Zentrum für Entwicklungsforschung
Center for Development Research
University of Bonn

ZEF

Working Paper Series 94

Emmanuel M. Akpabio, Saravanan V. Subramanian

Water Supply and Sanitation Practices in Nigeria: Applying Local Ecological Knowledge to Understand Complexity

universitätbonn

ISSN 1864-6638

Bonn, May 2012

ZEF Working Paper Series, ISSN 1864-6638
Department of Political and Cultural Change
Center for Development Research, University of Bonn
Editors: Joachim von Braun, Manfred Denich, Solvay Gerke, Anna-Katharina Hornidge and Conrad Schetter

Authors' addresses

Emmanuel M. Akpabio
Department of Geography and Regional Planning, University of Uyo
P. O. Box 4223, Uyo, Akwa Ibom State, Nigeria

Currently serving as AvH Fellow,
Center for Development Research (ZEF), University of Bonn
Walter-Flex-Str. 3
53113 Bonn, Germany
E-Mail: emakpabio@yahoo.com

Saravanan V. Subramanian
Center for Development Research (ZEF), University of Bonn
Walter-Flex-Str.3
53113 Bonn, Germany
E-Mail: s.saravanan@uni-bonn.de

www.zef.de

Water Supply and Sanitation Practices in Nigeria: Applying Local Ecological Knowledge to Understand Complexity

Emmanuel M. Akpabio

Saravanan V. Subramanian

Abstract

For many years, tremendous efforts have been made to link important diseases and epidemics to water supply and sanitation practices in a manner that focus mostly on understanding and breaking the various chains and channels of diseases transmission pathways. Such efforts paid off and led to significant breakthroughs in drinking water supplies and sanitation coverage most especially in developed countries. However, such scientific efforts became lost in providing adequate explanatory framework for understanding complex environmental health issues arising from water supplies and sanitation practices in Africa. In this working paper, a broad framework of Local Ecological Knowledge (LEK) is utilized in accounting for the contribution of the diversities of cultural, socio-economic, physical-environmental and temporal factors in explaining water and sanitation practices in Africa. The framework sees the human-environment relationship more from the transactive, than interactive, point of view. It proceeds, on the basis of such broad assumption, to offer a structure for thinking of the specific roles of such contexts as beliefs, physical location, exposure, age, education, economic position, emotion, values, norms, meanings, perceptions, spirituality etc. in determining water and sanitation practices of individuals and groups with a specific case study drawn from southern Nigeria. Consequently, important water and sanitation practices and behaviours were highlighted to reflect various contextual influences of physical/ environmental, socio-economic and cultural factors. The empirical research offers insight on how intervention targets could be successfully framed both in the immediate and long-term perspectives. By incorporating a multiplicity of complex ecological health issues, the LEK framework offers both a conceptual and methodological basis for understanding the complex health geographies of developing countries especially in Africa.

Keywords: Local Ecological knowledge, Water, Sanitation, Contexts, Nigeria

Acknowledgements

The Alexander von Humboldt Foundation, Germany, provided funding for this project. ZEF (Zentrum fur Entwicklungsforschung) research colloquium members and all members of staff at ZEFa (Bonn, Germany) were very helpful and useful with ideas, suggestions and comments at any point this topic was discussed. The volunteers who contributed in fieldwork, discussions, suggestions and in many other forms while the study lasted are equally acknowledged as follows: Diana Abasi, Emmanuel Asuquo, Isang Utere, Udo Udom, Ekaette Ekwerre, Pius Edet Essien, Kaiso Ikpe John, Ime Effiong, Nsikak Udofia, Archibong Ntiense, Unwana David Jack, Comfort Osung, Karen Abraham, Clement John, and Inyang Samuel Inyang. Finally, ideas and opinions are of the authors' and not of the institutions named above.

1 INTRODUCTION

This working paper uses the framework of local ecological knowledge (LEK) in explaining and accounting for the contribution of the diversities of cultural, socio-economic, physical-environmental and temporal factors in explaining environmental health problems arising from water supply and sanitation practices in Africa. According to research reports, that about 2.6 billion people live without improved sanitation facilities and about a billion lack access to safe drinking water (Lane, 2012; WHO, 2010; WHO/UNICEF, 2010; UN-Habitat, 2003). More troubling in the reports is the knowledge that a majority of the people without access to improved water supply and sanitation live in developing countries. While a number of intervention and policy commitments have successfully improved the water and sanitation situation in Asia and Latin America, sub-Sahara African countries have been variously reported as lacking behind in the water and sanitation coverage map (Mara, 2012; Lane, 2012; WHO, 2010). What then could be the problem? Existing literature on water and sanitation seems 'loose' and 'soft' as it does not employ thorough analytical methods or techniques as well as appropriate and relevant indigenous concepts in understanding these issues from the perspective of cultural communities in Africa. This research attempts to improve our understanding of the complex issues involved by using the LEK framework in discussing the problems of water and sanitation in Nigeria both as a methodological and conceptual framework.

For many years, efforts have been made to link disease epidemics to water supply and sanitation[1] practices (White et.al, 1972; Curtis et.al, 2000; Kolsky and Blumenthal, 1995; Cairncross et.al, 1996; Saravanan et al, 2011). Such efforts have dominated the basis of modern diagnosis and intervention programmes often mobilized around the strategic disruption, interruption or weakening of the chain of disease transmission pathways (Esrey et.al, 1991; Khan, 1982; Aung and Hlaing, 1989-cited in Kolsky, 1993; Curtis and Cairncross, 2003). Although water mediates the transmission of micro-organisms or parasites onto humans, unsafe sanitation practices and lack of environmental hygiene catalyze the spread of infections. Conventional science and knowledge often employ the logic of biological-epidemiological evidence in understanding such environmental and behavioural health perspectives of water contamination and diseases spread (see Curtis et al, 2000). This has led to standard categorization of water related infectious diseases[2] transmission pathways. What seems to be missing in such thinking is the role of cultural factors of beliefs, local knowledge, norms, values and spirituality in influencing the broader contexts of behaviours for which contaminations and diseases spread occur.

In an extensive review of literature, Jewitt (2011) captured both the spatial and temporal dimension of cultural and environmental factors that constrain intervention efforts at addressing water and sanitation challenges in developing countries. Among the factors are the taboos and ambivalence surrounding human excrements, enhanced status of individuals, among other socio-economic and physical factors. Of particular interest in the review are a) reports from Madagascar's cultural taboo against storing sewerage underground for fear of contaminating the dead and putting one person's faeces on top of another's both of which exclude the use of drop and store systems (the author cited

[1] The author's idea of sanitation relates to all aspects of personal hygiene, waste disposal, and environmental cleanliness which could have impact on health (Black and Talbot, 2005:101). There often exists a lineal connection between dirt, water, and disease - covering personal and domestic hygiene, vector control, food cleanliness, drinking water storage. Most intervention efforts this days conceive of sanitation in a narrow form of toilet construction, rather than a package of environmental and household cleanliness, with water assuming a central position.

[2] The four categories are i.) Infections spread through water supplies i.e., water-borne; ii.) Infections spread through lack of water for personal hygiene i.e., water-washed; iii.) Infections transmitted through an aquatic invertebrate host i.e., water-based; and iv.) infections spread by insects that depend on water i.e., water related insect vectors (White et al, 1972 and Bradley, 1977)

Black and Fawcett, 2008; Ramanantsoa, 2004); b) resistance against the use of cesspits in Uganda for fear of allowing excreta to be used by sorcerers to cause harm (the author cited Gillanders, 1940); c) many other cases of cultural tolerance for the handling of faeces (faecophillia) as common with 'night soil workers' in countries such as China, India, Ghana (see also Van der Geest, 1998; Ramaswamy, 2005; Esrey et.al, 1998; Hart-Davis, 2008). Jewitt equally demonstrated the impact of socio-economic characteristics in influencing the adoption of modern attitudes and behaviours towards water and sanitation practices when she observed how the experience of urban and improved living can influence the sanitation attitudes of rural dwellers as follows:

> during my own village-based fieldwork in Jharkhand (India), I came across only two households that had poor flush latrines. These belonged to villagers who worked in government service and lived in urban areas during the week. They installed toilets primarily for convenience of their family members but also to ensure that urban visitors would have a decent place to go. (p.617)

Taken together, the physical environment as well as social, cultural and temporal factors operates as fundamental contexts defining knowledge, behaviours and decisions relating to problems of water supply and sanitation practices. Briggs (2003) stresses multiple exposure-multiple effects (MEME) model, which emphasizes the divergent, multiple links between exposure and health effects. Kurup (1996) and van Wijk-Sijbesma (1998) indicate that there is a high correlation between latrine ownership and higher socio-economic status. Evaluating water, sanitation and hygiene education programmes in northern Pakistan, Nanan et al (2003) conclude that boys are more resistant to diarrhea compared to girls, while diarrhea prevalence was negatively correlated with annual increase in mother's age and monthly increase in child's age. In a hospital-based study (Sodeinde et al., 1997) in Nigeria, poor nutritional status was identified as a major factor for the persistence of diarrhea. The frequencies of occurrence of under-nutrition, marasmus and kwashiorkor were reported to be higher among children suffering from persistent diarrhea. According to Dunn et.al (1994) each individual's contextual experience is unique, but the community shares many elements of contextual experiences. Such unique and shared experiences as Gibbs (2009) had observed (in the case of water) have the potential to reveal diverse cultures of nature, the institutions humans devise to mediate relationships with nature and the complex interactions that comprise a more-than-human world.

Sheat (1992) has particularly stressed that planners must acknowledge the importance of water quality perception among users given that 'perceived' water quality matters more than the real measurable quality. In an article entitled, 'water boiling in a Peruvian town', Wellin (1955) discussed how cultural factors exert influence on the perception of water as follows:

> a trained health worker can perceive contamination in water because his perceptions are linked to certain scientific understandings which permit him to view water in a specially conditioned way. The Peruvian townsman also views water in a specially conditioned way. Between him and the water he observes, his culture filters out bacteria and filters in cold, hot or other qualities that are as meaningful to him as they are meaningless to outside (cited in Paul, 1957: 1504).

According to Derryberry (1954), some of these ideas may be correct, but even if they are not, the people are just as sure they are correct as the sanitarian is sure they are mistaken. WHO reports on drinking water in some Asian countries observed that the people's idea of what is 'good' portable water does not take into account chemical, organic or bacterial pollutants (Barnabas, 1982). The same study also highlighted the impact of social structural and geographical (physical terrain) factors as impediments not only to communication between people and professional specialists but also to equitable access to health inputs such as safe drinking water (see Madan, 1987).

Human relationship with nature varies in place and time reflecting the cultural, socio-economic and physical contexts as well as temporal factors yet, the potential contribution of these contextual factors in evaluation and intervention practices has received very little attention both in research and policy arena. With particular reference to water and sanitation, some scholars (Banda et al, 2007; McFarlane, 2008; Black and Fawcett, 2008; Odumosu, 2010) have argued for more place sensitive and locally evolved approaches that take account of the various socio-economic, cultural, political and physical/ecological environments rather than pure physical infrastructures and assumptions of ignorance often credited to the intended beneficiaries. Odumosu (2010) in his study particularly urged UNICEF to look into the challenges of under what circumstances people in different geographical areas and cultural contexts become willing and able to change their sanitation behaviours and practices. Jewitt (2011) on the other hand believed that greater sensitivity to the wider political ecologies of sanitation provision in specific local contexts as well as the environmental, socio-economic and cultural appropriateness of different sanitation options will have significant impact in addressing the challenges in developing countries.

