Information Communication Technology and Sustainable Communities in Africa: The Case of the Niger Delta Region of Nigeria. (Feb. 2009)

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Abstract— Sustainable development is largely seen as pertaining primarily to environmental issues and grassroots social development. This stereotype misses the reality that sustainable development and the information society are operationally interconnected. The two phases of the World Summit on the Information Society (WSIS) in Geneva (December 2003) and Tunis (November 2005) provide an excellent opportunity to integrate sustainable development principles and practices into the institutions and policy frameworks that are shaping the information society. While the World Summit on Sustainable Development (WSSD) and WSIS Phase I brought these issues to international attention, Southern voices and visions are still notably lacking from the debate

As we move into the age of information it is critically important for us to consider the implications of ICT in Sustainable Development and vice-versa. This research undertaking looks at precisely this intersection with its primary focus on sustainable communities. Sustainable Communities development is an evolving discourse. The locally-owned or adapted knowledge of a community is essential for integrated sustainable development, and is becoming a key priority for development practitioners. The popularity of the concept of communities is growing, and so are ideas on how to support these communities with technologies and how these communities might use ICTs to support themselves. These issues are pertinent in assessing the real contribution of ICTs to sustainable development, and therefore merit a closer examination. The paper presents the findings from the study of 9 communities in the Niger Delta region of Nigeria. The aim of the study was to explore how ICTs may contribute to the social sustainability of communities in the Niger Delta Region of Nigeria. The study grounds the understanding of ICT usage among indigenous communities and consumers in the reality of their everyday lives, in order to promote actions for sustainability.

Index Terms— Communicative Ecology, Information Communication Technology, Social Change, Sustainable Communities

I. INTRODUCTION

During the last decades four themes have emerged as a response to the collective concerns of world citizens: peace, freedom, development and environment. As a consequence this collective concern and the four themes were manifested in a political process towards sustainability labeled "sustainable development". The concept of sustainability lacks a widely accepted definition. Sustainable development is a wide concept and has over the years been introduced through many different definitions. The term "sustainable development" was popularized by the World Commission on Environment and Development (WCED), in its 1987 report entitled, "Our Common future". This report by the Brundtland commission (named after it's chair Dr. Gro Harlem Brundtland) provided the most commonly cited definition of sustainable development. The Commission wrote: "Humanity has the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generation to meet their own needs". This definition has broad appeal and little specificity, but some combination of development and environment is found in most attempts to describe it. Since the publication of the report, there has been a mass of literature generated in various fields which has resulted in more specific application of the concept, such as sustainable agriculture, sustainable livelihoods, and sustainable transport. Over the years, the interest and scope of the sustainable development debate has grown substantially and this has led to an increasing diversity of interpretations. Mostly, sustainable development is modeled on three pillars used to facilitate the comprehension of the term: the triangle of environmental (conservation), economic (growth), and social (equity) dimensions. According to Selman (1996:31), while such universal aspirations may be helpful, they are insufficient, at the local level, to identify local needs, choose meaningful targets, and most important, "harness the energies of local people and organizations and aid development of the local society and economy to change in ways which are conducive to sustainability"

There are newer approaches that argue that the point of departure most be the community. Redclift and Sage (1995)

argue that if sustainable development is to mean something, then it must be capable of translating into local action. Liemgruber and Imhof (1998) go even further by suggesting that the true scale for sustainability is the local level, where people interact and communicate and where each individual is affected by everybody's actions. Woodhouse (2000) offers a similar argument; he states that the concept of sustainability is best understood and evaluated on the basis of a sustainable community. He further states that genuine development enhances the sustainability of the community and this does not necessarily involve economic growth. As the debate on sustainability matures it is becoming increasing accepted that development cannot be sustainable unless it builds on cultural traditions (Nurse, 2004) Traditions, norms and customs are all cultural capital that needs to be preserved and passed to future generations. Sustainable development cannot be a product packaged by the international community and delivered to a local community; it works best when it draws on existing community resources and capacity building efforts (Cooper and Vargas, 2004). It relies heavily on community involvement and commitment, since sustainable development is a way of life. Ideas and projects that are developed locally often have the greatest staying power because the community develops a sense of ownership. Cooper and Vargas also state that sustainable development is both a bottom-up and top-down process. Global commitments made by the nations of the world are necessary but not sufficient to ensure sustainability. Hence, the slogan from earlier Earth Days, "Think Globally, act locally". Localizing global aspirations is a key challenge for implementing sustainable development strategies and even more so for developing countries where most people live in rural and sometimes remote communities. There is a need to ask local questions and focus on meeting local needs. This paper makes a distinction between external physical dimensions of sustainability and the internal socio-cultural dimension. The latter dimension is mainly concerned with individual actions, social structures and the social capital of communities. Contrary to what the proponents that prioritise environmental concerns believe, within developing countries like Nigeria, pressing problems of social exclusion, poverty and unemployment are reducing the attention paid to environmental problems. Because of these problems, societies are less willing to accept the structural changes associated with shifts towards a more environmentally sound patterns of consumption. Thus, for countries like Nigeria, a socio-cultural perspective is integral to all discussions about susutainable development.

The aim of this research is to explore from a socio-cultural perspective how ICTs may contribute to and support the sustainable development of communities in the Niger Delta Region of Nigeria. This paper outlines the conceptual framework for the study of ICTs and Sustainable communities and presents a narrative of the findings of the empirical research conducted in Nigeria on the Communicative ecology of Niger Delta communities. This research contributes to the understanding of the interaction of ICT with the communities'

communication ecology with a focus on a (new) definition of sustainability. It adds to the ongoing dialogue among academics, development practitioners, business leaders and government officials, aimed at pinpointing the ways in which ICTs can help make the transition to sustainable development easier, quicker and economically viable. Its focus is on ICTs as means and tools that enable desired changes, since it is these changes, not ICTs that lead to collective action and sustainable development. The presented research is at the base of ICT for development in developing Countries. A thorough understanding of the interaction ICT with the communities' communication ecology is of primary importance, before the deployment of any ICT solution. Thereby it will be of use for further research and/or development of ICT as part of a solution for indigenous communities.

