e-government, ICT

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Introduction

In 1960, the Malinesian writer Amadou Hampâté Bâ coined the saying: "In Africa, when an old man dies, it's a library burning," when he spoke in front to the UNESCO. This quote draws the attention to the oral culture of Africa, yet, it also points to the general importance of communication (media) for societies. Social structures of a society are mainly determined by the communication media used (McLuhan, 1964). The integration of new media has far-ranging consequences for the society itself since any new communication media functions as a socializing moment. Today, African societies face massive changes in communication and media which have a strong influence on economic, social and political structures of the society. The phenomenally rapid spread of the information and communication technology (ICT) has been one of the most remarkable developments in the last decades in Africa. In large parts of Africa, in which not even telephones have existed a few years ago, mobile communication, primarily via mobile phones, is nowadays taken for granted.

The mobile phone penetration was 41 percent in 2010 and is growing rapidly: "Africa is the fastest growing cellular market in the world. It represents around 10 per cent of the total cellular connections worldwide" (OECD, 2009, p. 94). The internet penetration lies over 11 percent in Africa and is growing almost equally fast. The ICT Development Index (IDI), a composite index made up of three sub-indices (access, use, skills) including a total of 11 indicators, is relatively small for Africa compared to the rest of the world: "Africa is still at an early stage of ICT development and the IDI values for all countries in the region in 2008 were relatively low" (ITU, 2010, p. 25). Nevertheless, despite the small IDI, many different innovative applications were generated in Africa over the last few years, e.g. e-banking, e-commerce, e-government, and e-education. E- and m-banking, namely financial transactions via transmission of units on mobile phones are today more familiar for Africans than for Europeans and have led to a revolution on payment and credit transactions in regions which not even had a bank before. This shows that ICTs are not only used by small elite but have a large distribution within the majority of the population. Generally, ICT plays a catalytic role for developing countries; this may also be attributed to the fact that ICTs are a part of the Millennium Development Goals and at the same time are needed to achieve other goals (www.un.org/millenniumgoals).

A new application from the world of the internet, which influences societies in developing countries, is web 2.0. Easy to use, open-source-internet-based

applications and services, which are known as "social media", e.g. wiki, weblog, podcasts, social networks or virtual worlds, make it possible for people to easily produce, share, and publish almost any kind of information. This information can be gathered and/or used collectively. On the one hand, information can be generated and used by public, administrative, governmental and educational institutions, in the form of e-government and e-learning, or, on the other hand, published by private persons, for example, to point out grievances, as was the case with the bloggers in the Arab Spring in 2011. The important aspects of web 2.0 are the possibilities of participation as well as drawing on collective intelligence (O'Reilly, 2005). In light of this, web 2.0 has a special value within developing countries with regard to the development of a democratic civil society and for the improvement of learning processes in Distance Education. Numerous applications have gained a strong foothold in Africa, such as the political weblog usage and the strongly interactive, thematically diverse information online services within the areas of education and political participation (www.web2fordev.net and www.ict4dev.org).

One web 2.0 application that plays a particularly strong role within local governance structures is PGIS (Participatory Geographical Information System). The relevance of GIS for sustainable development in Africa is undisputed. The National Research Council declared in a report on this topic in 2002:

"The report draws on experiences in African countries and examines how future sources and applications of geographic data could provide reliable support to decision-makers as they work toward sustainable development. The committee emphasizes the potential of new technologies, such as satellite remote-sensing systems and geographic information systems (GIS), that have revolutionized data collection and analysis over the last decade" (NRC, 2002, p. 1).

Within the last few years, the technical development of GIS has been linked to the web 2.0, so that nowadays multiple realities and diverse forms of information are being offered as well as a map-based online discussion. Moreover, it is now possible to transfer one's own spatial ideas into online-based maps. These applications support, among other things, social learning and enable the public to participate in different socio-economical contexts and sectors for the needs of spatial planning processes. The practical usage of PGIS means that the user must master the technology. Taylor (2004) observes: "In particular, the development of indigenous capacity is the key. African development is about people, and technology is a means to an end, not an end in itself. People cannot be 'developed': they can only develop themselves" (Taylor, 2004, p. 522). Thus, an essential component for the empowerment of the indigenous capacity for using PGIS is spatial citizenship education. A spatial citizen is a citizen who is able to reflect critically on medial

spatial representations such as maps, GIS, and GPS; he/she can also communicate with others via spatial presentations in order to participate in decision-making about spatial planning.