Although the international development agencies have attempted to transform thinking to the practice of addressing safe drinking water and sanitation, it has not gone far enough (Jakimov, 2008). The prevalence of the problem is even worse in sub-Saharan Africa, where only 60% of the population has access to improved water source (Bonn 2011, Nexus Conference). Inadequate access to safe drinking water and sanitation services together with poor hygiene is a primary reason for the high levels of diseases, poor nutrition and the mortality of children. It is partly responsible for about five million child deaths a year. Knowledge gaps for targeted actions exist especially at the domestic household and community levels. There is need for a better understanding of local social, cultural and ecological geographies to be able to evolve flexible engagements with local actors and target population on environmental health issues. Consequently, this paper is trying to develop and expound on the local ecological knowledge (LEK) as an organizing structure for understanding the problem of water and sanitation as well as offering a range of opportunities and factors in expanding intervention in cultural communities. By local ecological knowledge, this paper relies on the broad policy sciences literature's characterization of local knowledge as 'knowledge that does not owe its origin, testing, degree of verification, truth, status, or currency to distinctive……professional techniques, but rather to common sense, casual empiricism, or thoughtful speculation and analysis (Corburn, 2003 cited Lindblom and Cohen, 1979:12). Corburn (2003) also quoted another definition of local knowledge from Geertz (1983) as 'practical, collective and strongly rooted in a particular place' that forms an organized body of thought based on immediacy of experience (pp.75). Relevant theoretical development in the field of LEK has questioned the earlier conceptualization of LEK as a kind of declarative knowledge. Instead it was suggested that this knowledge is processual, situational, and can better be described with the notion of skills (Ingold, 2000). This framework, therefore, emphasizes the significance of cultural norms and beliefs within the constellation of other plural contextual factors.

2 A REVIEW OF LITERATURE

Literature will be discussed around two broad themes namely, human-environment relationship and local ecological knowledge (LEK), the rationale being to give background theoretical and general knowledge as basis for discussing the application of LEK as emerging conceptual and methodological framework of analysis in environmental health issues in Africa.

2.1 Human-Environment Relationship

A recurring theme in the human ecology literature is the concept that environment[3] (i.e. contexts) is a critical factor in human behaviour (Young et al, 2006; Muhlhausler and Peace, 2006; Koning and Smaling, 2005; Robbins, 2004; Zimmerer and Bassett, 2003 and Flyvbjerg, 2001). Bertalanffy (1981) had observed that human nature has two sides. The physical or material side is the one in which each human being lives 'with a biological body, physically equipped with impulses, instincts and limitations on each species. The other side is broader. Here each person creates, uses, dominates and is dominated by a universe of symbols[4]. This vision allows for an association between ecology and cultures. Ecology is usually associated with the physical or material world and this world is interrellated with human being, and therefore, culture. In this form of relationship, humans are seen as part of an ecosystem, and such unity of nature and culture contribute in producing meanings and values over time.

A variety of conceptual frameworks have emphasized the reciprocal relationship of humans and the environment, giving rise to studies focusing on the effects of human activities on the environment and vice versa (Dietz et al, 2009; Liu et al, 2007). Such studies which are largely located in the human ecology literature (Morales et al, 2009; Manson, 2008; Dearing, 2006 and Turner, 1997) tend to demonstrate that human impact on the environment is not merely driven by ignorance or carelesssness but by the advantages derived from exploiting the environment (see Dietz et al, 2009). The fact that people use information they have about the environment to act gives indication of the relationship between human cognition and specific ecological, cultural and social settings. Such relationship is specialized and often contributes to meeting the specific human economic, social and cultural demands. Law et al (1996 citing Dunn et al, 1994) posited that the environment should be broadly considered more from a transactive than interactive perspective (see Horelli, 2006 and Moser, 2009). The interactive approach assumes the characteristics of the person and environment exist independently of one another with a lineal 'cause and effect' relationship between the two domains. With such discrete and measurable characteristics, an interactive approach allows behaviour to be predicted and controlled by influencing change at the level of an individual or environmental characteristics. The transactional approach assumes an interdependence of person and environment. It is acknowledged that behaviour is influenced and cannot be separated from contextual environments, temporal factors, and physical as well as psychological characteristics. Within the environmental psychology literature environment-human relationship is either conceived from an interactional or transactional perspectives. Hart (1979) for instance noted that the process

[3] Environment here is looked at from the perspectives of contexts and situations which occur outside individuals and elicit responses from them (Law, 1991). It includes the personal, social, cultural and physical environments. Of recent, the notion of personal-environment congruence or environmental fit which suggests the coexistence of human beings and the environment (with neither dominating the other) has gained currency in the literature (Knapper et al, 1986; Shalinksky, 1986).

[4] For more clarification the symbolic dimension encompasses both the spiritual and the symbolic parts. It consists of the norms that rule each social group, that is, ideas, interpretations, beliefs, traditions and even aspirations.

of learning about self and the environment is interactional and limited the concept of environment to the physical environment while Bruner (1989) focused on transactional contextualism as a process in which the person constructs the self in the context of the environment (cited in Dunn et al, 1994). Bronfenbrenner's (1979) ecological model for human development utilized the concept of ecological validity, in which he argued that research was not valid unless it was grounded in context. Context influences behaviour and relationship in every human situations as an individual does not exist in a vacuum. Scholars have tried to capture the contextual environment in different ways depending on their disciplinary orientation. For instance, Dunn et al (1994) had made references to Hall (1983) and Zerubavel (1991) concept of time as aspect of environment. Gibson's (1986) consideration of the environment from both physical (ecological context) and phenomenological (visual perception) perspectives, enabled the argument that the environment is both physical and phenomenological in that persons perceive objects in the environment by the affordances they offer. Mention is also made of Auerswald's (1971) emphasis on ecology and context, in which the author argued that the processing of information from a holistic ecological perspective should replace simpler linear cause-and-effect thinking in therapeutic intervention. On the other hand, Shalinsky (1986) describes environmental factors as physical (built and natural environments) and psychosocial (the psychological and social factors such as attitudes, family and government).

Theories working on behavioural change and human cognition often place too much focus on individuals as the unit of intervention and analysis. Individuals are considered targets for behavioural change while the wider socio-cultural contexts that enforces behavioural compliance are ignored. Behavioural change approaches, mostly grounded on the theory of reasoned action, assume that individuals move from an existing condition of risk reducing strategies. Parker (2004) observed that such approaches, which are mostly targeted at homogenous groups, easily gets lost in conditions of heterogeneity whereby different cultural, socio-economic, environmental and temporal contexts prevail. More so, the tendency to imply a change in behaviour from one state of practice (inappropriate and risky behaviour) to another state of practice (appropriate and low/no risk behaviour) is a weak assumption given that the complexities of changing contexts and environment do not hold at the same phase. Indeed, the behavioural change theories lack the capacity to provide sufficient framework for bringing about behavioural change when applied to the contexts of indigenous communities in Africa. What seems to disfavour the utilization of a behavioural approach and theories of cognition in explaining the phenomenon around water and sanitation practices in Africa derive from the following. First, the simple, linear relationship between individual knowledge and action does not take into account the variation among the political, socio-economic and cultural contexts that prevail in the continent. Second, emphasis on quantitative research results and distorted interpretation of meanings and facts in observed behaviours are not representative of realities. Third, the assumption that individuals can and will exercise control over their behaviour has led to a focus on the individual rather than on the social and cultural contexts within which the individual functions and a disregard for the influences of contextual variables such as culture and environment. To overcome these limitations, there is need for a framework that recognizes the contextual environment as well as a theory of relation of knowledge to practice. This forms the basis for the Local Ecological Knowledge (LEK).

2.2 Local Ecological Knowledge

One of the difficulties faced by scholars who work in highly heterogenous cultural milieu is the inability to use scientific theories in explaining human-environment relationship especially in African countries. As the contexts in which knowledge and representation of realities or phenomena differ spatially and over time, it implies that a simple linear, universalized concept may not find a perfect explanatory fit. Anthropologies believe that environmental values are rooted in the traditional practices, religious beliefs and knowledge systems that contribute to community norms in small-scale

societies (see Alcorn, 1993). Bonaiuto et al (2002, p. 633) in a study of 'local identity processes and environmental attitudes....' argued in support of contextual factors as determinants of human-environment relationship in the following statements, 'generally, research on environmental concern does not take into specific account the actual places in which and toward which pro-environmental attitudes occur. Environmental concern tends to be seen as a product of attitudes, values or worldviews, considered only in their global and abstract dimension, with the idea that these general evaluations, which are out of context, should remain constant across different objects or situations'. Similarly, Hyun (2001) stressed the importance of understanding individual values within their particular evolving socio-cultural-historical contexts. These go a long way to buttress an earlier argument of Csikzentmihalyi and Rochberg-Halton (1981: xi) which lends credence to the idea that meanings about environment are socially constructed and culturally specific. They observed as follows:

> meanings involves an active process of interpretation……the concept accounts for the vast differences in the range of meanings that people derived from the objects with which they interacted. The same culturally legitimized object might provide only fleeting comfort to one person, whereas to another, it signified complex emotional and cognitive ties to other people and ideas (cited in Strang, 2005).

Babe (1997) wrote as follows, 'when we give meaning to the objects of….interactions, people act on them, which affects them'. That explains the reason why 'ecology blends environmental sciences with human cultures[5]' (page 1-2). No particular problem can be solved only by one aspect namely the material aspect. The symbolic aspect also has to be considered. As Strang (2005, p. 93) argues, 'the challenge is not merely to embark upon a balancing act, or to observe that these concepts are not mutually exclusive, but to effect a reconciliation-an understanding of the relationship between the physical, sensory and cognitive potentialities that all people share, and the specific socio-cultural and material contexts that different groups inhabit and construct'. She equally noted that Bourdieu's (1977) notion of habitus and Hegel's (1977) thesis capturing a dialectical scenario in which humans project the 'self' into the environment and reincorporate this projection are in line with Descola and Palsson (1996) depiction of human-environmental relations as mutually constitutive as well as Ingold's (2005:4) observation of the social and ecological systems as operating in a reciprocal interplay.

Geographically, human-environmental relationship does not assume uniformities given differences in physical, social and cultural circumstances. Morphy's (1998) model of cultural adaptation, which sets out to reconcile human experience and the various temporal and material realities of evolutionary, ecological and cultural change implies that different contexts carry different implications for human behaviours and adaptation. This and related arguments offer the very basis for understanding the relevance of local knowledge and adaptation strategies. In African contexts, such local knowledge commonly referred to as the local ecological knowledge tries to capture the accumulated knowledge usefully held by indigenous and local cultures, and which is rooted in a long-term and intimate involvement with local ecosystems. Local ecological knowledge is often held by members of a community that can be both geographically located and contextual to specific identity groups. This means that a 'knowledge community' might be a neighbourhood and/or a group with a shared culture, symbols, language, norms or even interests. Because indigenous systems of resource use and ecosystem design have evolved over thousands of years to provide for human needs without relying

[5] Culture though created by human beings, necessarily includes dimensions of the material or objective and symbolic or subjective. DeBusto (2009) observed that the material dimension of culture consists of a set of goods, utensils, practices and institutions created to face natural or objective physical circumstances. This material dimension of culture further comprises information technology, the market and political organization-those institutions that enhances human needs satisfaction. The symbolic dimension encompasses both the spiritual and the symbolic parts. It comprises of the norms that rule each social group.

on outside inputs, they can provide tools and knowledge for long-term interaction with environment, sustainability and resource conservation (Menzies and Butler, 2006 cited in Martin et al, 2010). Berkes (2008) emphasizes the fact that, unlike western science, local ecological knowledge is a knowledge-practice-belief system, often inherently linked with local religion and folklore that conveys interrellatedness between humans and the rest of the ecosystem. He further observes that emotionally powerful spiritual symbols are used to pass on moral codes, ecological knowledge, and management systems to future generations (also see Berkes et al, 2000). Practitioners of local ecological knowledge rely on evidence from traditions, institution, images, pictures, oral storeytelling or narratives, as well as visual demonstrations such as street theater (Van der Ploeg, 1993). Corburn (2003) observed that such knowledge is easily accessible to locals and widely shared.