II. Conceptual framework

A. Information Communication Technologies (ICTs)

The definition of ICT for this research uses Hamelink's definition of ICTs: "Information and Communication Technologies (ICTs) encompass all those technologies that enable the handling of information and facilitate different forms of communication among human actors, between human being and electronic systems and among electronic systems" (Hamelink, 1997:3) and Duncombe and Heeks (1999) simplified definition describing ICTs as an 'electronic means of capturing, processing, storing and disseminating information'. This includes the "old" ICTs of radio, television and telephone, and the "new" ICTs of computers and mobile technology and the Internet.

Information and Communication Technologies are rapidly consolidating global communication networks and international trade with implications for people in developing countries. Despite this there is a worrying lack of empirical evidence or analysis of the actual experiences and effects of ICTs upon poor people's economic and social development. The constraints of existing information systems on poor women and men and their intersection with ICTs are also little understood. Little attempt is made by those promoting ICTs for development to assess their impact on the cultural identity, the values, and the state of social equity of the less developed economies. Also lacking are analysis of the social and cultural factors which determine the effective application and use of ICTs by developing countries. Social exclusion in the developing world cannot simply be resolved by technology if consideration of the factors that can ensure respect for cultural values, justice, equity and equality in the distribution of wealth - including information - is absent. Rodgers et al, (1994) argues that by definition, the nature of these elements imposes certain limitations on how ICTs can be appropriated for development. Even if the introduction of ICTs is feasible over a relatively short period of time as some predict, a dialogue between those promoting the technologies and the potential beneficiaries must be the foundation of any

development action. In the current information age, the capacity of a society to effectively position itself as a consumer and producer of knowledge is crucial to its social development. ICTs are increasingly playing a crucial role in most communities' capacities to produce, access, adapt and apply information and thus offer enormous opportunities for facilitating the transfer and acquisition knowledge. They present (atleast theoretically) a promising potential to lead developing countries into the 'highways' of development. (Friedman 2006; Castells 2000). Despite the potential role and contribution of ICTs to development, there is still a growing voice in the development field raising serious concerns about the socio-cultural dimension of their application and use (Panos 1998; Wade 2002; Gumucio 2001). Proponents of ICTs (World Bank 2002, UNDP 2001; Pohjola, 2002; Braga, 1998) take an optimistic view and highlight the positive effects of the Internet and other forms of ICTs to create new economic, social and political opportunities for developing countries and the poor, but it also highlighted the need to ask both with regards to individuals and society, especially in third world countries, about the nature and extent of the influence and changes, and about the factors which facilitate or impede these processes, and more importantly how these influences and change may promote actions for sustainability. It has been found more useful to approach the question in terms of different predispositions and experiences, and with different historical, ethnic, linguistic, social, economic or religious backgrounds in different situations, making different use of ICT media (Avgerou, 2001; Walsham, 1993). Taachi et al (2003) further argue that it is important to study the communication needs, communication patterns and network, and the increasingly important impact which developments in communication technology might have on these. O'Farrell (2001) and Heek's (1999) share the belief that before one can advocate for the development of ICTs among the poor, it is important to understand the existing information systems of the poor, how they interact with more formal information and the best way to strengthen them before intervening with new information sources and means of access sources. Questions such as: who benefits and who loses from the introduction of these technologies; how can ICTs be made useful and meaningful to the developing countries' poor majority who are struggling to meet their basic needs; what are the social and cultural opportunities and risks they present; and how can developing countries meaningfully adopt these technologies while lessening their undesirable social and cultural consequences, are some of the questions that emerge when looking at the potential development impacts of ICTs. These issues are pertinent in assessing the real contribution of ICTs to sustainable Communities development, and therefore merit a closer examination.

B. Information Society and Sustainable development: An emerging Convergence

According to the organizers of the World Summit on the Information Society (WSIS), "We are in the midst of a revolution, perhaps the greatest that humanity has ever experienced. To benefit the world community, the successful and continued growth of this new dynamic requires global discussion and harmonization in appropriate areas." Unfortunately, until recently, few discussions have focused on harmonizing the visions of the emerging information society with the principles and priorities articulated by the United Nations' Millennium Development Goals (MDGs) and the World Summit on Sustainable Development (WSSD).

Meaningful discussions about national policy coherence between these processes have been limited by restricted thinking about the information society (IS) and sustainable development (SD). Each has emerged from a different community with a different vocabulary and process for determining national priorities. Information society specialists have primarily been drawn from the fields of telecommunications and economic development. While, sustainable development has been delegated primarily to environmental issues despite the best efforts of its practitioners to articulate a holistic vision of integrated economic, social and environmental decision-making.

The lack of interaction between these two policy communities is currently serving to reinforce stereotypes of both fields. Sustainable development is seen as pertaining primarily to environmental issues and grassroots social development, while the information society is perceived as being more relevant to the economic development potential of urban elites. These stereotypes miss the reality that sustainable development and the information society are operationally interconnected. Both terms are increasingly used by civil society and academics to refer to a desired global future that is casting its shadow upon our current time and decisions. For sustainable development to be effective and efficient, it must harness the institutions and tools of the information society. And for the information society to sustain itself, it must pay careful attention to the stocks and flows of resources (material and human) and energy that underpin it.