This paper addresses the convergence of ICT, geoinformation, and education. When new technologies and old challenges converge they will generate many new opportunities. We consider a relevant question that influences the discussion about the public, spatial, and political participation of citizens within African countries: What are the conditions that enhance Spatial Citizenship through distance education in Africa? To answer this focal question, which has not been discussed within the community of geographical education, we will first introduce the approach of Spatial Citizenship. We will then analyze the ITC situation in Africa, which is closely connected to the issue of Spatial Citizenship; other relevant factors will also be addressed: distance education, e-government, and geoinformation technologies. Following this discussion, we will present an overview of the current trends and a review of the current situation in Africa. How these interrelated factors determine the relationship between Spatial Citizenship and distance learning will be at the center of the synthesis and discussion chapter, followed by a conclusion. We are aware that our perspective is a generalized viewpoint of Africa and the conditions present. We will not show a best practice example from the grass roots, but adopt a continental frame of reference in order to explore and analyze as many tendencies and conditions as possible. Hence, we want to offer a first insight into the discussion on Spatial Citizenship and distance learning in Africa.

Spatial Citizenship

Due to the revolution in information technology, the pace and capacity for geoinformation being generated, processed, and globally communicated has grown tremendously (Sui & Morrill 2004). While using GIS has been the exclusive domain of experts until a few years ago, the development of web-based digital globes and GPS has made Al Gore's (1998) dream of a "Digital Earth" now come true. Digital globes and GPS have gained a secure place in our everyday lives during the last ten years. Butler (2006, p. 777) describes GIS as "the ultimate, original, multidisciplinary language"; a language which, when connecting web 2.0 applications to GIS, enables even non-experts and laymen to design interactive maps carrying many different forms of spatial information such as pictures, texts, or statistics. This development implies that the division between the consumers of maps and the producers of maps has been transcended. Currently, one even speaks of prosumers of maps, those who produce and consume maps at the same time.

However, we are not only confronted with GIS in our everyday lives. During the last years, GIS has started to be used as a new form of political participation in spatial planning processes within the framework of PGIS. Using PGIS supports and fosters the e-government strategies of municipalities. The intellectual basis for using geoinformation and geoinformation systems is the discipline of geography because of its domain specific reference to spatial structures and processes on different levels of measurements (comp. Dobson 2004, Golledge 2002). In order not to regard geoinformation systems as "black boxes", but to use the new opportunities of GIS to the fullest, the necessary skills must be taught and trained and an extended concept of GIS education must be advanced.

Within the debate about the skills that a GIS user must have, three core competencies have come to the fore: apart from spatial thinking and technical competence, the generic competencies of problem solving and critical thinking play an important role (Schulze et al., 2011). One concept of GIS education that pays attention to these central competencies is the spatial citizenship approach. Citizenship Education in geography is mainly understood as a democratic vision of global citizenship education (GCE) which means that: "Future citizens should find themselves at home when moving between the different levels of geographical and cultural reality: as local, European or even world citizens" (Sarno, 2011, p. 73). In particular, it is geographical education that fosters an acceptation of the values and beliefs of other people and an understanding of the rights and responsibilities of all citizens of the world. The ability of critical spatial thinking in relation to geomedia applications is the educational focus of the spatial citizenship approach. On a theoretical level the spatial citizenship approach is based on three principles which are interrelated:

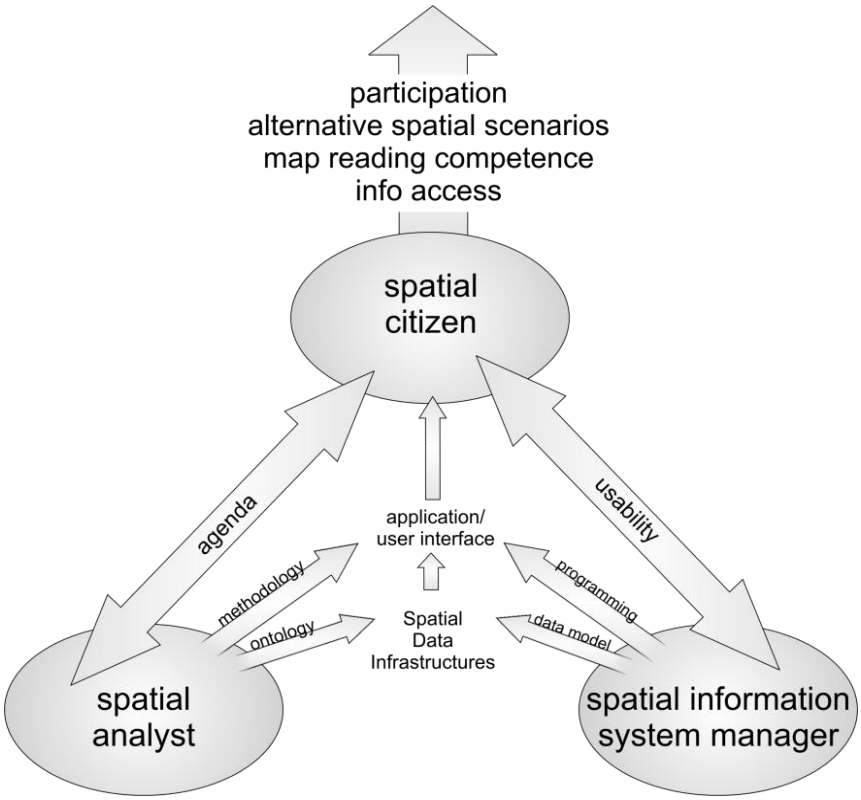
• "the social appropriation of space as basis for the participation in society,

• a critical perspective on spatial information and representations as discussed in the critical cartography / critical GI Science debate, and

• various conceptions of citizenship education" (Gryl and Jekel, 2011, p. 4).