Martins' et al (2010) philosophical comparison of the differences between local ecological knowledge and western science or professional knowledge[6] is very useful in understanding the various versions of human-nature interaction. In the categorization, three interrelated issues stand out as follows: 1.) the relationship between humans and their environment; 2.) the nature of knowledge-making in space and time, and; 3.) the role of belief systems in knowledge-making. By the yardstick of relationship between humans and nature, several studies have noted the local ecological knowledge as symbolizing the unity of nature and culture as opposed to the worldview of the western science which sees humans as typically disembedded, or as existing autonomous from the local system, creating a schism between non-human nature and human culture (Banuri and Apffel-Marglin, 1993; Pierotti and Wildcat, 1997; Bateson, 1972; Berks et al, 2000). Looking at knowledge making in time and space vis-a-vis the ecosystem, modern western science arose principally in one geographic locale (Europe) and is constructed and disseminated in a fixed manner based on rationality and universal principles. By this, western science assumes that knowledge exists independent of time and space. Citing several authors (such as Walters, 1986; Holling, 1996; Roy et al, 2010), Martins and others pointed out that ecosystem scientists have provided numerous examples of cases in which knowledge independent of time is insufficient due to common occurrence of ecological perturbation and surprise. This is in contradistinction to local ecological knowledge which has been shown to be context driven, evolutionary and adaptive, situated knowledge (Chambers and Gillespie, 2000) and is flexible over time, evolving with an often unpredictable, uncontrollable environment (Pierotti and Wildcat, 2000; Menzies and Butler, 2006). The last point in this categorization emphasizes the fact that, unlike western science, local ecological knowledge depends on beliefs, values, norms and spirituality which has been criticized for its 'anti-rational' philosophy (Howard and Widdowson, 1996). Scott (1998) in a critique of state-linked planning argued that projects often fail because professional planners fail to see the importance of the practical, contextual, and local knowledge that makes planning work. Berkes (2008) observed that the most fundamental lesson from the local ecological knowledge perhaps relate to the fact that worldviews and beliefs do not matter in the context of human-nature interaction.

The belief aspect of local ecological knowledge has raised questions of universal applicability and rationality. For instance, Howard and Widdowson (1996) argued that local ecological knowledge is 'a threat to environmental assessment given that rational understanding of the world is impeded by spiritualism'. In Dodu's (1975) argument, local ecological knowledge is fundamentally based on primitive theories condoned by ignorance, sanctioned by superstititon and sustained by belief in magic and witchcraft (see Azevedo et al, 1991). On the otherhand, others have argued that the belief component of local ecological knowledge enhances its ability to bridge the divide between nature and culture in many cases, further enabling technologies and management systems that are embedded in the local environment and sustainable over time (Banuri and Apffel-Marglin, 1993; Berkes, 2008; Martin et al, 2010). According to Henderson (1989: 27) local knowledge system is

[6] Corburn observed that Professional knowledge is generally held by members of a profession, discipline, University, government agency, or industrial association.

important in bridging the dichotomy between the physical and the spiritual, maintains a balance between humans, their society and their physical environment as well as helping in re-integrating humans into the society. In the case of water and sanitation related epidemics, many scholars have emphasized that the success of any government intervention programme cannot solely depend on the scientific understanding of diesease aetiology, references must also be made to accomodate values and beliefs that affect peoples' attitudes toward disease itself as well as behaviours towards modern intervention system (Jewitt, 2011; Azevedo et al, 1991; Odumosu, 2010).

Local ecological knowledge as a framework and basis for human-environment relationship is mostly encapsulated in a certain worldview, which according to Boonzaaijer and Apusigah (2008) include religious and philosophical systems and, to a large extent, dictate the way natural resources are viewed and managed in Africa. Such worldview influences the way people organise themselves and how they experiment and innovate, and are often dynamic and often influenced among others by religion as well as by science and formal education. According to the authors, the interaction of the spiritual, social, and material worlds implies the following possible constellations of knowledges:

- Local knowledge resulting from spiritual interactions only.
- Combinations of knowledge between the spiritual and social worlds.
- Knowledge resulting from social interactions only.
- Combinations of knowledge of the social and material worlds.
- Knowledge resulting from material interactions only.
- Combinations of knowledge of the material and spiritual worlds.
- Combinations of knowledge of the spiritual, social and material worlds.

The last constellation reflects the perfect state in African cosmovisions, in which the spiritual, social and material worlds are balanced in harmony with each other. The cosmovision of rural peoples is still expressed in everyday life and conversations-it strongly determines their choices. It is manifested in specialised institutions and systems, which are often inaccessible to the outsider. Most development interventions today concentrate on the material domain, and little on the social interactions between people. Such materislistic worldview is, to a large extent, influenced by the values encapsulated in the Western[7] perspectives on human-environment relationship. A lesson from the local ecological knowledge is that values and beliefs are an important part of a knowledge system, and constitute important channels for moral codes as well as determining ecological behaviours.

In contemporary development initiatives, water and sanitation policies in developing countries rarely consider the importance of indigenous water cosmovisions and beliefs, yet these play significant parts in supporting or constraining intervention. For instance, in African (and other indigenous) cultures, real life or wellbeing occurs where the three worlds of social, material and the spiritual meet (Miller and Hiemstra, 2009). Consequently, any effort to address the socio-economic challenges of the people without reference to such worldview often remains unsuccessful. This project will engage deeply in these issues, and is expected to contribute knowledge to the on-going debate on endogenous approaches to local development.

[7] Western tradition, according to Caton and Dunlap (1980 cited in Jacob, 1994) consist of the following beliefs and assumptions: 1.) that people are fundamentally different from all other creatures on earth, over which they have dominion; 2.) that people are masters of their own destiny, they can choose their goals and learn to do whatever is necessary to achieve them; 3.) that the world is vast, and thus provides unlimited opportunities for humans; and 4.) that the history of humanity is one of progress; for every problem there is a solution, and thus progress need never cease.

3 LOCAL ECOLOGICAL KNOWLEDGE FRAMEWORK: APPLICATION

In this section, an elaboration is made of the local ecological knowledge framework as a conceptual model as well as proceeding in its application as a methodological tool with particular reference to understanding water and sanitation practices in Nigeria. Although this framework is designed in an attempt to comprehend both the general and specific issues bordering on environmental health and medical geographies of rural villages in Nigeria, the framework could also be usefully adapted in other geographical spaces where environmental health issues and natural resources management intersect with deep rooted cultural norms and the barriers they create for the development of workable intervention measures. By this an argument is made for sensitive and flexible intervention programmes that incorporate the contexts of local cultures. This is not an entirely new line of argument. The ninth World Bank President, Sir James David Wolfensohn, in the mid-1990s once acknowledged the difficulties of implementing the Bank's programmes when he called for a need for greater sensitivity to and investment in national and local culture in the Bank's new development agenda (cited in Radcliffe and Laurie, 2006).

3.1 As a Conceptual Model

Local ecological knowledge (LEK) offers a structure for thinking of context as broad and key variable in assessment and intervention planning. It is founded and builds on the work of several scholars in several disciplines who have considered the interaction between persons and environment. Environmental psychologists, for instance, are very much interested in the interaction and interdependence of the physical elements of a person's immediate environment with behaviour (Holahan, 1986; Wicker, 1979). The school of environmental psychology scholars are, however, not holistic in their conceptualization of human-environment relationship when the broader contextual environments of socio-cultural and spiritual norms are given less emphasis. The theory of reasoned action (Ajzen and Fishbein, 1980; Fishbein, 1980; Fishbein and Ajzen, 1975) derived from the model of behaviour change has also been used to predict behaviours, and it focuses on four different dimensions: affect (attitudes), cognition (belief, opinion), conation (behavioural intentions), and behaviour (observed overt acts). A belief is said to represent the knowledge an individual has about an object, a proposition linking an object to an attribute. An attitude is a general predisposition that is based on beliefs and that leads to a set of intentions, rather than to a specific behaviour. Intentions are a special kind of belief in which the person is the object and the behaviour the attribute. A specific behaviour is viewed as determined by the person's intention to perform that behaviour (Fishbein and Ajzen, 1975: 16). Most social behaviour is assumed to be anchored on volition and very closely linked to intention to perform that behaviour. The model of reasoned action assumes that individuals act rationally in evaluating information and are free of outside constraints in taking action. The theory of culture embedded in this model treats culture as a set of beliefs, values, and individual goals that pattern human behaviour. In this view individuals are constrained by their image of normative action as they seek to pattern themselves in accordance to the values of their society (read Yoder, 1997). The model of reasoned action is more 'individually centered' and does not stress the specific role of social and ecological factors in explaining individual behaviour.

The general complexities of the world and specific environments one finds oneself implies that knowledge and actions emerging have some imprints of the contexts-the decisive factors accounting for what elements enter into decisions and what elements do not enter. According to Denzau/North (2004: 1, cited in Mielke et al, 2011: 10) human beings usually act based on insufficient information or '…..even in part upon the basis of myths, dogmas, ideologies and half-baked theories'. This according to the authors arise due to the complexities of the world/environment and the high costs

for attaining even roughly full information in order to establish individual preference rankings. This implies that local knowledge and emic understanding of relevance are very important. This perspective according to Berman et al (1994) assumes that underlying behaviours 'are, of course, patterns of knowledge, beliefs, cultural norms, and expectations of efficacy'.