There is now widespread recognition that sustainable development is the responsible way forward and it is enhanced by the recognition that information and communication technologies (ICTs) are key drivers of socio-economic change and so has to be brought into focus as part of the equation. For example, Radermacher (1998) points out that "Modern information and communication technologies drive the worldwide economic system and the process of globalisation. In this process we see enormous growth worldwide with opportunities for overcoming poverty and promoting human rights but also with major threats to sustainability and to social justice".

Only a small amount of literature has attempted to discuss the information society and sustainable development together. Both Felleman (1997) and Pamlin's (2002) works are good examples, with each offering important and interesting

insights into information policy and tools and their role in environmental sustainability. However, more often than not, discourse on these two policy fields has a tendency to provide a very narrow cross-section of issues and perspectives focused primarily on environmental sustainability. To adequately understand the potential for ICTs to enable the achievement of more sustainable development, we must look beyond the direct impacts of the tools themselves to indirect impacts of the broader information society that they enable.

A strong area of convergence is local content—the locally-owned or adapted knowledge of a community— which is shown by this paper to be essential for integrated sustainable development. Technology is crucial to sustainable development; local information is fundamental to many sustainable development activities, such as monitoring and raising awareness; local content is pervasive in many sectors of sustainable development.

Technology has long been a crucial element in measuring and achieving sustainable development. From satellite imagery, environmental information systems and, today, the use of mobile phones to share health information, there has been a key dependence on ICTs in the creation, dissemination and consumption of relevant, local information. But "even after the first United Nations (UN) World Summit on the Information Society (WSIS) in Geneva 2003, the relationship between issues of the global information systems and of sustainable development is not being discussed adequately. It seems that the interdisciplinary and international research in this field is just beginning (Hilty, Seifert and Treiber 2005).

C. Sustainable Communities

Sustainable development pursues long-term goals and in trying to explain their endurance, attention to the cultural dimension is essential. The cultural and historical dimensions combine to construct the common social, economic and ecological) pillars of interest of sustainable development. Sustainability must become a primary goal if we want to ensure the long-term health of communities.

What is lacking in the debate on sustainability is a strong focus on *people*. This research does not deal with the all encompassing question of sustainable development in general; rather it is focusing on the internal, social perspective of sustainability, arguing that it is a deeper explanation of sustainability issues. It argues that to explore the meaning of social sustainability, as well as its practical implications, is crucial to the understanding of sustainability issues. The central proposition of this research is that the issue of sustainability should be understood as a social problem, a problem created by, and eventually having its final impact on *people* themselves. Commoner (1993:23) argues that: "When an environmental issue is pursued to its origins, it reveals an inescapable truth—that the root cause of the crisis is not to be found in how men interact with nature, but in how they interact with each other...". The human scale (or social dimension) is important for the re-conceptualization of sustainability since the meanings of both environments and

development are both value-laden, involving people in the decision-making and management processes of our society. In other words the inter dependency between development and environment cannot be separated from people's actions. Manning (1990:291) stresses that "the concept underlying sustainable development is … a human perspective". Beck (1992:81) argues that environmental problems "are not problems of our surroundings, but – in their origins and through their consequences – are thoroughly *social* problems, *problems of people.* Environmental issues and developmental issues are mediated by human beings. According to Giddens' (1984) theory of structuration, the key to understanding the internal social dimension of sustainability is 'duality of structure'. His theory argues that individuals and society are one whole: human action creates the structures of society; those structures provide the context for the socialization of humans, and in turn, the human action which will reflect and recreate these structures. This concept of 'duality of structure' which consists of individual actions and social structures is the lens through which this research explores ICT use and adoption. Attention is placed on the ability of cultures and relationships, enabled by ICTs, to transform socio-economic patterns. By addressing in more detail how people relate to one another, how shared practices emerge, and how communities evolve, we will be able to understand better when, how, and why such communities use or do not use technologies. Insight into the social capital of communities will also provide better understanding concerning ICT adoption and use by communities than the more traditional analysis of technological requirements, knowledge requirements, and structural aspects of the community. Social capital refers to networked ties of goodwill, mutual support, shared language, shared norms, social trust, and a sense of mutual obligation that people can derive value from. Social capital then is about value gained from being a member of a network. In general, social capital is often seen as the glue that brings and holds communities together (Cohen & Prusak, 2001). Huysman & Wulf (2004a) go even further by saying 'social capital is considered as a necessary "ingredient" that binds communities over time'. There is no universal development model which leads to sustainable communities; instead development is an essential, multidimensional, dialectic process that can differ from community to community, context to context. Each society and community must attempt to define its own strategy for sustainable development. This research seeks to help Niger Delta citizens determine what constitutes sustainability in their own communities, and how they can act on their new knowledge and how ICTs may facilitate these.

III. CASE STUDY – THE NIGER DELTA REGION

The Niger Delta is the delta of the Niger River in Nigeria and as defined officially by the Nigerian Government, extends over about 70,000 km² and makes up 7.5% of Nigeria's land