Gryl and Jekel (2011) distinguish between three different levels of application (Figure 1), which need to be addressed at different times within geographical education. The educational time for the training to become a Spatial Analyst and Spatial Information Systems Manager is mainly reserved for postsecondary education and only basic forms of the skills, and knowledge can be taught separately in upper secondary education, since these competencies are needed professionally and not in everyday life. In contrast, the main target for primary and secondary education is the empowerment of the spatial citizen:

"Spatial Citizen is a role that each and every citizen should accept. In order to fully participate in society a spatial citizen should be able to access, read, interpret and critically reflect on spatial information, communicate with the aid of maps and



other spatial representations, and can express location-specific opinions using geomedia. We may consider spatial communication ability as an integral part of spatial citizenship and therefore a main target for primary and secondary education" (Gryl and Jekel, 2011, p. 5).

Figure 1. *Spheres of activities / roles regarding GI (Gryl and Jekel, 2011, p. 6).*

The spatial citizen should be able to participate in a geomedia society. Therefore, he or she needs technical/methodical competences to handle spatial representations, the competence to actively communicate with and participate in spatial

representations, and the competence to reflect, appraise and evaluate the use of spatial representations (Gryl and Jekel, 2011). Since the use of digital geomedia, like digital maps, digital globes, GPS and GIS, is a basic cultural technique, geographical education at school, in university, and in research contexts must strongly support the empowerment of spatial citizens.

ICT, distance education, e-government, and geographic information technologies (GIT) in Africa

In this chapter we will give a short overview about the main developments in the area of ICT, distance education, e-government and PGIS in Africa. Although we won't be able to discuss each individual aspect in detail, we will still present the dominating trends of each aspect's development and tie the individual aspects together in the concluding discussion.

ICT in Africa

A fist insight into the development and dispersal of ICT dissemination in Africa gives the ICT Development Index (IDI), annually published by the International Telecommunication Union. The ICT Development Index (IDI) is a composite index made up of three sub-indices (access, use, skills) which include 11 indicators altogether. Within the worldwide IDI ranking, only three African countries have accomplished to be in the top 100 list. These are the Seychelles (IDI rank 66), Mauritius (IDI rank 72) and South Africa (IDI rank 92). The regional disparities become particularly obvious when comparing the IDI of the Seychelles, 3.64, to the one of the Chad, 0.79. In contrast, Sweden which leads the ranking has an IDI of 7.85. Generally, most of the African countries have an IDI which is less than 1.50 and only appear in the lower ranks when compared globally. However, the IDI value has risen in all African countries in comparison to the last years; the increase again shows regional disparities. For example, between 2007 and 2008 the increase in Cape Verde was 0.34 and in Cameroon only 0.03. Looking at the sub-indices, the greatest increase occurred in the access sub-index whereas the changes in use sub-index can be ignored, which is mainly due to the slow progress within the development of broadband. Indeed, broadband penetration is low and the broadband prices are compared to Europe very high. Nevertheless, there is a rise in the access sub-index due to the increasing access to mobile services and applications, for example, m-banking and mobile phones (ITU, 2010).

The IDI figures show that in comparison to North and South America, Europe, Asia and other states of the CIS (Commonwealth of Independent States) Africa is still in an early stage of ICT development with great regional disparities. As to be expected, the richest countries with a high GNP are at the top of the IDI list. On a national level regional disparities also exist because the necessary infrastructural

services are more easily realized in some regions than others as, e.g., urban zones versus rural areas, flat areas versus mountainous ones and economically rich regions versus economically poor regions or war zones. Cheneau-Loquay (2007) points out that "the main question in Africa with respect to the 'digital divide' is not so much one of inequality of access and use with regards to ICTs, but rather a matter of knowing whether use of this new technology has improved the living conditions of the poorest (Cheneau-Loquay, 2007, p. 68). In fact, it is a long way until the living conditions of most Africans improve at the micro level by using ICT in Africa. On the level of (public) society there is a digital divide between affluent and marginalized groups of the population, between young and old, and between men and women. Nevertheless, ICT applications which are nowadays used by many parts of the population in Africa, such as m-banking, e-health or e-agriculture, lead to some improvements of the living conditions. An important aspect in reducing the digital divide is the price policy The ITU (2010) calculates a so-called ICT Price Basket and concludes: "None of the countries with an ICT Price Basket value of more than ten has IDI values above three. This suggests that prices become a relevant factor for ICT uptake only when they fall below a certain threshold, making ICT services affordable to a significant part of the population" (ITU, 2010, p. 61).