Over the past few years, research focus has been directed on understanding water resources management in Nigeria as reflected in several works of Akpabio (2006, 2007, 2008, 2010, 2011), Akpabio and Ekanem (2009) and Akpabio et al (2007). Given the constellations of plural authorities (legal, traditional, spiritual, religious, administrative) and multiplicity of environmental contexts as well as varying socio-economic characteristics of actors, this present research attempt to understand the various ways in which people draw on beliefs, tradition and religious concepts and authorities in dealing with water and environmental health issues. This broadly falls under the ecology of local peoples' lives especially the motives for doing something. As early as 1955, Wellin (1955) had explored the core motives and circumstances of the women who boiled water and those who did not. Findings informed us that irrespective of the demonstrable health benefits of boiling water and the risks of 'not boiling', the greatest number of people were not convinced of boiling water purely on cultural reasons. For the few who were willing to accept the intervention measure, routine of activities prevented them from doing so. In the literature, the water of the Ganges is widely reported to be polluted but the Hindus perform their ablutions in it because of their beliefs in the restorative powers of mother Ganga (Alley, 2002 cited in Orlove and Caton). The interplay of cognitive and ecological factors produce some patterns of locally sanctioned and meaningful norms, behaviours and practices which may not necessarily be acceptable to wider socio-ecological and cultural order. Consequently, such peripheral behavioural tendencies are often discriminated against and labeled as 'deviant' (Mielke et al, 2011). Given that there is a world of difference between universalized norms and highly localized ones, it will appear therefore that the entire struggle for which pattern or system of knowledge and behaviour is and should, at best, is a manifestation of inexorable power struggle-in this case the dominant power will tend to have its way over the weaker ones. In relation to water and sanitation practices in Africa, issues directly emerging from these arguments include: a.) the existence of actors outside the immediate social and ecological situation who recognize the problems and prescribe solutions mostly in a scientific manner; b.) the existence of elite groups who use all instruments of state resources to promote 'sanctioned knowledge practices' even if it is obviously outside the norms of the local knowledge systems. Often times, the relationship between 'outsider actors' and 'local ones' in evolving common intervention or knowledge system remain unworkable given the domineering attitude of the outsider actor as well as mutually unwilling attitudes to learn from each other's knowledge. Given that a group's ecology, economy, social differentiations, and cultural convictions and behaviours are important in the entire constellation of knowledge struggles, this model holds the assumption that the only way to assess and understand human behaviours in relations to water and sanitation practices is to understand the contexts of the person and group. The contexts will then include the physical, temporal, social and cultural features while humans are interpreted in the contexts of experiences, cognitive and psycho social skills and abilities (Dunn et al, 1994). In this case, human knowledge and experiences reflect environmental contexts. The temporal dimension of human contexts imply a continuously shifting or changing situations, which also sets the stage for behavioural change/adjustment in relation to emerging set goals. For instance, the meanings and images of water and sanitation and the behaviours accompanying such image could undergo some gradual metamorphosis and change depending on factors such as education, exposure, age, income level, and changes in reformations in the structure of local governance, among others. Jewitt (2011) argued that the greatest limiting factors in the solution to inadequate sanitation stems from inappropriate, top-down sanitation interventions that prioritize 'hardware' and neglect wider political ecologies and 'software' (which in our opinion include socio-economic, cultural) dimensions. This, Jewitt further observed, has helped to prevent a thorough analysis of why different sanitation systems succeed or fail in different cultural contexts. One particular aspect of

contexts that are very important as an element of cultural feature is the spiritual dimension. Berkes et al (2000) agreed that the spiritual dimension of cultural feature forms important contexts of the local ecological knowledge in environmental health and natural resources management issues.

Individuals respond to actual or potential tasks through their contextual filter, the accumulated experiences and their perceptions about the physical, social, and cultural factors of their knowledge settings. While some persons may look at water and sanitation problems through the logic of disease transmission pathways arising from the contamination of water and food materials, others may build their perception based on their spiritual and ecological knowledge. This may help explain how differential contexts and circumstances affect individual behaviours. The former may be educated while the later may not be. The former may have been better exposed while the later may not have been. In another dimension, education or 'exposure' as changing circumstance may not succeed in impacting or changing attitudes about the subject of perception (in this case water and sanitation problem). A close scrutiny may then reveal some fundamental influences of spiritual beliefs, values and other cultural attachments. Douglas's (1966) observation of cultural differences in 'natural' and 'unnatural' behaviour present a useful background understanding of the reality of spatial and temporal variations in cultural attitudes towards environmental health issues. Based on Douglas's (1966) observation, Jewitt (2011) has identified studies by Cox (2007) and Holloway et al (2007) that attempt to demonstrate how dirt, contamination and disgust are conceptualized (and find expression) within different geographical contexts. Cox (2007:153), for example is noted to have emphasized how 'the traditions of writing on urban sanitation, squalor and decay have no counterpart in rural studies', which gives rise to intriguing tensions between imaginations of rural spaces as clean, pure and healthy and the actual importance of dirt, sweat and manure in traditional rural livelihoods (Holloway et al., 2007). In this context, dirt is not 'matter out of place' but 'an integral part of how the countryside is constructed, in the imaginations of both rural communities and urban dwellers' (Cox, 2007:154).

Relying on the temporal and spatial contexts associated with environmental health behaviours, the local ecological knowledge framework holds the following assumptions:

a) That the relationship between humans and the broader environment engenders what behaviours and outcomes are possible.

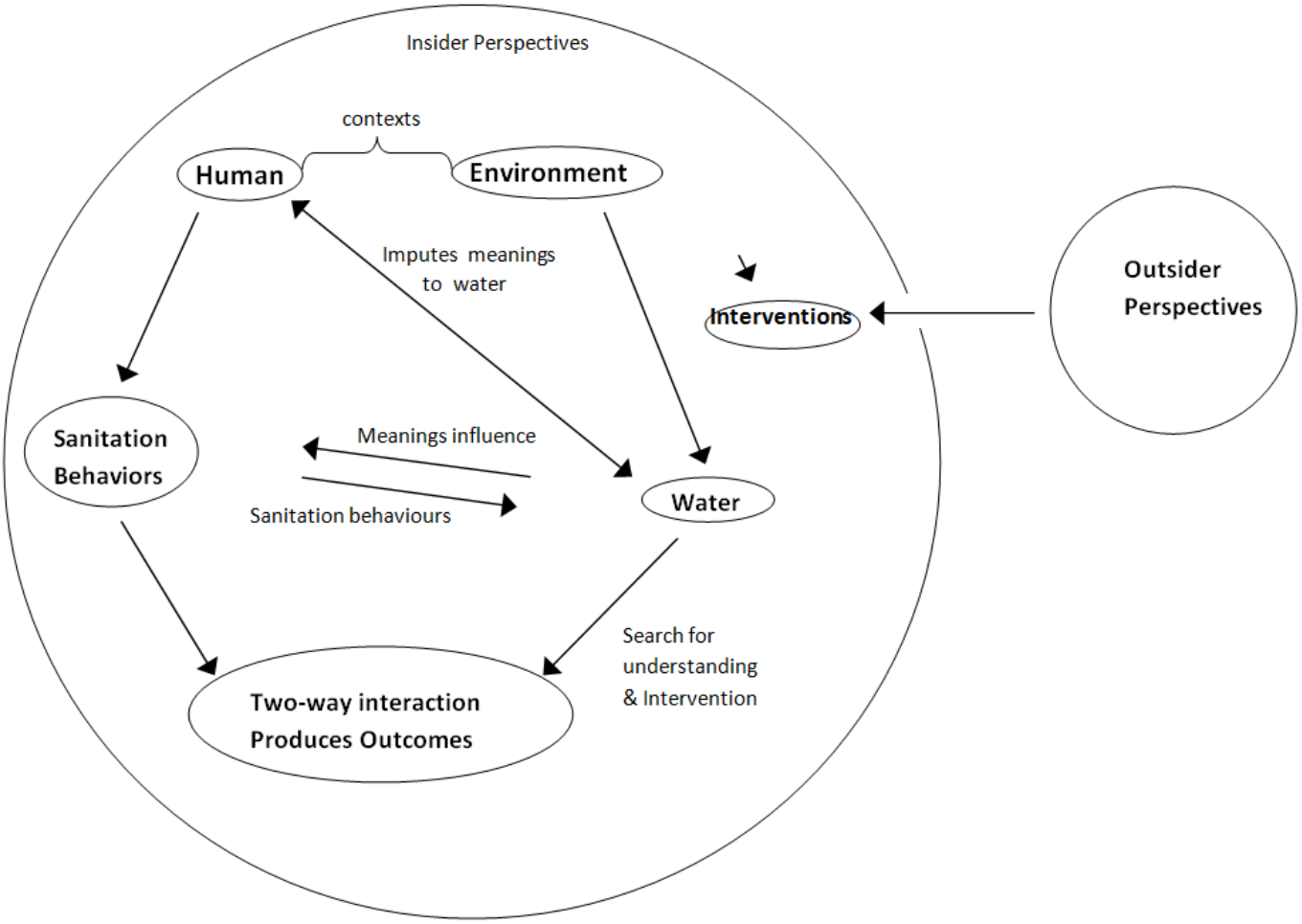
b) The interdependent relationship between human and environment is dynamic-can change or reinforce depending on the nature of the contexts, and circumstances which may differ across space and over time (such spatial, temporal and socio-cultural and economic circumstances have already been discussed).

c) It is not possible to understand behaviours in rural communities of Africa without understanding the contextual environment.

d) The continual interaction of humans and the environment produces knowledge that defines behaviours and actions over time.

In African countries, diverse and complex explanations for diseases and sicknesses linked to water, sanitation and hygiene behaviours evolve in relations to individual situated experiences which are nested in cultural factors of beliefs, traditional values, norms and religion. A diagrammatic representation of the model[8] is captured in Figure 1.

[8] Although this model is designed specifically to address general water and sanitation problem, it can also be usefully adapted to understanding other socio-environmental and natural resources management issues that have deep cultural entrenchments. The important thing is to recognize the key issues and variables as encapsulated in Figure 1 namely human, environment interaction and the behaviour produced.



A framework for Understanding Water and Sanitation Behaviors in Local Communities

In the model an attempt is made to advance the general understanding of the mechanisms governing local meanings about water and the accompanying behaviours which may have several sanitation implications. It is designed to capture the objects and contexts of behaviours and their interrelationship as well as the outcomes produced. In Figure 1, meanings about water are very fundamental as important contextual factor in controlling behaviours[9]. This equally implies that behaviours around water are a function of the meanings held about it[10]. However, what may seem 'inappropriate' and 'health endangering' behaviours in the language and logic of science may turn out to be culturally acceptable norms of human relationship with water and available water bodies

[9] John Donahue and Barbara Rose Johnston (cited in Linton 2010: 58) highlighted the need to investigate the links between how water gets defined, how it gets managed, and for whose benefit: 'what different cultural meanings does water have for the contending parties, and how do these meanings complicate mediation among the various interests? How are some social actors able to impose their definition of water on other social actors with different but equally legitimate definitions? In other words, how is power used in the service of one or another of the cultural definitions of water?'

[10] In the word of Linton (2010:58), 'water management implies a particular kind of hydro social relation, one characterized by deference to a kind of abstract expertise and professionalism. It also implies a particular kind of water, stripped of its complex social relationships such that it may be managed by experts who are not necessarily directly involved in these relationships.

(Douglass, 1966). In a wider context, the later norm of relationship assumes more of a functional dimension. This may have to do with a number of factors including the cultural and spiritual notions of health[11] and well-being[12] as well as the general judgments of environmental health issues. Social as well as economic factors such as level of education and awareness, level of poverty and access, income level, gender, marital status, age, level of mobility and exposure etc. equally play roles in determining individual and group behaviours around environmental health issues. Such factors constitute heavy barriers against behaviour change most especially when the cost of access becomes so limiting that individuals tend to be complacent with, and draws on resources within immediate reach as a way of coping.

Given the interplay of cultural, socio-economic and physical factors in environmental health behaviours, efforts should be directed at investigating and relating the various elements of observable behaviours against identified contextual factors e.g., cultural, socio-economic and physical or environmental to enhance analytical understanding of the various driving factors of local behaviours. For instance if it is discovered that certain practices such as hand washing after toilets, baby and wastes handling practices do not have deep cultural affinity, it would then be appropriate to restrict intervention at the level of massive education and enlightenment campaigns. There are, however, situations people find it difficult to do what is considered 'appropriate' or 'right' because of cultural reasons[13] (e.g., being obliged to use water judged to be of poor quality or indulging in sanitation practices that are believed to capture, reinforce or define the depth and values of mother-child bond). Such cultural practices are often very powerful enough as to reduce sensitivity to the 'inappropriateness' of indulging in certain unhygienic practices. In this case intervention will best succeed by working with available local value base and institutions (e.g., local traditional and religious value structures) than through secular approach (Oberkircher and Hornidge, 2011).