mass. Some 20 million people of more than 40 ethnic groups, speaking some 250 dialects live in the Delta. Their livelihoods are primarily based on fishing and farming. Nigeria has become Africa's biggest producer of petroleum, including many oil wells in the Oil Rivers. Some 3 million barrels a day are extracted in the Niger Delta. The region has accounted for more than 80% of Nigeria's export earnings. Much of the natural gas extracted in oil wells in the Delta is immediately burned, or flared, into the air at a rate of approximately 70 million m³ per day. This is equivalent to 40% of African natural gas consumption, and forms the single largest source of greenhouse gas emissions on the planet. The environmental devastation associated with the industry and the lack of distribution of oil wealth have been the source and/or key aggravating factors of numerous environmental movements and inter-ethnic conflicts in the region, including recent guerrilla activity by the Movement for the Emancipation of the Niger Delta (MEND).
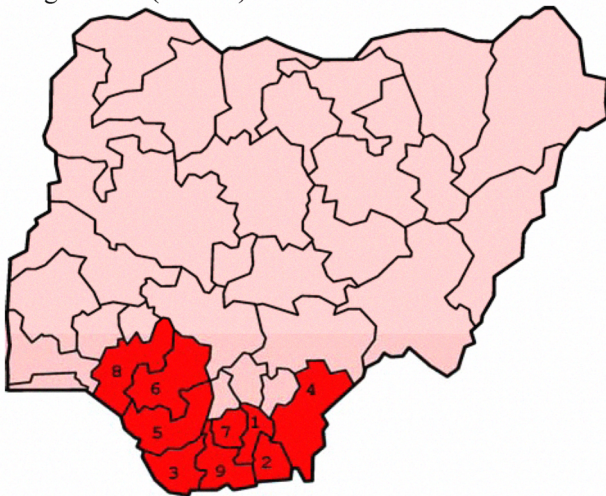

Fig. 1: Map of Nigeria
Map of Nigeria numerically showing states of the Niger Delta region depicted in red:
1. Abia, 2. Akwa Ibom, 3. Bayelsa, 4. Cross River, 5. Delta, 6. Edo, 7. Imo, 8. Ondo, 9. Rivers

A. Community Related Challenges
The Niger Delta remains largely underdeveloped although there are areas where expatriates working in oil companies like ExxonMobil, Shell, Chevron etc. live, which look like a communities in well developed countries. However, amidst growing exports and increasing revenues to national, state and local governments, poverty levels in the country have been increasing while social infrastructures collapse. Dependence on oil and gas revenues has been a major factor in the inability of the state to create an enabling environment for sustainable development with the result that citizens are disenchanted while violence has escalated in the country. The increasing violence in the Niger Delta complicates a social situation characterized by massive poverty and environmental degradation. Corruption has robbed communities of potential

benefits from the considerable government revenues from oil and gas sales, as the bulk of revenues have been looted or mismanaged by public office holders at all levels of government.

The subsiding levels of a culture of public participation in governance and the prevalence of corruption among public office holders have fuelled fierce competition for political offices with contenders deploying violent mechanisms to deter opponents. The use of state apparatus and armed gangs by politicians has been on the increase across the country, and with it the harassment and abuses of the rights of citizens.

The majority of citizens have thus been alienated from the political processes, while those that speak out are sometimes targeted for intimidation and, sometimes, even outright elimination.

The increase in militia activities in the Niger Delta is a reflection of disenchantment and local desperation in the struggle for survival, as well as a quest to seek attention of the world to their plight in the hands of trans-national oil and gas corporations and the Nigerian government. Criminal gangs are also increasingly exploiting the breakdown of communal order to unleash mayhem on citizens.

However, the increasing global appreciation of the problem is an opportunity for concerted action. That is why it is critically important to the region to get on the global information highway and for ICT media to reflect local content to enable to people advocate for their rights as citizens. Community mobilization and collective action is essential not just to counter looting of revenues allocated to the different tiers of government, but also to demand for and defend their democracy.

IV.   METHODOLOGICAL APPROACH

The methodological approach is based on Ethnography and Participatory Research. The research methodology incorporated Ethnographic approach into the Participatory Research framework. Taachi *et al*. (2002) have used this kind of approach successfully for a research designed to develop a transferable methodology for the evaluation of community multimedia centers. It was developed to focus on actual practices of use and interactions with technologies in the wider context of people's lives and social and cultural structures (Tacchi and Slater, 2003) Ethnography is used to guide the research process and make sense of the complete range of social relationships and processes. The research will involve individuals and groups researching their own socio-cultural settings and experiences. They will reflect on their values, shared realities, collective meanings, needs and goals. A major factor considered in designing the methodology is the evolving paradigm in development research. Most notable is the 'things' versus 'people' debate (Korten 1995; Chambers, 2003). Previously research in ICT for development had been focused on 'things' i.e. infrastructure, connectivity, hardware and surveys of ICT use in developing countries etc. (Hoffman,1985; Flamm,1987; OECD 1988) More recently

there has been a shift in research focus from 'things' to 'people'. In an evolving paradigm of development there is a new high ground, a paradigm of people as people (Kling, 2000; Heeks 2001; Madon, 1997).

The research is people-centered and the methodological design reflected this emphasis. The approach is open, evolving, participatory, employing diverse methods, interactions seek to enable local people and it is a bottom-up approach. Central to these methods were participant observation, keeping of field notes, in-depth interviews, focus group discussions and group interviews. The PAR strategy adopted here aimed to produce knowledge and action directly through research and to empower people on a deeper level through the process of constructing and using their own knowledge. The study is an integrated three stage process of social investigation, education and action designed to support those with less power in their community settings. The field work for the research is in three key stages that reflects the overall Participative Research Framework (see Table 1). The findings for the first 2 phases of the research are presented in this paper.

TABLE 1
RESEARCH FRAMEWORK

PHASES	Purpose	METHODS
Phase 1 Preliminary Study	**Redefining 'Community' and 'Sustainability'**	Focus Group Discussions Interviews
Phase 2 Ethnographic Study	**Understanding the Communicative Ecology**	Participant observation Field Notes In-depth interviews Diaries
Phase 3 Participatory Action Research	**Engaging communities in critical dialogue**	Focus Group Discussions Workshops

A. Sampling
The Niger Delta consists of 9 states, and the study was conducted in 3 states, Rivers, Bayelsa and Akwa Ibom states. These 3 states were predetermined and selected based on the diversity of their cultures, ethnicity, differing levels of development and population to effectively represent the Niger Delta as a whole. During phase 1 of the study, 9 communities were studied. Three in each state and four focus groups was conducted in each state. Each group had similar membership, and so two of these constituted of women participants (young women and older women) and 2 of men participants (young men and older men). In total there were therefore be 12 focus groups. Three focus groups were conducted in more urban communities and 9 conducted in rural communities. This was to enable a comparative analysis of rural versus urban constructions of meanings of 'community' and 'sustainability'. Participants were drawn from various backgrounds ranging from students, professionals and civil servants to artisans and market women. Group size ranged between 6 -12 people. 104 semi structured interviews were also conducted in the nine communities.