For the development of the ICT sector in Africa there are three levels to be considered. These are:

• Connectivity, which means a stable energy supply for the development of the infrastructure for telecommunication.

• Capacity, which means the development of the human resources for which reading- and writing skills (in English) and a basic understanding for technology are the minimum standards.

• Content, which means the development of appropriate ITC solutions with regards to the indigenous language and culture of communication.

Although Africa is still at an early stage of the ICT development, there is a noticeable optimistic atmosphere with regards to ICT. Pan-African institutions as well as national governments have developed ICT action plans within the last years, which include plans for an improved information technology education from primary school to higher education and the founding of export-oriented ICT service centers. In addition, the market for ICT booms in Africa, despite all unfavorable conditions and the recent global finical crisis.

Distance education in Africa

In the following, distance education is understood as "a field of education that focuses on teaching methods and technology with the aim of delivering teaching (…) to students who are not physically present in a traditional educational setting such as a classroom" (www.wikipedia.org), whereby the focus of this paper is the electronic ICTs.

According to the low development in the ITC sector, the diffusion of distance education is very low in Africa, because distance education is a technological intensive concept. In addition, there are great disparities across the continent and within individual African countries. In Africa, e-learning is a luxury good, of which mainly/predominately the rich, the upper middle class and the urban elite profits. The problem of the uneven/unequal access to computers and the internet is a crucial point in the developing of e-learning in Africa. Nevertheless, there are numerous efforts (great efforts) in Africa in order to extend the distance education sector by means of ICT. Nearly every country has ICT education policies in place or under implementation. Pityana points out: "The focus of distance education in Africa in recent years has shifted remarkably from mere assertion of desirability or seeking to make the case for distance education. A growing number of African states are in the process of establishing their own distance education institutions" (Pityana, 2009, p. 10). In fact, within post-secondary education distance education is not a dream of the future as the existence of many e-learning initiatives and activities shows: For example, e.g., the African Virtual University, established in 1995 (http://www.avu.org), the University of South Africa (UNISA), the largest provider of Open and Distance Learning (ODL) on the continent (the annual eLearning Africa conference, which drew 1778 participants, mainly from Africa and from 78 different countries, in 2011 (www.elearning-africa.com). On the level of primary and secondary education there are also combined efforts to implement ICT education. The New Partnership for Africa's Development (NEPAD), a program of the African Union (AU), launched 2003 during the initiative NEPAD e-schools. The project focuses on providing end-to-end ICT solutions across Africa. Its goal is to provide 50 percent of all secondary schools with internet access by 2015; private sector companies and non-governmental organizations sponsor the project. Besides this initiative, there is an overwhelming multitude of further initiatives that promote distance education and e-learning in Africa. Farrell and Shafika (2007) give an excellent overview of these programs and activities in Africa.

Despite these endeavors, all these programs face a number of problems and challenges, which Braimoh and Osiki (2008) summarize as follows:

• "unstable power supply

• economic drive to amass own wealth by some distance education institutions

• commercializing education at the expense of quality offered

• high cost and weak socio-economic viability of learners who may be reluctant to invest in technological facilities for knowledge acquisition purposes

• technological illiteracy among learners, even if they have access to modern technology for learning purposes

• ruralization of geographical typography of the learners, where they are bereft of the paraphernalia of modern life that restricts their access to modern facilities.

• fraud, bribery and corruption among some lecturers and site tutors

• quantity of qualified tutors sacrificed at the expense of quality programme facilitators

• infiltration of cultural dilution and value disorientation by neo-imperialism of foreign institutions

• problems with proper counseling and mentoring for learners, and

• inadequate learner support provision" (Braimoh and Osiki, 2008, p. 58)

Against the background of these current problems and the digital divide present in the educational sector, Gulati (2008) concludes that even in cases of existing, albeit limited, IT infrastructure, it is easier and more effective to use more traditional media such as radio, print media or TV for distance learning since the learners can be reached more easily via these media channels. Thus, Gulati (2008) recommends not abandon e-learning projects completely, but advocates the development of holistic strategies, which could/will help to provide access to education for as many people as possible. In summary it can be said that many distance education programs within higher education and teacher training are being offered in Africa at the moment. At large, these developments indicate that using modern ICT within the educational sector, based on demand and progressive development, serves as a principal element in realizing the vision of sustainable development in Africa.