For purposes of mobilizing intervention, the local ecological knowledge framework suggests that the various contextual factors that sustain some water and sanitation behaviours considered scientifically 'inappropriate' be grouped into various affinities and strands of physical, socio-economic and cultural determinants. Such grouping is important in identifying context-based behaviours for analytical purposes. Grouping may not achieve completely mutually exclusive classes of interrelated facts and behaviour variables given the likely overlapping tendencies of some issues as well as the interrelatedness of factors. For instance, meanings[14] imputed on water and bodies of water could fall in the strands of either 'cultural' or 'socio-economic' depending on location and historical circumstances of relationship. What is often common as intervention to situations arising from water handling and sanitation practices is the penchant to frame interventions on the singular basis of the scientific logic which works purely at understanding the contamination cycle or diseases transmission pathways (and in a top-down manner) which often inform technological options and infrastructure dumping, among other forms of enlightenment campaigns. In most cases, the fundamental issues of contexts that drive behaviours are hardly touched. By using the local ecological knowledge framework, it would be possible to understand the fundamentals of supportive

[11] Mahapatra argues, 'a tribal man or woman is not usually considered afflicted with some diseases unless and until the individual feels incapable of doing normal work assigned to their respective age and sex in that culture (1990:4 see Mehta and Puja, 2007:201)

[12] If development should be seen in the contexts of expanding the real freedoms that people enjoy (Sen, 1999: 3), then the single dimensional notion of equating wellbeing and poverty with tangible and material gains over such intangible issues as socio-cultural identity and values etc. remain questionable.

[13] Cultural reasons is understood to include the various beliefs, taboos, traditions, spiritualities, religious practices, norms and value systems. Value systems remain highly relative and may travel across socio-economic and cultural realms.

[14] Studies have shown that where meanings around water are rooted in religion or spirituality, it becomes even more difficult to influence change of behaviours (Corell and Swain, 1995; Sen, 1962: 17; Akpabio, 2006; Eguavoen, 2008:125-133).

or constraining contexts and processes as well as understanding the mechanisms for which solutions could be best applied.

For methodological reasons, the LEK framework has been criticized for its 'anti-rational' philosophy which is not amenable to clear empirical analysis (Howard and Widdowson, 1996). The important concern tilts to the question of how such knowledge system could be identified for analytical purposes. Although available literatures are not clearly specific about this issue, an attempt is made here to capture some useful 'routes' or 'facts' to such knowledge system, with some useful examples (Table 1) as a methodological guide.

Table 1 Clues to local ecological knowledge

Clues to Local Knowledge	**Description and Examples**
Experiential Accounts, public narratives, community stories.	This accumulates through trial and error. Many ecologically related issues are often explained by local people based on their perception and relationship with the environment
Beliefs.	Self-convinced knowledge of the environment and ecosystem, meanings can be identified and explored during interviews, narratives etc.
physical observation of practices.	General practices and observances around a marine, river or stream ecosystem. E.g., sacred groves, religious/ritual activities.
Situatedness.	contexts of knowledge production and practices, e.g., routines, customs
Institutional practices.	how local institutions recognize, validate and integrate same into natural resource governance. How local institutions negotiate and regulate activities or development practices to preserve tradition. This could be measured by assessing relationship with public intervention programmes/projects.

These are not exhaustive. Depending on the study area and the general cultural and socio-economic contexts, the clues are expandable. As a methodological framework, the clues can facilitate and empower researchers by opening up communications into local knowledge systems.

3.2 Application of the Model: A case study of water and sanitation practices in local communities of Akwa Ibom state, Nigeria

A research was conducted on water meanings and sanitation practices in Akwa Ibom state, Nigeria, which started with an initial collection and transcription of local proverbs in 2004 and 2005 (Akpabio, 2006), and then subsequently seeking deeper understanding of their meanings with specific reference to drinking water. Such information specifically, on notions and values of water, were subsequently extended to understand their impacts on sanitation practices. This equally triggered additional follow-up investigation (with in-depth interviews) on various sanitation practices and hygiene behaviours of individuals and groups within the contexts of space and time.

As a consequence, the village elders and youths (males and females) were interviewed. The age grades were classified as follows- the elders were of 60 years and above, followed by those in the age

grades of 35 and 60 years while the rest were below 35 years but at least 18 years of age or older. These classifications were arbitrarily made to capture the various layers of opinions and, in most cases, particular attention was paid to the status and position of an individual. Individuals were allowed to freely discuss all they know about water and sanitation.

The study was based in three major ethnic communities from *Ibibio*, *Annang* and *Oron*. In-depth interviews were conducted on household's basis, with the head of a household being the contact person[15]. All interviews (n = 20 for each community) were conducted in local languages with the help of three trained research assistants. Case studies were made of few government drinking water projects (public impact on rural sanitation is very insignificant and conceptually built around drinking water projects) in these ethnic communities to understand the challenges underlying the survival of such projects both at the levels of governments/donor agencies and the communities involved.

Group leaders, village chiefs, and some elders were also separately interviewed because of their relative roles in the village governance. For instance, the village chiefs and elders are believed to be the most important sources of information on village history, ancestral matters and system of governance in their respective domains. As a way of balancing views and given the aim of this study, officials of Akwa Ibom state Rural Water and Sanitation (AKRUWATSAN), the only agency in charge of rural water and sanitation program in the state were interviewed. Such interviews were to enhance an understanding of how the state institutions relate with local people in the implementation of water and sanitation schemes. Although this agency may not have projects in some of these villages studied, the information gathered at that level was useful in enhancing the discussions, generalizations and conclusions. The various views that emerged were assembled and interpreted to identify the commonalities and differences within and across the study communities as well as changes over time. All discussions and interviews were guided by a checklist of discussion topics especially in local communities. Such checklist of topics broadly include: a.) ideas about water and water quality; b.) ideas about sanitation and hygiene; c.) water handling practices from source to utilization at home; d.) toilets and defecation preferences/practices; e.) ideas about some water related disease such as cholera, dysentery, typhoid and diarrhoea etc.; f.) toilet and faeces handling for children and adults; g.) hand washing after defecation, before eating, before preparing food; h) locational influences of sanitation behaviours; i) healing practices, among several others. This study also depended tremendously on additional information from individuals with relative knowledge of the areas studied as well as the general Akwa Ibom state. Consequently, students drawn from the University of Uyo with a fair knowledge of their respective ethnic localities were utilized to volunteer information and clarify some issues. They were useful in complementing information from fieldwork as well as providing clues to other relevant and sensitive information about local cultures and environments. In applying the local ecological knowledge framework in evaluating the data on water and sanitation practices, a step by step approach was followed (see Textbox).

[15] In African contexts, the head of a household is usually represented by a man. However, efforts were equally made to reach out to a woman (who anchors domestic water and sanitation practices) in a given household while information from such household was taken collectively as representing the household.

A Step by Step Approach in applying LEK framework

a. First is to identify the common issues of interest. This may include, but not limited to, the diversities of meanings, beliefs and practices on water, water quality, sanitation, hygiene practices, defecation practices, water and sanitation related diseases and epidemics, among many others.

b. explore human understanding/knowledge/attitude about these issues.

c. Evaluate the characteristics of contexts- physical, socio-economic, cultural and temporal which may support or constrain local knowledge, attitudes & behaviours about the common issues of research interest.

d. Sieve knowledge of identified facts and issues by contextual elements-socio-economic, physical and cultural. knowledge of problem may be due to socio-economic factors such as ignorance, low education status, lack of exposure, poverty, age, gender, marital status; physical factors may have to do with locational characteristics of a place while cultural factors may relate to beliefs, level of development, traditional practices, value systems, religious and spiritual norms etc.

e. Note the commonalities and differences of facts and information across spatial areas.

f. Relate the emerging knowledge/understanding to contextual environments to account for observed commonalities and differences.

g. Explore the temporal perspectives to understand what has or could be changed about certain knowledge, attitudes, values, beliefs, practices, behaviours etc.

h. Explore all possible and available local and external intervention measures about prevailing behaviours and practices (in this case water and sanitation).

i. Identify problems and opportunities with existing interventions.

j. Generate and explore possible interventions that could build on local value and institutional systems.

3.3 Discussion Points

The general views about water and sanitation related problems and hygiene practices were largely dictated by a whole range of physical, socio-economic, cultural as well as temporal factors. Water carries various meanings broadly categorized into the following themes namely, ‘divine or sacred resource’ (which cannot harm); ‘homes of spirit deities’ (spirit ancestors and deities are believed to live in water bodies); ‘religious/spiritual meanings’ (rituals and symbols of power), among several others (Table 2).

Table 2: Ideas and Beliefs around Water, Sanitation Practice and Hygiene Behaviours

Local Beliefs/ideas of Water	**General knowledge**	**Manifestations**
Sense of purity.	1.'Divine' and 'sacred' resource. 2.Water cannot harm[16].	1.A local proverb says *Mmooŋ-mmooŋ eyet idiọknkpọ, idiọk-nkpọ iyetke mmooŋ* (It is only water that can wash away dirt). 2. Water is believed to come from God (*Mmọọŋ edi ake Abasi*) and so is perfect. 3. The use of Holy water come from this belief. 4. Purity exemplifies the cleansing power of water which forms the basis of ritual bathes.
Homes of spirit deities and ancestors.	1.Water bodies of this category have existential meaning to individuals and communities. 2.Water is believed to offer healing powers to some human problems upon drinking or bathing.	1.Unquestioning use of water irrespective of quality. 2. Changes in quality are believed to be directly responsible by the spirit deities. 3. Attract values, rituals and deification.
Religious/spiritual symbol.	Water is believed to possess spiritual cleansing power among the Christians and traditional religion.	1.Holy water. 2. Ritual bathes.
Cleanliness.	'*Nsana idem ado uyai'* (physical cleanliness is beauty).	This notion encourages good personal and environmental hygiene practices.
Sanitary Taboos.	1. Some bodies of water are credited with some spiritual functions. 2.Some healing mixtures have sanitary implications which are not to be objected to	Objecting or raising questions on sanitary implications may spell negative consequences based on the local beliefs.
Germs Myths.	Germs never kill Africa (germs *iwutke* Africa).	A readily available justification for unavoidable unhygienic practices or for consuming unhygienic food.
Child Health/well-being.	The child's life is believed to be in the protective hands of 'God' (*Abasi ekpeme ntuho-eyen*).	1.Children's excreta are regarded as inoffensive. 2. Children are allowed to experiment with many things

[16] Of course in rural societies, issues of industrial water pollution are relatively unheard of. A behavioural change could be possible if water pollution were to be a problem.

		including soil eating. 3. Infant with a sign of convulsion or epilepsy is sometimes abandoned at a waste dump site as a traditional method for healing.
Diseases Epidemics.	1. Diarrhea or cholera epidemics assume spiritual explanation. It is seen as abnormal-'*idoho nkana'*, '*utoro-ikpu'*, *utoro-anwa ifot'*- especially if it kills. 2. It is linked with seasonal fruits and vegetables	1.Solution depends on the spiritual or traditional rituals. 2. Restriction against eating fruits and some vegetables.
Healing and Bathe restriction.	It is believed to be part of the rules and processes of traditional or spiritual healing.	Most traditional healing processes restrict their patience from bathe for some days.
Human excreta and traditional medicine.	This partly anchors on the belief that the dirtier the elements are the more effective the concoctions are believed to be.	Human faeces and urine occasionally form part of traditional medicine and spiritual healing e.g., *editibe* (local immunity against charms); *akpub* (bullet proof), etc.
Infant/Child Hygiene.	Beliefs on parental bond and inoffensiveness of child's waste products.	1. Infant faeces are not to be dumped alongside the adults. They are often disposed of around a plantain or banana stalk. It is believed the infant teeth will not develop. 2.Mothers are not bound to wash hands after baby's excreta handling 3.Children of under 7 years are normally free to defecate at any other location outside the general toilet 4. Swaddling clothes are mostly washed at home by hand for re-use. 5.Parents use their mouth to suck off infant nasal mucus 6. Parent/elders spit saliva into the mouth of the infant

Ideas of hygiene were based on what could be seen or perceived about an individual's habit of maintaining self and environmental sanitary cleanliness. Physical environmental and private cleanliness were recurring themes in answer to questions on hygiene. The general sense of cleanliness is based on local saying that links physical cleanliness with beauty (*nsana idem ado uyai*). Such emphasis on the positive aspect of hygiene constitutes the basis for conscious self and environmental hygiene behaviours and practices by individuals and groups.