In phase 2 of the field work, the sampling size was smaller to allow for a more in-depth and rigorous exercise. The ethnographic approach meant longer periods of time was spent in each community. The aim of the study was to understand the communicative ecologies of the target communities by investigating the local information flows, social networks and structures and how these may affect people's perception and use of ICTs. It was conducted in Akwa Ibom and Bayelsa states; four communities were studied, using participant observation, field notes, in-depth interviews and diaries. Phase 2 spanned four months. The researcher immersed herself in each community for a month.

V. FINDINGS

The findings presented in this section are the results from the first 2 phases of the empirical study.

A. Redefining 'Community' and 'Sustainability'
Developing a clear picture of what is meant by Community sustainability from a group of people who are generally not reflective is not an easy undertaking. The study set out to answer three key questions about Niger Delta Communities (1) *What kind of community is it?* (2)*What is to be sustained?* (3)And *How will it be sustained?*

The definition of community has been contested within sociology from Tönnies onwards (Tönnies 1957). For developing countries with a strong cultural heritage 'community' means something different from the western construct of community. By understanding what 'community means to local people at a local level, it should be possible to develop sustainable strategies that are meaningful and germane to people in those communities. Key elements that are integral to healthy communities like Identity, ownership, participation, cohesion were given special focus.

The key findings from the preliminary study were that the parameters that define communities for the Niger Delta people are different from those of western communities. Geography and ethnicity played a strong role in defining who belonged to which community, although that was not always the case.

There were cases of people who resided in particular communities who were considered outsiders and were not involved in community activities because they belonged to a different ethic group or are not originally from there. In some cases people living outside a geographic region have a stronger identity with their communities of origin even though they don't live there. Language is a crucial element in belonging to the community, if you had a different language you were not considered a community member in the rural communities, Culture, Social Norms and Values, Shared leadership and Lineage make community bonds much stronger. Their 'emic' definition of a sustainable community also differed from the western construct of sustainable communities. The major reasons for this are that community is viewed differently and the priorities of the people are based on their socio-economic situation and their cultural heritage. Also the struggle for survival supersedes all other development needs of the people. Their construct of a sustainable community is:

- A place where everyone (who shares the same heritage, language, values and ethnicity) has an equal opportunity to participate and contribute.
- A place where citizens shared strong community values, where their relationships, community leadership structure and Indigenous customs and culture are preserved for future generations.
- A community where there is use of ICT with local content and language, and where people (especially the youths) have the skills and capacities to use ICTs effectively.
- One where there is access to information and education.
- A community where there are income generating activities and employment opportunities.
- A community where there are functioning schools and health centers.
- And people are able to provide for the daily sustenance of their families.

So the sustainable development priorities of these communities differ significantly from the accepted models for sustainable communities. These communities also have social structures that required participation from representative groups like the youths, women and men associations. The traditional leadership structure is very vital in the defining community laws and future development agendas. There was a strong sense of ownership and identity among community members which are crucial elements in building healthy communities.

With a better understanding of what 'community' and 'sustainability' meant the people, the next phase of the research was to study the communicative ecologies of these communities in order to be able to explore how ICTs maybe deployed to meet the sustainable development needs of these communities.

B. The Communicative Ecology

An analytical framework for the analysis of the communicative ecology with eleven key concepts grouped under three categories was developed: These categories are *Community practice; Community Information and Communications systems* and*; ICT Use and Impact.*

The classification of the concepts under the three categories was based on: causal relationships, contextual factors or intervening conditions, and actions and consequence of the previous two. See Fig. 2 below.
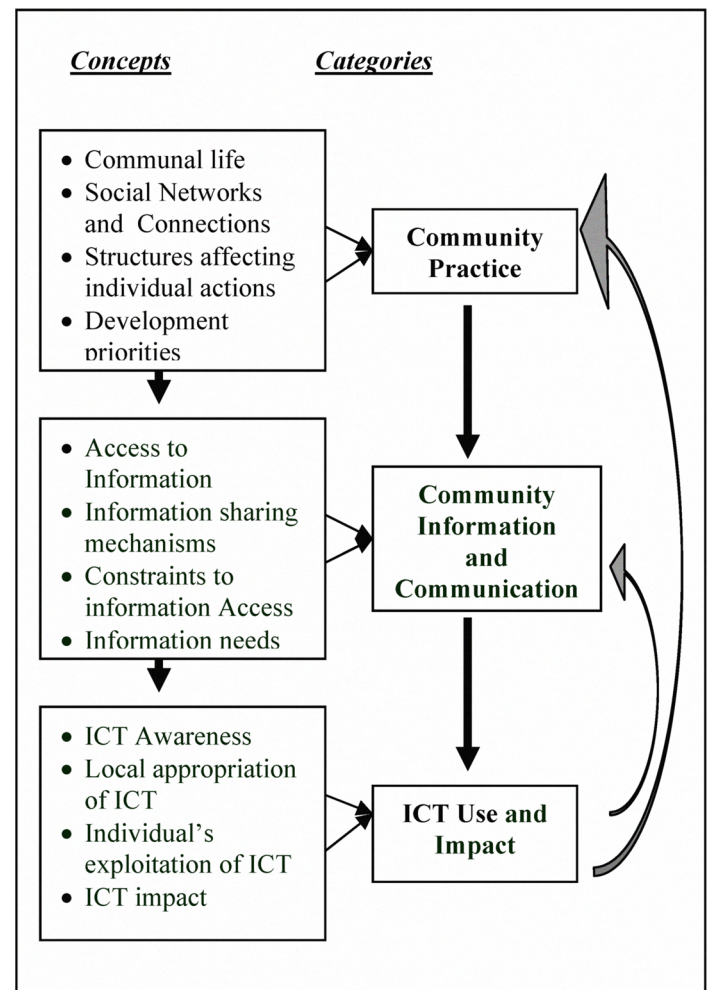