E-Government in Africa

In the last decades, many great efforts have been made worldwide to make citizens participate more intensively in government activities through the framework of e-government. Particularly the internet and web. 2.0 applications provide a vehicle for promoting e-government and public participation. Similarly to e-learning in relation

to distance education, which allows teacher and learner to communicate with each other more efficiently over distance and facilitates to bring education to students (or students to education), e-government aims at making interactions inside governments, between different governments, and between government and citizens or business or other institutions more transparent and efficient. In terms of Africa, there is the hope that e-government can serve as an entrance and inducement for a reform of states and their administrative apparatuses. In this respect, the internet may be a means to create new forms of engagement in order to make governmental administrations, public and state activities and leadership more participatory. This means that e-government in Africa offers new possibilities for improved governance, which essentially means good governance. The basic tenets of "Good Governance" are effectiveness, responsiveness, democracy and transparency. The link between e-government and "Good Governance" is illustrated by this quotation: "E-government can help build trust between governments and citizens. Building trust between governments and citizens is fundamental to good governance" (OECD 2003). According to the World Bank and the United Nations, only societies in which there is "Good Governance" can achieve positive developmental accomplishments in the sense of welfare advancement; hence, the noticeable importance of e-government for the economical cooperation between Africa and the developed countries and their institutions. To put it differently, if there are no efforts to implement e-government, respectively "Good Governance", there will be no financial aid.

An overview about the development and dispersal of e-government in Africa is provided by the "E-Government Survey 2010", published by the United Nations (2011). The E-Government Development Index (EGDI) is a comprehensive evaluation of online and mobile technology within the execution of government functions. The maximum value is one and the minimum zero. "Mathematically, the EDGI is a weighted average of three normalized scores on the most important dimensions of e-government, namely: scope and quality of online services, telecommunication connectivity, and human capacity" (United Nations, 2011, p. 109). Given the relevance of infrastructure and education for the ranking, it comes as no surprise that the Republic of Korea is at the top of the list with a score of 0,8785, followed by the United States (0.8510), Canada (0.8448), the United Kingdom (0.8147), and the Netherlands with (0.8097); only four African countries are in the Top 100. These are Tunisia (0.4826 / rank 66), Mauritius (0.4645 / rank 77), Egypt (0.4518 / rank 86) and South Africa (0.4306 / rank 97). On the worldwide level Europe (0.6227) and the Americas (0.4790) are above the world average (0.4406). Asia (0.4424) and Oceania (0.4193) are close to the world average and Africa (0.2733) is far below the world average. The survey also points out again that inside

Africa are also disparities. Northern Africa leads the ranking with an average of the development index value of 0.3692, followed by Southern Africa (0.3505), Eastern Africa (0.2782) and Middle Africa (0.2603). Western Africa (0.2156) is far behind the other sub-regions.

As mentioned before, web 2.0 and social networking tools have the inherent possibilities to empowered citizens so that they become more active in expressing their views of government policies. In light of this the e-government development index is complemented by an e-participation index, which consist of three factors for citizen engagement: electronic information dissemination, electronic consultation and electronic participation in decision-making. The e-participation index shows the same disparities like the e-government development index. On the worldwide level Europe (0.3236) at the top is followed by Asia (0.2396), and the Americas (0.1982). Africa is far behind the others with a value of 0.0845. The Americas (0.4790) above the world average (0.4406); Asia (0.4424) and Oceania (0.4193) close to the world average and Africa (0.2733) far below the world average. However, in comparison to the 2008 survey there are visible improvements in Africa, especially in Middle, Northern and Western Africa, and there are likewise many practice examples for different e-government solutions, such as those practiced in Cape Verde, Ethiopia and Kenya. There are great political and intuitional efforts to strengthen e-government in Africa even further, especially with an eye on the economical cooperation with the World Bank and the United Nations.

The factors limiting the implementation of e-government are: low literacy and schooling rates, gender inequalities, infrastructure limitations and the status of democratic governance. Not surprisingly, the key challenges are the improvement of the general literacy rate, the development of telecommunication infrastructure, and the commitment of governments to genuine transformation towards a more transparent and citizen-centered governance (Schuppan 2009). Taking these main factors into consideration, Kitaw (2006) remarks: "There are also several 'non-connectivity' and 'non political' barriers to accessibility and delivery of e-government services including cultural background, language and level of technology experience" (Kitaw, 2006, p. 14). Nevertheless, e-government has undoubtedly great potential and there are numerous opportunities to promote democracy and political participation in Africa; yet, "despite the progress made in citizen participation and e-governance, there is a long way to go in enabling all citizens to participate in decision-making" (The Panos Institute West Africa & The United Nations Development Programme, n.d., p. 69). In order to offer e-government participation programs specifically to the most vulnerable and most

marginalized groups, additional concepts must be introduced: First, one has to exactly identify the target groups and to find out about their special needs. Furthermore, it may then be beneficial to provide community centers for e-government, respectively to extend already existing community centers and their e-government programs. Additionally, the implementation of e-government has proven to be more successful when the local administration has been taken into account and preferably incorporated in the programs.