Discussions on infant/child health and well-being practices reflect a mixture of beliefs, taboos and emotions and a lack of information as well. Notions on infant/child hygiene are dominantly based on the belief that children are under the protective hands of 'God' (*Abasi ekpeme ntuho-eyen*). One nursing mother in her late 20s made this remark, '……..these children are under God's care……they are innocent……so what do they know……no matter what they eat around, it does not harm them…..'. The respondent was quick to emphasize that most problems children have do come from evil powers……*idiok ererimbot* (wicked world). The belief in 'divine protection' for children influences parents' attitudes of allowing the infant or child to explore all manners of things around the environment including 'soil eating'. Such daily exploration/experimentation by infants/children represents a way of cultivating parental confidence about the capability of the child in mastering the immediate environment. Since the responsibility for child upbringing and well-being is solely the parents' business, cultivating the spirits of boldness, courage and risk-taking is the parents' way of shaping up the child for the future lives of 'self-struggle' and 'risk-taking'. This probably relates to the absence of social protection from the government that daily confronts the Nigerian society and her populace. An informant remarked that most parents hardly heed to the advice against exposing infants to 'soil eating'. The likely reply from parents on such advice, according to the informant, is '……leave them….that is part of childhood…….infants do eat soil…..you were in the same situation as infant'. Minimizing risky health practices and behaviours remain potentially difficult given that every social, economic, cultural and political structure within the Nigerian environment demand competitive spirits where survival struggles sometimes have to be a matter of individual strength, coping and risk-taking abilities as well as other forms of hard and extreme private initiatives. This is close to the observation of a warrior societal structure in which might seems always right (Douglass, 1966) and must be cultivated by the citizenry as a weapon for coping.

When questions on infant/child excreta handling were discussed, most responses were subjectively based on parental-child bond, inoffensiveness of child excreta and child wastes, among other beliefs. Key examples gathered include: an elder or the parents usually spit saliva into the child's mouth, the parents use their mouths to suck off the infant nasal mucus, infants faeces are not dumped alongside adult's but separately disposed of around the stalk of a plantain or banana roots, children can defecate at any point. One woman who should be in her fifties stated as follows, 'infant faeces are not dropped in the common pit with adults……doing so will affect the development of the infant teeth……it is often thrown into the bush or around waste dumpsites'. All the hygiene practices on infants and children are loaded with lots of meanings. Parental bond is a dominant idea, considered natural, and would amount to a sign of rejecting a child if these practices and emotions are not cultivated. Parents who are still looking for children must develop such bond of love and emotional attachment as expected natural responsibilities to guarantee procreation and the 'blessing' of children in their homes. Newly married couples who desire children in their matrimony are expected to display some behaviours such as not avoiding 'dirty children', helping clean up other children in their dirty condition, among others. Almost all the respondents were of the consensus that child or infant hygiene and parents behaviours toward them are normal traditional and natural expectations and practices that carry spiritual implications (Table 2).

The adults were also involved in unhygienic and unsanitary behaviours and practices. These happen as part of healing rituals or as part of liquid preparations or concoctions for various purposes. Most local healing processes restrict bathe for some days as part of the rules for successful healing. The

days could vary from one to as long as seven days depending on the nature of healing sought as well as the nature of the rites performed. Any form of sickness can attract any form of rite depending on the meaning attached, for instance when spiritual explanation of witchcraft, ancestral spirits etc. are attached to simple or common sickness of diarrhea and cholera. Such understanding determines the kind of treatment or healing options. Such points of healing process lead to practices with grave sanitation implications. There are instances in which human excreta (faeces or urine) are used as parts of traditional medicinal preparation for individual use. From an informant perspective, such traditional 'concoctions' as '*akpub*' (bullet proof) attract the most dirtiest or disgusting of substances which may include 'a piece of torn cloth from an insane person', among others. The dirtier the elements, the most effective the concoction is believed to be against charms. One man in his late 40s noted as follows, '…….local beliefs in bullet proof……*akpub*…..are real and often mysterious……how human beings with naked bodies withstand several bullets shots……I understand they drink a whole lot of things your eyes will hate to see…….'. while human and environmental wastes and unsanitary environments are seen from the negative perspectives, the beliefs and practices around them in the study area defies some imagination and this seems most consistent with Douglass (1966) observations of the universal view of extra power of taboos. For instance, an infant or child who is attacked by epilepsy or convulsion will be taken and abandoned in a waste dump site for some minutes or hours. The underlying spiritual assumption is that the earth goddess (*Eka Abasi*) responsible for that sickness is not friendly with dirty areas, which are often capitalized upon as the basis of separating the afflicted child from the '*Eka Abasi'*. This practice has to persist till the baby outgrows such problem.

Based on the model and given the various meanings attached to water and the accompanying sanitation practices, it was imperative to create a tabular scenario that relates the broad environmental contexts with prevailing notions of water and sanitation behaviours (Table 3).

Table 3: Contextual Variables and Relationship with Local Notions of Water and Sanitation

Contexts	**Water**	**Sanitation**
Physical/ Environmental	-Physical cleanliness observed for drinking water to some extent. -Settlement locations close to bodies of large rivers do not harbor much concern on the river water quality either because of religious/spiritual reason or simply a historical reason of established use.	-Cleanliness is beauty (*nsana idem ado uyai*). This is the basis for regular physical hygiene and compound/village cleanliness -Settlement location near gullies, ravines, rivers and open bushes practice open defecation most.
Socio-economic	-Food hygiene, child health and well-being practices (e.g., handwashing after baby's wastes handling or before and after defecation. -Covering drinking water and maintaining some safe distance from excreta and waste materials. -Washing dishes and covering them to prevent infectious flies. -Perception of water and sanitation epidemics as seasonal phenomena, among several other practices -Water related epidemics rarely linked to	Practices here range from physical bodily cleanliness, covering the latrine, regular toilet cleaning and disinfection, regular house and kitchen cleaning, safe toilet distance from house, infant/child excreta disposal practice, ownership of latrine, open defecation practices, perception of water and sanitation diseases epidemics as seasonal phenomena, relating infant diarrhea and cholera to the development of teeth, sucking infant nasal mucus with mouth, etc.

	water but to witches and witchcraft and sorceries.	
Cultural	-Water as home of spirit deities (this presupposes emotional attachment). -Water as divine or sacred resource (water cannot harm-*mmọọn mmọọn eyet idioknkpo*). -Power of spiritual cleansing and healing (some bodies of water serve these purposes). -Existential meanings (some human souls are believed to be harboured in bodies of water. Such individuals must develop close attachments to such bodies of water by bathing and drinking regularly or during sickness irrespective of the quality. -Water beliefs more stronger in settlements closer to large bodies of water e.g., coastal and riverine settlement locations.	-Unquestioning use of water irrespective of quality. -Sanitary taboo (e.g., objecting to the poor quality of some water bodies or some healing mixtures that need the waters of certain streams or rivers). -Child hygiene and health loaded with beliefs and customary attitudes (parent-child bond, child is free to defecate anywhere, dirty places such as waste dumpsites have healing values for certain infant/child sickness e.g., convulsion). -Because of spiritual and religious values, water is mostly exonerated as agents of some diseases. -Some healing rituals restrict patience from bath. -Human excreta and urine sometimes form part of healing mixture. -Infant faeces not to be dumped alongside adults' but disposed of in the open. -Parents spit saliva into infant mouths.

Water meanings, sanitation practices, hygiene behaviours in rural Nigeria are not only nested in cultural beliefs, physical environmental as well as socio-economic factors do render most intervention efforts unrealizable. Their impacts cut across diverse locations and socio-economic groups and consequently keep reinforcing the prevalence of water related diseases (water-born, water-washed and water-based). Most of the respondents do not harbor serious concerns for germs (bacteria causing organisms). There is a popular saying associated with 'disease germs' which goes as 'germs *iwutke* Africa' (germs never kill Africa). The perceived 'impotency' of germs, which is largely based on ignorance and helplessness, is at least one entry point for understanding various sanitation and hygiene related behaviours. The basis of this understanding did not have much to do with culture than economic factors. Within the hierarchy of needs, acquisition of essential items as food, shelter, water and security attract high priorities than quality and hygiene. Consequently, financial investments in sanitation and hygiene to ensure the safety and quality of acquired needs remain the least in the priority list. This pushes back, though unsuccessfully, the responsibility for provision of sanitation services on the government. Although individual attitudes could be changed through programmes of community-driven education, such efforts will have to be matched by significant improvement in the standard of living for it to have any meaningful outcome.

Locational effects were noted to play a role in driving sanitation and hygiene related behaviours. Settlements closer to open vegetation, big natural ravine or open bodies of water were more likely to practice open defecation. Where these conditions are not favourable, ownership of private latrines will be encouraged. In coastal areas, many settlements do not own pit latrine because of availability of very many ravines as well as river systems (which also served as sources of drinking water). Here in lies the paradox of purity and danger as observed by Douglass (1966). A study by Ikurekong et al (2008) has shown a very high incidence of water and sanitation related diseases linked with highly contaminated drinking water sources and inadequate sanitation in such areas. Settlements whose sources of livelihoods depended on the river were generally more likely to be influenced by water-linked beliefs, which will affect their sanitation related behaviours. Given the various existential meanings developed by local communities about water, it will be culturally contradictory to expect a perception that turns out to implicate water as a source of existential problem.