Fig.2. Analytical Framework

VI. COMMUNITY PRACTICE

A. Communal life

Life in these communities is shaped by three major aspects: the conventional face-to-face interaction, villagers' interest in participating in communal issues and the ways and channels for information exchange. A well-built social interweave where everybody knows one another was observed. This network of connections creates the rules of reciprocity, epitomized by membership in community organizations which is a platform where people exchange experiences, stories and every kind of information that is of villagers' interest. Communal life is also dictated by the leadership and

traditional values of the community. Societal norms are set by the village head, although most have been handed down by a previous generation. There is a very strong respect for their community laws and they believe that obeying these laws is important to the development of their communities. The communal life in these communities supports active community involvement and mobilization for actions that may lead to the development of their community. The sense of responsibility and identity the people have is very strong.

B. Social networks and Connections

Communities can be understood as ongoing systems of interactions, a set of social identifications and interactions. Social networks build and support the development of community capacity and individual agency critical to social development. The conceptualizaion here, refers to peoples connections with other people and the community. The idea is to focus on how the structure of ties affects individuals and their relationships. The shape of a social network helps determine a network's usefulness to its individuals. In the Niger delta it was observed that the people have very close connections to family and have strong family ties. The implication of this is that their actions are greatly influenced by their interaction with family members. Outside of the family, the church, community groups and associations provide avenues for social interactions. Types of information exchanged with their social network are about community events, happenings in the community, community infrastructural developments, business, financial challenges and politics, personal and family issues. The young men have the widest network of connections within the community and they are key information carriers within the community. This is because it is acceptable and even expected for them to circulate and interact more. They also act as vigilante for the community.

A sense of belonging and the concrete experience of social networks and the relationships of trust that are involved in these connections bring significant benefits. However, the sense of attachment and quality of social networks varies between different people. It could be argued that for sustainability to take place in a community we should be focusing on enhancing the quality of social networks etc. rather than the creation or strengthening of 'community'. This is the line taken by writers such as (Stacey, 1969). Exploring this concept adds to the context creation of these communities.

C. Structures affecting individual actions

This concept explores what is responsible for individual actions in the community, this adds to the causal conditions for people's action which may prove useful in understanding how these may facilitate actions for sustainability. Respondents expressed the desire to uphold the family reputation within the community, so they were constantly careful in their actions to protect this family reputation. Another factor that affected individual action was the desire by the people to ensure community support in times of need and to avoid punishment and enforcement of community laws. There are societal expectations in these communities that guide the choices people make; they are expected to enhance the good norms of the society and to serve future generations. Membership in community fraternities, associations also has an influence on how people conduct themselves in this community. For example there are community laws that penalize women for certain offences that do not apply to men. For example insubordination and adultery. There are also certain community development meetings that women cannot participate in, like meetings to resolve inter community conflicts.

D. Development priorities

The kind of development people want plays a role in what they would commit to in terms of sustainability. Development that does not meet the people's needs may not get the required support. Preserving indigenous knowledge and values is very important to the sustainability of these communities. Majority of the respondents felt that their local self government and community leadership structure was a positive development that if preserved would benefit future generations because it had proven effective in running their communities. The observation and interviews revealed that they value their traditions and communal norms very highly. As one respondent put it *"our traditions and values are what makes us unique, that is our identity"* These traditions have been passed down to the younger generation by inculcating it in them when they are young. Community associations also reinforce these traditions. Social, educational and economic development was highlighted as the development most desired in their communities. That is the way people interact with each other for the advancement of their communities. Education was also highly desired. In a rural community like Mbiaya Uruan where poverty is high, many children could not get further than a primary education and because of this they grow up not having many opportunities and many of them migrate to the city centers where there are better opportunities. The youths prioritized human development, capacity building and technological advancement as most important for sustainability. Inconsistent power supply hinders their use of ICT and unless there was an attempt by the government to provide consistent power supply, they did not see how they could maximize ICT for their benefits.

VII. COMMUNITY INFORMATION AND COMMUNICATIONS SYSTEMS

The concepts under this category are comprised of contextual, mediating factors that affect access to information in the communities. Within communities, people also live and

participate in what we could call an "information ecosystem." This does not just refer to the information that a community presently has available, but all the human and technological elements through which people become informed. The "media," of course, plays a critical role in the information ecosystem, but they are hardly all of it. Numerous actors, both individual and institutional, contribute to the information ecosystem by creating, storing, disseminating, interpreting, and consuming information. Understanding how and why a community accesses information is critical in exploring the role ICTs play in meeting the community's developmental goals.