Geographic Information Technologies and Participation in Africa

The value of geographic information technologies (GIT) for sustainable development in Africa is undisputed. The need for complex information, like information on demographics, infrastructure, rainfall, soil types, biodiversity, vegetation, rainfall, settlements etc., with a location attribute is necessary to work successfully in sustainable development areas such as food security, water supply, resource management, education planning etc. Within the last years, great efforts were made to implement GIT in Africa. One of the first studies which illustrated the importance of GIT for Africa was "Down to Earth: The Geographic Foundations of Sustainable Development in Africa" (NRC 2002). The study lists the barriers to the use of geographic information: technical limitations of accessibility to data, administrative challenges of accessibility to data, a lack of financial means to tools and data, educational and organizational limitations of access to data and ineffective transfer of technology to the local level at which many decisions are being made that have an impact on sustainable development (NRC, 2002,). Recognizing the significance of Spatial Data Infrastructure (SDI) for integrated economic and development planning, the United Nations Economic Commission for Africa (2007) published a study about the "Determination of Fundamental Datasets for Africa" and stated: "This study is only the starting point on the long journey to have Africa comprehensively mapped" (United Nations Economic Commission for Africa, 2007, p. 44).

As a matter of fact the utilization and the application of geographic information technologies are still at an early stage in Africa; a situation that is recognized by institutions such as the Economic Commission for Africa (ECA) of the UN that published a press release titled "The Global Geospatial Initiative comes to Africa" on August 4th 2011.

Nevertheless, within the context of geographic information technologies many activities have been and are happening right now in Africa. For example, the Geographic Information for Sustainable Development (GISD) initiative is an international collaboration whose goal is to apply some GIS-linked technologies that can solve development problems in different African regions

(http://www.opengeospatial.org/gisd). Another initiative is EIS-Africa, a non-profit pan-African organization of geo-information practitioners and institutions for the co-operative management of environmental information in Africa. EIS-Africa organizes the annual "Africa GIS-Conference", the leading platform for geoinformation science, technologies and applications in Africa (The ongoing work and activities also take place in the Global Spatial Data Infrastructure Association (GSDI), which publishes an "SDI-Africa implementation guide" in a wiki environment, providing the necessary information to implement a geographic information infrastructure (www.geoinfo.uneca.org/sdiafrica). Besides the institutional level, the scientific and the private sector play an active, important and growing role in the GIT field in Africa. A good overview on the many regional projects initiated and conducted within the academic sector, is provided by the publication "Geoinformation for Development" from Zeil and Kienberger (2007) and the homepage from the Faculty of Geo-Information Science and Earth Observation (ITC) of the University of Twente (www.itc.nl). One examples for initiatives carried out by the private sector are the Google Earth Outreach initiative in Africa, which was launched with the objective of enabling citizens and organizations to organize their spatial data and to build their own maps in 2010.

The numerous initiatives within GIT in Africa do not only center on the professional side of the development and management of geographical information systems and spatial data analysis as tool for decision-making for sustainable development. In addition, due to the growing GIT movement in Africa, more and more GIT becomes utilized on a local level; hoping to foster and promote the participation of indigenous people in the field of spatial decisions making. Since the rise of web 2.0 applications and the simpler usability of geographic information systems, local participation practices are being operated with GIS applications in the context of Participatory GIS (PGIS) respectively. Public Participation GIS (PPGIS). The idea behind these concepts is that the indigenous people can tell their stories through geographical visualization in a conflict-based democratic situation. In other words: "Producing, geo-referencing and visualizing indigenous spatial knowledge (ISK) helps communities engage in peer-to-peer dialogue and promotes their particular issues and concerns vis-à-vis higher level authorities and economic forces" (Rambaldi et al., 2006, p. 2). The difference between GIS and PP GIS is clarified by Steinman et al (2005):

Table 1.
Difference between GIS and PP GIS, (Steinmann et al., 2005, p. 27)

GIS	**Dimension**	**PP GIS**
Technology	Focus	People and technology
Facilitate official policy making	Goal	Empower Communities
Rigid, hierarchical an bureaucratic	Organizational structure	Flexible and open
Specified by technologists and GIS experts	Details	Specified by users, focus groups
Led by independent specialists	Applications	Led by facilitators, group leaders
General, multipurpose application	Function	Specific, project-level activities
Top-down	Approach	Bottom up

The crucial point of PP GIS is interactivity. In this sense PP GIS is an important part of e-government activities that make the interactions between governments and citizens more transparent and efficient. This means that the internet is a possible way to deliver spatial information in both directions (government to citizen and citizen to government), to facilitate map-based discussions and to create one's own maps for the decision-making process on a local level. The GIT participatory tools available for citizens are simple GIS applications like Scribble Maps, which is a tool that makes it easy to draw on maps according to one's own interests and to share them with others. Individual regions can be distinguished by color or one's own lines and polygons can be added. Furthermore, spatial information about specific locations on the map can be uploaded; similar applications are possible with Google Earth. Other technologies which have become cheaper and more affordable in the last years include different mobile devices, such as smart phones with a Global Positioning System (GPS), used, e.g., for the demarcation of areas which are disputed.