Socio-economic improvements (education, poverty reduction, exposure to better information, and improved services provision and effective settlement planning) could possibly lead to behavioural change. However, such behavioural change may be slightly difficult where cultural and religious barriers take roots. This is because some of the hygiene related behaviours were still within the clutches of beliefs. Informant discussants were very particular about these with clearly cited instances on infant/child hygiene, health and wellbeing, ascribing diseases' epidemics to spiritual forces, patronage of local healing and spiritual homes as well as the various deep-seated beliefs and meanings attached to water and bodies of water, among others. An informant in his early 30s (who is educated upto a Bachelors' degree) stated, '……all these issues of drinking dirty things for protection or patronizing traditional healing homes or sorceries…..do you think they are limited to the common people?.....top government officials, educated people…..in short very many of them are involved…..or do you tell me they will say some of the concoctions they drink are unhygienic….never…….'. Behaviours relating to infant/child hygiene equally assumed deep-seated cultural root. The ideas and practices about child-parents bond were responsible for such unhygienic behaviours as spitting saliva into the infant mouth, the perception of child excreta as inoffensive, among others. The desire to mould the child character in the likes of the parents was one of the explanations offered for spitting saliva into the infant mouth. These practices are not understood from the physical perspective of hygiene and child well-being, they are loaded with spiritual meanings with implication that families not prepared to practice or endure some of the practices are spiritually 'cursed' of having children. Besides the reasons of physical aesthetic and a conscious attempt to influence the perceptions of self (through regulating and controlling certain information during interview), those in the educated class are not really free from the grips of cultural beliefs that are attached to water and sanitation practices. Openly stigmatizing some of the practices only relegates them to individual and household privacy/secrecy.

Beliefs and behaviours about water, sanitation and hygiene tend to be very strong among the elders and the less exposed. This manifested at the various instances of discussions as most of them do not hide what they believe and practice. Although ignorance and exposure could explain this more, it was gathered at informal levels that such did not make much difference between the educated and uneducated except that the later (the uneducated) was more open and frank in explaining their behaviours than the former (the educated), for fear of being ridiculed.

Clearly, solution seeking behaviours arising from sanitation and hygiene problems will be influenced by ideas about causes and the beliefs underlying possible responsive practices. For instance, infant diarrhea is believed to be associated with teething. Consequently, parental response will be 'a no action' situation given that such a case is believed to be 'normal' for infants. At most the mother will prepare small herbal substance or purchase 'teething powder' to regulate the diarrhea. In cases where diarrhea is believed to be associated with bad food, seasonal fruits (mango, fresh vegetables etc) or hot/cold food (e.g., hot eggs etc), the usual response is regulation or stoppage. These

reflected much on the level of ignorance and have less to do with cultural beliefs. This may pose less difficulty for information and enlightenment programmes aimed at achieving a reduction in risky behaviours that may affect the child health and well-being.

Contrary to prevailing expectation, religious affiliation has no significant impact over most of the belief aspects of sanitation practices and hygiene behaviours. Although over 90% of the general population in the area professes Christianity, such identified issues bordering on sanitation, hygiene and healthcare behaviours and practices still received greater influence of the local tradition. The proliferation and consequent patronage of healing homes imply that every sanitation and hygiene concerns arising from treatments from such places are never discounted. More so, most spiritual homes run by churches equally integrate and draw on some elements of traditional healing options in their practices. Given these unique interplay of the physical, traditional, religious and spiritual factors, achieving effective Programme intervention will have to depend on available local institutions and groups in a manner that utilizes dialogue and information dissemination practices. Oberkircher and Hornidge (2011) have suggested the incorporation of available local value base in passing necessary information to local groups than using the Western secular approach. In this context, the use of available local traditional and religious value structures could pass the needed environmental health information given the wider respect and acceptability that such structures enjoy among the rural populace.

4 CONCLUSION

This paper sought to understand how individuals draw on local ecological knowledge in relating with water and how such relationship produce sanitation related behaviours. Human contexts such as cultural and socio-economic variables were matched with the various ideas held about water and sanitation as a way of drawing relative inferences about relationship. Consequently, similarities or differences in ideas about water were explained in relation to cultural or socio-economic human variables. We were equally interested in the effect of environmental contexts such as physical location of settlements in influencing sanitation behaviours. Findings informed us that local knowledge held about water (expressed in meanings, beliefs, values etc.) influence sanitation behaviours which consequently lead to water and sanitation related health outcomes. Understanding the broad nature of human-environment relationship and the outcome produced is a long-settled scientific practice especially with respect to water and sanitation related problems. However, such scientific pathway gets lost where local meanings, values and norms define human-environment relationship. Therefore, successful practical intervention in solving water and sanitation related problems in Africa must move beyond hard science and focus more in understanding the complexities of water and sanitation health issues.

The ideas and arguments for LEK is to widen our analytical lens by giving recognition and subsequently incorporating the multiplicity of complex environmental, socio-economic, temporal and cultural factors in understanding equally complex environmental health issues that are deeply entrenched in culture. The framework particularly focuses on the transactional perspective of human-environment relationship. It recognizes the interrelationship of human with the physical, socio-economic and broader cultural environment (often described as contexts) as a dynamic process that keeps producing outcomes and specific behaviours. It equally recognizes the changing circumstances of the key factors (human, physical, socio-economic and cultural) in relation to objects of interaction. Contexts are very critical in producing meanings around specific issues which then produce some attitudes and intentions as well as actual behaviour. Most complex environmental health issues should then be seen as products of a range of ecological, socio-economic and cultural and cannot be addressed with simple linear approach encapsulated in the pure sciences. Grouping and understanding such complex contextual characteristics produce more focused and sharpened insights that could help strengthen practical intervention. In the case of water and sanitation behaviours, Jewitt (2011) has highlighted the danger of attempting to impose hardware solutions[17] that are inappropriate to individual socio-cultural setting. She, instead, argues for the consideration of locally specific sanitation 'software' (education, awareness creation etc.) measures given deeply entrenched influence of cultural norms and taboos around many critical sanitation issues.

The most important questions (most of which could pass as limitations) and concern about this framework relate to how the various contextual factors could be captured objectively as well as deciding or sieving which factor explains which behaviour relatively very accurately. More so, there may be many more contextual features available to influence individual behavioural response than captured in this piece. With the little case study presented, direct, participatory and in-depth interviews as well as key informants are very important in probing individual understanding, beliefs, attitudes, experiences and institutional practices as well as drawing inferences surrounding observed norms of behaviours. It is not enough to identify behaviours and relate same with the contextual features, more grounded and thorough analysis are needed with highly relevant qualitative research tools available. Analysis of socio-economic characteristics of individuals as well as personal

[17] Paul (1957) in his opening statement noted, 'improvement of the environment for better health is not a matter of technology. It may impinge on various beliefs and customs of people and lead them to reject such action

observations become equally relevant in highlighting and emphasizing contextual factors that are socio-economically determined while personal observation could contribute in establishing relationship between locational factors and environmental behaviours. According to Mosey (1981) any frame of reference must clearly capture and describe the necessary postulates to facilitate practical application as well as offering specific guidance for intervention. Researchers employing this framework will therefore need to refine the various contextual factors by assessing their adequacy and answering practice-oriented questions. Acknowledgement is made of the fact that one single case study as utilized in supporting this framework is not sufficient and thorough enough but given that this framework has just been developed, more research and field application is necessary to validate some of its assumptions.

5 REFERENCES

Akpabio, E. M. (2011). Water and People: Perception and Management Practices in Akwa Ibom State, Nigeria. Society and Natural Resources, **24** (6): 584-596.

Akpabio, E. M. (2010). Integrated Water Resources Management in Nigeria: Local factors and institutional challenges.. Lap Lambert Academic Publishing, Germany, 164 pages.

Akpabio, E. M. & Ekanem E.M. (2009). Water Uncertainties in Southeastern Nigeria: Why Government should be interested in Management. *International Journal of Sociology and Anthropology* **1**(2): 038-046. http://www.academicjournals.org/ijsa.

Akpabio, E. M. (2008). Integrated Water Resources Management in the Cross River Basin, Nigeria: How can we Reconcile Institutional Boundaries and Interests? *International Journal of River Basin Management* **6** (2): 1-10.

Akpabio, E. M (2007). Nigeria's Water Law: how is it translated in the Cross River Basin? *International Journal of Regulation and Governance* **7** (2): 157-184.

Akpabio, E. M., Watson, N. M., Ite, U. E. and Ukpong, I. E. (2007) Integrated water resources management in the Cross River Basin, Nigeria. *International Journal of Water Resources Development* **23** (4): 691-708.

Akpabio, E. M. (2006). Notions of Environment and Environmental Management in Akwa Ibom State, South-eastern Nigeria. *Environmentalist* **26**, 227-236.

Alcorn, J. B. (1993). Indigenous Peoples and Conservation. Conservation Biology 7: 424-426.

Alley, K. D. (2002). On the Banks of the Ganga: When Wastewater Meets a Sacred River. Ann Arbor: University, Mich. Press.

Ajzen, I. and M. Fishbein (1980). Understanding Attitudes and Predicting Social Behaviour. Englewood Cliffs, NJ: Prentice-Hall.

Auerswald, E. H. (1971). Families, Change, and Ecological Perspective. Family Process, 10: 263-280.

Aung M. H. And T. Hlaing (1989). Prevention of Diarrhoea and Dysentery by Hand Washing. Transactions of the Royal Society of Tropical Medicine and Hygiene, 83, 128-131.

Azevedo, M. J., G. S. Prater and D. N. Lantum (1991). Culture, biomedicine and child mortality in Cameroon. Soc. Sci. Med. 32 (12): 1341-1349.

Babe, R.(1997). Understanding the Cultural Ecology Model: In D. Cliché (ed.). Cultural Ecology. The Changing Dinamics of Communications, IIC, Londres.

Barnabas, A. P. (1982). Policy and Community Participation in Drinking Water Supply to Rural Areas. Assignment Report. WHO (SEAR), New Delhi.

Banda, K., R. Sarkar, S. Gopal, J. Govindarajan, B. B. Harijan; M. B. Jeyakumar; P. Mitta; M. E. Sadanala; T. Selwyn; C. R. Suresh; V. A. Thomas; P. Devadason; R. Kumar; D. Selvapandian; G. Kang; V. Balraj (2007). Water Handling, Sanitation and Defecation Practices in Rural Southern India: a Knowledge, Attitudes and Practices. Transactions of the Royal Society of Tropical Medicine and Hygiene, 101: 1124-1130

Banuri, T., Apfell-Marglin, F. (1993) (eds). Who will Save the Forest? Knowledge, Power and Environmental Destruction. Zed Books, London

Bateson, G. (1972). Step to an Ecology of Mind. The University of Chicago Press, Chigaco.

Berkes, F. (2008). Sacred Ecology. Taylor and Francis, Philadelphia.

Berkes, F., Colding, J., Folke, C. (2000). Rediscovery of Traditional Ecological Knowledge as Adaptive Management. Ecol. Appl.10 (5), 1251-1262.

Berman, P., C. Kendall, and K. Bhattacharyya (1994). The Household Production of Health: Integrating Social Science Perspectives on Micro-level Health Determinants. Social Science and Medicine 38: 205-215.

Bertalanffly, V. L. (1981). A System view of Man. Westview Press, Boulder, Colorado.

Bonn, 2011. Policy Recommendations: The Water, Energy and Food Security Nexus – Solutions for a Green Economy. http://www.water-energy-food.org/documents/bonn2011_policyrecommendations.pdf accessed on 10th January 2012.

Bonaiuto, M., G. Carrus, H. Martorella and M. Bonnes (2002). Local Identity Processes and Environmental Attitudes in Land Use Changes: The Case of Natural Protected Areas. Journal of Economic Psychology, 23, 631-653

Boonzaaijer, C. M. S. and A. A. Apusigah (2008). Endogenous Development in Africa. Chapter Three. In: D. Millar; A. A. Apusigah and B. Haverkort (eds). Endogenous Development in Africa, Towards a Systematization of Experiences. COMPAS/UDS: the Netherlands.

Black, M. and Talbot (2005). Water, a Matter of Life and Health-Water Supply and Sanitation in Village India. UNICEF. Oxford University Press. Pp 93-129.