A. Information sharing mechanisms

Interactions and communication is a vital part of Niger Delta communities. Most communication in the community is done through mobile phones and face to face interactions. In the rural sites communities share and disseminate information using town criers or announcers and community meetings. One of the key ways of receiving information is through a town crier, who disseminates community information about road repairs, meetings and new laws to community members. The information passed by the town crier is by far the most important information of all to the people. Information is also received through heads of family. Information from neighboring communities is passed on by 'Okada' (commercial motorcycles) riders in the community. Within these communities there are no public transport systems. There are intercity buses that drop people off at the entrance to the communities, but 'Okada' riders are the main means of transportation within the communities. Because of this they have access to all sorts of information which they pick up from the motor parks in town and from the passengers they carry, so they have become key information carriers for their community. See Fig. 4 below.
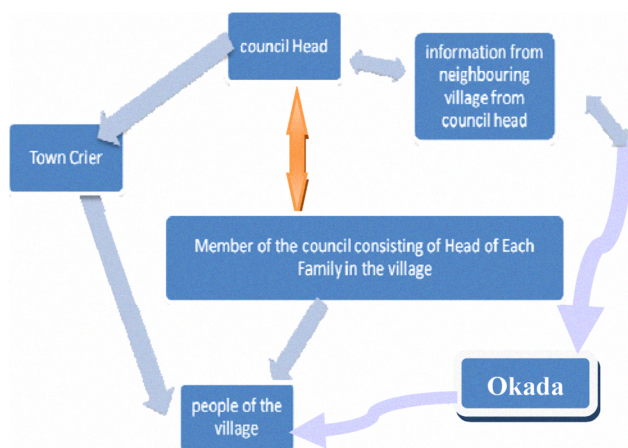

Fig. 4 Information Flows

Community leaders filter certain developmental information that comes in and transmit information they consider useful to community members. This goes to show the kind of influence that the leaders have on the community's access to information. Observations and the interviews revealed that over 80% of these leaders are illiterate and totally out of touch with what is happening on the global scene, yet the educated ones in the community allow these leaders to preside over them. People with mobile phones exchange more information than those without. Local and state information is received from Radio and Television. Radio and town criers are the most constant means of receiving information.

B. Constraints to information Access

Gender is one of the factors that hinder access to information, the widening technological gap between the sexes was observed and it is reinforcing traditional forms of power dynamics and hierarchies between men and women. A large proportion of women in the region don't have the capacities to use ICTs. ICT solutions need to mainstream gender perspectives into any initiatives to ensure equity.

The regions integration and participation in the global information highway is also constrained by factors such as the high cost of access, high Internet access costs, low bandwidth, poor ICT infrastructure, Inconsistent power supply and often unreliable communication facilities.

Traditional Leadership can also be a constraint, the discretion of the leaders affects information access, as stated earlier they filter the information coming into the community and if it is deemed not suitable, it is withheld from the people. In oral cultures, the collective memory and importance placed on the elders to store information creates a strong system for information flow (Slim & Thompson 1993). There is a need for mediation between the traditional and emerging information systems when considering the socio-cultural and economic leap that will be required for societies, accustomed to receiving information orally from a known and trusted source, to new digital, text based information sources. Lack of education was another barrier observed, the illiterate ones in the community where not given certain information because it is believed it would be of no use to them. For example information from the Niger Delta Development Commission that could benefit the whole community is told to only the leaders and the educated ones. So there are people that are totally excluded from happenings within the community, the deployment of ICT could further isolate this socially excluded groups.

C. Information needs

A number of factors affect how different members of the community may understand or use information, such as gender, economic status, literacy, etc. Each community has it's own way of communicating and finding out about what is going on in their area and outside. The information needs identified by students and workers were: Latest discovery in science and technology, Events around the world, Entertainment information i.e. music, creative arts, Local and state news, Health news and information; Social events; Sport news; Business information i.e stock news; Job opportunities and Information on community development. Traders and

market women are interested in product prices. The elders and leadership were more interested in information that has to do with community development and politics.

VIII. ICT USE AND IMPACT

The investigations revealed that a combination of old ICTs (Radio and Television) and new ones like mobile phones, computers and internet (very limited) were used in the Niger delta region of Nigeria. The impact and use of these ICTs was explored in this category to identify the factors that influence the adoption and use of ICTs and identify tangible economic and social benefits arising from having access to and using ICTs.

A. ICT Awareness

Computers are viewed as a symbol of modernity. A lot of the older people were quite intimidated by the prospect of using one. People under the age of forty said ICTs are important for their individual lives and their communities. Some young people saw it as a tool that helps learning; some others view it as a means of getting beneficial information. One respondent said *"it can give everybody information about the events happening in different communities and how they overcame such problems so the community can learn from it"* They also thought it can be useful in building capacities and personal growth and can also provide an opportunity for wealth creation. Some cited the fact that many people now earn an income from running calling centers, so could also be income generating. These calling centers are usually little tents that are constructed by the road side where people make local and national calls from mobile phones for as little as N25 (1p) per minute, and international calls for N75 (3p) per minute. These calling places are all over the place on almost all street corners. Profits are marginal and competition fierce, but people eke out constant income from offering these services.

B. Individual's exploitation of ICT

There were no fixed land lines in any of the communities studied, so all calls are made with mobile phones.

The graphs below show ICT usage in two of the communities studied. Mobile phones and Radio were the most affordable and most used. In more rural communities like Mbiaya Uruan radio is a major source of Information. There were many people interviewed who owned televisions and some times because of power outage, would get to watch it only once a week, and in cases where the outage is due to faults, they would go for months without watching TV. Radio has become a primary source for getting information on local, state, national and international news and events. Radio is considered cheaper to run because it is battery operated, no power supply needed, there is a huge supply of radios and low level batteries imported from china that is readily available in most corner shops. Phones are also affordable, portable and mobile, although not as cheap as radio but definitely highly