Nevertheless, PGIS, respectively PPGIS, are approaches/concepts which are still at an early stage in their development, even in the developed countries, which are far better technically equipped and have far more established understanding of democracy than African countries. However, there are many examples for combined efforts in Africa to implement PGIS within the societies, the governments and their policies. ERMIS Africa is the biggest stakeholder in this field and operates in five countries. Its goal is "to share knowledge, ideas, experiences, skills and strategies on PGIS and community mapping among development practitioners and local resource

dependent communities" (www.ermisafrica.org). Another project is the PGIS initiatives run by the Technical Centre for Agricultural and Rural Cooperation (CTA) which is financed by the EU and an institution of the ACP Group of states (Africa, Caribbean and Pacific). The CTA developed a "Training Kit on Participatory Spatial Information Management and Communication" whose modules cover the entire spectrum of good developmental practice focuses on the development sector. The training kit is available online since 2010 (http://pgis-tk-en.cta.int).

Apart from these institutional initiatives there has been a growing number of practical experiences with PGIS in Africa, e.g. in Cameroon and South Africa. All authors of empirical studies assert that there is great potential for using PGIS in order to visualize local spatial knowledge and, consequently, to involve the citizens in spatial decisions on a local level (Rambaldi et al., 2006, Weiner & Harris, 2003 and Minang & McCall, 2006).

Synthesis and discussion

In this section we will present the analysis and results of the discussions of the individual sections of this article and offer a synthesis of the different findings. Keeping the starting question in mind, what are the conditions in Africa that enhance Spatial Citizenship through distance education, the investigation centers around the relationship between ITC, distance education, e-government, GIT, and PGIS. The results of this investigation clearly demonstrate that there are essential disparities among African countries in each sector analyzed. On the one hand, this entails a certain risk of generalization since these differences among countries lead to regard the continent as a homogenous bloc for reasons of simplicity. On the other hand, the continental perspective is an appropriate approach for the assessment of the African holistic geoinformation vision. This point of view is certainly important in order to estimate how the Spatial Citizenship development will continue and which difficulties will arise and will have to be overcome eventually.

From a destructive position one could easily call the discourse on the relation between Spatial Citizenship and distance education in Africa into question because, because 40 percent of the adult population is illiterate, the IDI-index and the e-government development index is the lowest in the world, the implementation of GIT is in most countries still at an early stage - even on the governmental level - and the culture of democracy is not fully embraced. Does that mean that all Spatial Citizenship initiatives in connection with distance education are bound to fail? Is Spatial Citizenship Education in general a luxury that the continent cannot really

afford?

This is certainly not the case when considering the youth of this continent. The literacy rate of the ages 15 – 24 is over 70 percent in Sub Saharan Africa. Mobile phone penetration is about 40 percent and is still a fast growing market which in turn has revolutionized the banking sector. Nowadays, m-banking has made it (theoretically) possible for every African to transfer money and use the mobile phone in order to retrieve data on prices for market goods. More and more innovations in this sector will be launched; innovations which one can't even imagine right now. Similarly, web 2.0 applications will expand and be used intensively by many young Africans as could already be seen during the so-called Arab Spring of 2011. Even now web 2.0 applications and the mobile phone contribute extensively to a growth in civil and political participation, as the example of the Arab Spring shows. It is to be expected that in the area of spatial data infrastructures (SDIs) innovations within the particular local political participation with PGIS will occur because simple web-GIS applications can be quickly combined with GPS and integrated in mobile phones. In this respect, the empowerment of the indigenous people with the help of Spatial Citizenship is a capital contribution to good governance. The NRC (2002) declares: "Good governance creates a climate in which geospatial capacity can grow and vice versa. Geographic information illuminates social and political problems, such as the uneven distribution of the benefits of economic development, lack of accountability of elected officials, and a burden of disease that impacts societal cohesion" (NRC, 2002, p. 4). In other words, good governance needs responsible and committed spatial citizens. The educational objective of Spatial Citizenship is to empower citizens. The educational approach of Spatial Citizenship refers predominately to the local areas of action, in which the conditions for participation are more motivating and favorable since the citizens are inherently more involved and the local realm is manageable in terms of conflicting interests and possible problems. However, "the real danger about GIS data is that people may come to believe that everything they see is true" (Stevens, 2007, p. 206), a danger that makes capacity building on a local level especially important. Clarke (2011) proposes that geo-spatial information and technology must be usable by everyone and that the skill particularly required is map literacy.