desired. Internet use is very limited as stated earlier, because cyber cafés are located outside the community and travel costs is included with airtime costs. Most people have never used the internet and can't use computers but have the perception that it is very costly and don't even try.
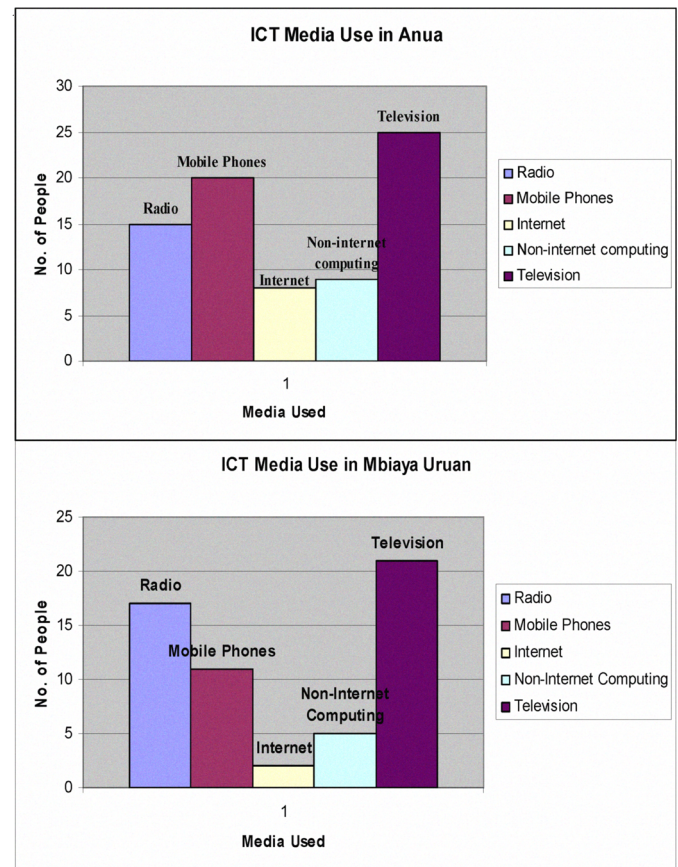

Fig. 3 ICT use

C. ICT Impact

This concept explores the interaction between Community Information Systems and ICT Tools. The study showed that ICT further reinforces the social structures of these communities. The greatest area where ICT is affecting community systems is in strengthening social networks, social interactions have been greatly enhanced by using mobile phones, it is getting more people involved in the happenings in the community. ICT use is also strengthening the sense of identity people have with their communities, there are indigenes that work and live outside of their communities and radion and mobile phones are keeping them connected to happenings in their communities, because as revealed from the findings of the preliminary study Niger Delta citizens feel a sense of identity with their communities of origin, and are committed to the development of their indigenous communities. In this way ICT is helping to strengthen these bonds.

ICT use is also impacting the development priorities of community members, because it connects them to the rest of the world. This connection has positive benefit for the communities. They are becoming more aware of global issues

like HIV/AIDS, environmental degradation and human rights and have mobilized themselves to address some of these issues.

ICTs have also had an impact on the security of citizens in these communities. The Nigerian Government is very ineffective in protecting their citizens from crime. So citizens have been forced to find ways to fill this gap by defending and protecting their own communities and ICT is playing a crucial role in that. Mobile phones are being used effectively by vigilantes for security.

The following is a summary of areas where ICT is impacting communities in the Niger Delta

- Community mobilization
- Community watch
- Circulates information faster
- Connects people together, Fosters good relationships
- Income generation

The study shows that ICT is being integrated into the social fabric of the community, especially mobile phones. Computers and the Internet are not as yet having any real impact in the communities. There is still a long way to go before ICT can begin to meet the information needs of these communities, because they do not have input on content, this is designed by others who may not be sensitive to needs of the people. These initial positive development of ICT use shows that there is great potential for ICT, if appropriately deployed to meet community information needs.

IX. IMPLICATIONS OF ICT IMPACT ON SUSTAINABILITY

Incorporating sustainable development at the local level is one of the biggest challenges facing the movement towards sustainability, how to take global principles and make them concrete locally. Communities which are culturally rooted, locally produced and technologically adapted are being rapidly eroded. Vast literature frame the sustainability discourse largely in terms of an environmental agenda pre-occupied with 'green' issues. Literature has largely neglected the community development as sustainable and livable places which adapt their unique cultural identities and specific historical heritage to contemporary needs. Analyzing the cultural environment and information ecosystem is a method of understanding the complexity of a given community, its culture, its fragility, resilience and it's reaction to change.

The factors relevant to sustainability of communities identified from the research are:

- Awareness about sustainable development;
- Information availability and thus transparency;
- Public participation in governance;
- Empowerment of citizens, especially women;
- Fostering of cultural diversity;
- Building capacity
- Social cohesion

- Preservation of Indigenous cultures
- Job creation and skills acquisition

The empirical data provided possible directions for exploring how ICTs may be employed to contribute to sustainable development for the Niger Delta people. ICT can play a role in facilitating sustainability by:

1. Strengthening community systems that enable cohesion and collective action

2. Providing appropriate information on sustainable development practices through:

- Public awareness campaigns and social reorientation on development issues;
- Education;
- Provide access to information,

3. Electronically documenting indigenous knowledge and practices for now and future generations.

X. CONCLUSION

The study provided a better understanding of how the use of technology affects relationships within the community and how individuals use technology to develop their relations with others in community.

The study also showed the importance of mobile phones and radio in changing the lives of the people. Mobile phones is by far the most common communication technology to effect tangible positive change in these communities (market and trading information, emergency and security communications, strengthening kinship relations and social interactions) and is the backbone of ICTs.

At present there is a vast unmet demand for radio broadcasting with local content in these communities. A combination of mobile technology and rural broadcasting will enable information and communication services reach more people than any other medium.

Overall, the study has provided a better understanding of the use of technology in community life and presented opportunities of how ICTs may be deployed to help these communities towards sustainability.

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