Which possibilities do we have to enhance a critical and reflexive map literacy, which is an important goal of Spatial Citizenship, among the indigenous people through distance education? Generally, distance education in combination with e-learning and traditional ways of communication is an appropriate solution in Africa since it offers the chance to provide access to education in remote rural areas and to supply educational material for a population that is continuously growing as well as to increase the quality of education. Nearly every country has an ICT education policy and there are much cooperation with developing agencies and universities

from developed countries. Today, there are a number of concrete e-learning modules for e-government (e.g. www.uneca.org/elearnafrica), geoinformation (e.g. www.rectas.org) and PGIS (e.g. http://pgis.cta.int). With respect to geoinformation there exists a great affinity between distance education and the learning and teaching with and about GIS. Modern GIS education seems to be a life-long learning development and distance education is an important learning opportunity and tool for life-long learning. There are many GIS e-learning courses all over the world available (see www.ppgis.net); overall is there a tendency in GIS education for internationalization and online learning (Wright et al., 2009). The analyses of the different sectors have shown that within distance education provides mainly modules for the post-secondary education (e.g. university, teacher training, development workers and professional training). This means, on the one hand, that there are no offers for primary and secondary education and, on the other hand, that African citizens, who are not ready for distance education because they don't have access to the technical equipment or can't afford the travelling cost of the many blended learning arrangements, do not benefit from distance education developments in Africa. Indeed, distance education that promotes Spatial Citizenship seems not to be available for anyone, at least not for young pupils and poor citizens. However, on the content level there are many distance education offers which could be used for primary and secondary education and for capacity building of the poor/underprivileged. Most of this material is not only suitable for technical GIS training, but it teaches and supports critical and reflexive map literacy. For example, the "Training Kit on Participatory Spatial Information Management and Communication" from the CTA offers many modules whose contents could be made suitable for Spatial Citizenship education for the above mentioned target groups without much effort.

Getting the content and the data is just half the story. Using the content and the data is the other half of the story. As has become clear in the sectional analysis, the greatest problem is the insufficient infrastructure for ICT in Africa such as stable electricity supply, internet access, data provision and pc supply. Given that the number of mobile phone user rises continuously in rural areas, attempts should be made to use m-learning via mobile phones for distance education and to combine those with print media and radio. This way target groups in primary and secondary education as well as citizens on the grassroots level could be reached, who would otherwise be without infrastructure for internet access or too illiterate to work with other technical equipment. Brown (2005) who is working on m-learning projects in Africa describes some important premises for m-learning in Africa:

• "M-learning is a supportive mode of education and not a primary mode of

education.
• M-learning provides flexibilities for various learning- and life-styles.
• The most appropriate mobile device for learners in Africa is a mobile phone.
• Possibilities and latest developments in mobile technologies must be tested against practicality, usability and cost-effectiveness.
• The use of multimedia on mobile phones must be tested against the envisaged leaning outcomes.
• The major focus of m-learning should be more on communication and interaction than on Content" (Brown, 2005, S. 311).

One practical example for a methodological-didactic approach for m-learning within Spatial Citizenship could be that learners within a storytelling setting are provided with access to maps and GPS data. In addition, they could listen to an accompanying radio program and answer questions via text messaging or receive additional information via the mobile phone. Another interesting approach is the development of games or quizzes for mobile phones. A simple quiz or simulation game that requires the learners to reflect, appraise and evaluate the use of spatial information could train the competency for Spatial Citizenship. At the same time, distance education approaches should not mislead us: in most cases the primary setting for the Spatial Citizenship education is still the classroom. All these approaches can support or substitute face-to-face education. There is no question about high-tech or high-teach. Both must go hand in hand and both cannot be had without money. In fact, money seems to be the greatest challenge in Africa.

The above-mentioned approaches are only a few possible strategies to enhance Spatial Citizenship through distance education. Map literacy must be taught in school. Therefore, the school curricula have to be analyzed to find out the educational deficiencies. After that it is possible to decide which aspects could be supported successfully by distance education. Against this background and the missing empirical studies on the supply, utilization and spread of Spatial Citizenship initiatives and projects, the next step must be an analysis of the situation on the regional and national level in order to study and present good practice examples. The proposed answers given in this article are only of a provisional character.

Conclusion

Technology is not a solution for problems per se, yet, the access and capability to use ICT is a prerequisite for following and understanding the development of our world today. But it is a serious mistake to assume that the development is a globally uniform process. Developments are essentially based on the regional emergent properties, a claim that Castell (1996) made in his study "The rise of the network society". Based on this argument, an answer to our initial question, what are the conditions in Africa that enhance Spatial Citizenship through distance education, can

be attempted. The conditions that enhance Spatial Citizenship are determined by the interrelated factors discussed: namely, ICT, distance education, e-government, GIT, and PGIS.

One of the results is that in each sector holds important disparities among African countries. Despite these differences, there is the tendency to develop and realize a vision for an African holistic geoinformation education, which is strongly promoted by many Pan-African organizations. A further result is that taking stock has shown that there are many distance education materials for GIS and PGIS available. However, most of these are directed exclusively to the post-secondary education sector and not made for the primary and secondary education. African citizens who are not capable to use online-based distance education for various reasons can't benefit from the developments in online distance learning. This disadvantage can only be remedied when mobile learning approaches will be strengthened and employed on a larger scale since m-learning tools, e.g. mobile phones, are more readily accessible to more people in Africa.

This paper offers a contribution to a further understanding of the convergence - with all its positive and negative consequences - of distance education and Spatial Citizenship in Africa. Investigations into good practice examples for distance education for Spatial Citizenship purposes on the local or the national level are needed now.

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