Black, M. and Fawcett, B. (2008). The Last Taboo: Opening the Door on the Global Sanitation Crisis. London: Earthscan.

Bradley, D. (1977). Health Aspects of Water Supplies in Tropical Countries. In: Water, Wastes and Health in Hot Climates, Feachem, R., McGarry, M. and Mara, D. (eds). Chichester: John Wiley, PP.

Briggs, D. (2003). Making a difference: indicators to improve children's environmental health. Summary. Prepared on behalf of the World Health Organization. WHO.

Bronfenbrenner, U. (1979). The Ecology of Human Development. Cambridge, MA: Harvard University Press.

Bruner, J. (1989). Acts of Meaning. Cambridge MA: Harvard University Press.

Bourdieu, P. (1977). Outline of a Theory of Practice (trans.R. Nice). Cambridge: Cambridge University Press.

Cairncross, S., Blumenthal U., Kolsky, P., Moraes, L. and Tayeh, A. (1996). The Public and Domestic Domains in the Transmission of Disease. Tropical Medicine and International Health 1, 27-34..

Catton, W. R. and R. E. Dunlap (1980). A New Ecological Paradigm for Post-exuberant Sociology. American Behavioural Scientist 24: 15-47.

Chambers, D. W., Gillespie, R. (2000). Locality in the History of Science: Colonial Science, Technoscience, and Indigenous Knowledge. Osiris 15, 221-240.

Corell, E. and A. Swain (1995). India: The Domestic and International Politics of Water Scarcity. In L. Ohlsson (ed). Hydropolitics: Conflicts over Water as a Development Constraints. ZED Books, Dhaka.

Corburn, J. (2003). Bringing local knowledge into environmental decision making: improving urban planning for communities at risk. Journal of Planning Education and Research 22: 420-433.

Cox, R. (2007). Introduction. In: Campkin, B. and Cox, R. (eds). Dirt: New Geographies of Cleanliness and Contamination. London: IB Tauris, 153-155.

Csikzentmihalyi, M. and Rochberg-Halton, E. (1981). The Meaning of Things: Domestic Symbols and the Self. Cambridge: Cambridge University Press.

Curtis, V., Cairncross, S. (2003). Effect of Washing Hands with Soap on Diarrhea Risk in the Community: a Systematic Review. Lancet Infect. Dis. 3, 275-281.

Curtis, V., Cairncross S. and Yonli, R. (2000). Domestic Hygiene and Diarrhoea-Pinpointing the Problem. Trop Med Int Health 5: 22-32.

Dearing, J. (2006). Climate-human-environment interactions: resolving our past. Climate of the Past 2: 187-203.

De Bustos, J. C. M. (2009). Cultural Ecology. Culture, Communication and Ecology. Infoamerica_Icr_Juan_Carlos_De_Miguel_Bustos.

Denzau, A. T. and D. C. North (1993). Shared Mental Models: Ideologies and Institutions. The Economics Working Paper Archive (EconWPA; Economic History 9309003). Cited in Mielke, K., C. Schetter and A. Wilde (2011). Dimensions of Social Order: Empirical Fact, Analytical Framework and Boundary Concept. ZEF Working Paper Series 78. Center for Development Research, University of Bonn, Germany.

Derryberry, M. (1954). Health Education Aspects of Sanitation Programmes in Rural Areas and Small Communities. Bull. Wld Hlth Org, 10: 145-154.

Descola, P. and Palsson, G. (eds) (1996). Nature and Society: Anthropological Perspectives. London: Routledge.

Dietz, T., Eugene A. Rosa and R. York (2009). Environmentally efficient well-being: Rethinking sustainability as the relationship between human well-being and environmental impacts. Human Ecology Review 16 (1): 114-123

Dodu, S. (1975). Meeting the Health Needs of Our Developing Countries: Past, Present and Future. University of Ghana. New Series 5, 5.

Douglas, M. (1966). Purity and Danger: An Analysis of Concepts of Pollution and Taboo. London: Routledge and Kegan Paul.

Dunn, W., Brown, C., and McGuigan, A. (1994). The Ecology of Human Performance: a Framework for Considering the Effect of Context. American Journal of Occupational Therapy, 48, 595-607.

Eguavoen, I. (2008). The Political Ecology of Household Water in Northern Ghana. ZEF Development Studies. Litt Münster. Germany.

Esrey, S. A., Potash, J. B., Roberts, L., Shiff, C. (1991). Effects of Improved Water Supply and Sanitation on Ascariasis, Diarrhea, Dracunculiasis, Hookworm Infection, Schistosomiasis, and Trachoma. Bull. World Health Organ. 69, 609-621.

Esrey, S. A., Gough, J. Rapapor, D., Sawyer, R. Simpson-Hebert, M., Vargas, J. et.al (1998). Ecological Sanitation. Stockholm: Swedish International Development Cooperation Agency.

Fishbein, M. and I. Azjen (1975). Belief, Attitude, Intention, and Behaviour: An Introduction to Theory and Research. Boston: Addison-Wesley.

Fishbein, M. (1980). A Theory of Reasoned Action: Some Applications and Implications. In Nebraska Symposium on Motivation, 1979. H. Howe and M. Page (eds). Pp.65-116. Lincoln: University of Nebraska Press.

Flyvbjerg, B. (2001). Making social science matter: why social inquiry fails and how it can succeed again. Cambridge, UK: Cambridge University Press.

Gibbs, L. M. (2009). Water places: cultural, social and More-than-Human Geographies of Nature. Scottish Geographical Journal, Vol. 125, No. 3-4, 361-369.

Gillanders, G. (1940). Rural Housing. Journal of the Royal Institute of Sanitation 60 (6): 230-240

Hall, E. T. (1983). The Dance of Life. New York: Doubleday.

Hart-Davis, A. (2008). Thunder, Flush and Thomas Crapper: An Encyclopedia. London: Michael O' Mara Books.

Hart, R. (1979). Children's Experience of Place. New York: Irvington.

Hegel, F. (1977). The Phenomenology of Spirit. Oxford: Clarendon Press.

Henderson, G. A. (1989). A practitioner's guide to understanding indigenous and foreign cultures, P:3. Charles Thomas, Illinois.

Holahan, C. J. (1986). Environmental Psychology. Annual Review of Psychology, 37, 381-407.

Holling, C. S. (1996). Surprise for Science, Resilience for Ecosystems, and Incentives for People. Ecol. Appl. 6 (3), 733-735.

Holloway, L., Venn L., Cox R., Kneafsey M., Dowler E. and Toumained H. (2007). Dirty Vegetables: Connecting Consumers to the Growing of their Food. In: Campkin B and Cox R (eds). Dirt: New Geographies of Cleanliness and Contamination. London: IB Tauris, 178-188.

Horelli, L. (2006). Environmental human-friendliness as a contextual determinant for quality of life. European Review of Applied Psychology, 56:15-22.

Howard, A., Widdowson, F. (1996). Traditional Knowledge Threatens Environmental Assessment. Pol. Options 17 (9), 34-36.

Hyun, K. J. (2001). Sociocultural Change and Traditional Values: Confucian Values among Koreans and Korean Americans. International Journal of Intercultural Relations 25: 203-229.

Ikurekong, E. E., J. O. Esin and E. P. Udofia (2008). Faecal Waste Disposal and Environmental Health Status in a Nigerian Coastal Settlement of Oron. Taf Preventive Medicine Bulletin, 7(5): 363-368.

Ingold, T. (2005). *The Perception of the Environment, Essays in Livelihood, Dwelling and Skill*. Routledge. London.

Ingold, T.(2000). The perception of the Environment: Essays on Livelihood, Dwelling and Skill. London: Routledge. In: Max Planck Institute for Social Anthropology. Report 2008-2009, vol 1. Halle/Saale. Germany.

Jacob, M. (1994). Sustainable Development and Deep Ecology: an Analysis of Competing Traditions. Environmental Management 18 (4): 477-488.

Jakimow, T. (2008). Answering the critics: the potential and limitations of the knowledge agenda as a practical response to post-development critiques. Progress in Development Studies 8: 311-323.

Jewitt, S. (2011). Geographies of Shit: Spatial and Temporary Variations in Attitudes Towards Human Wastes. Progress in Human Geography 35 (5) 608-626.

Khan, M. U. (1982). Interruption of Shigellosis by Handwashing. Transactions of the Royal Society of Tropical Medicine and Hygiene 76, 164-168.

Knapper, C., Lerner, S., and Bunting, T. (1986). Special Groups and the Environment-An Introduction. Environements, 18 (3), 1-5.

Koning, N. and E. Smaling (2005). Environmental crisis or 'lie of the land'? the debate on soil degradation in Africa. Land Use Policy 22: 3-11.

Kolsky. P. J. (1993). Diarrhoeal Disease: Current Concepts and Future Challenges Water, Sanitation and Diarrhea: the Limits of Understanding. Transactions of the Royal Society of Tropical Medicine and Hygiene 87, Supplement 3, 43-46.

Kolsky, P. and Blumenthal, U. (1995). Environmental Health Indicators and Sanitation-Related Disease in Developing Countries: Limitations to the Use of Routine Data Sources. World Health Stat Q; 48: 132-9.

Kurup, B. K. (1996) The community-managed sanitation programme in kerala - learning from experience. Report for (IRC International Water and Sanitation Centre, The Hague, The Netherlands).

Lane, J. (2012). Barriers and opportunities for sanitation and water for all, as envisaged by the New Delhi statement. IDS Bulletin volume 43 Number 2, March. Institute of Development Studies, Oxford, UK.

Law, M. (1991). Thee Environment: a Focus for Occupational Therapy. Canadian Journal of Occupational Therapy, 58, 171-179.

Law, M., B. Cooper, S. Strong, D. Stewart, P. Rigby and L. Letts (1996). The Person-Environment-Occupation Model: A Transactive Approach to Occupational Performance. Canadian Journal of Occupational Therapy, vol.63, No. 1.

Lindblom, C. E. and David K. Cohen (1979). Usable knowledge: social science and social problem solving. New Haven, CT: Yale University Press.

Linton, J. (2010).What is Water? The History of a Modern Abstraction. University of British Columbia Press.

Liu, J. T., Dietz, S. R., Carpenter, C. Folke, M. Alberti, C. L. Redman, S. H. Schneider, E. Ostrom, A. N. Pell, J. Lubcheneko, W. W. Taylor, Z. Ouyang, P. Deadman, T: Kratz, and W. Provencher (2007). Coupled human and natural systems. Ambio 36, 639-649.

Madan, T. N. (1987). Community Involvement in Health Policy: Socio-Structural and Dynamic Aspects of Health Beliefs. Soc. Sci. Med. Vol 25, No. 6, pp 615-620.

Mahapatra, L. K. (1990). Rehabilitation of Tribal Affected by Major Dams and other Projects in Orissa. In A. P. Fernandez (ed). Report on Workshop Rehabilitation of Persons Displaced by Development Projects. Bangalore: Institute for Social and Economic Change.

Manson, S. M. (2008). Does scale exist? An epistemological scale continuum for complex human-environment systems. Geoforum 39: 776-788.

Mara, D. (2012). Sanitation: what's the real problem? IDS Bulletin volume 43 Number 2, March. Institute of Development Studies, Oxford, UK.

Martin, J. F., E. D. Roy, S. A. W. Diemont, B. G. Ferguson (2010). Traditional Ecological Knowledge (TEK): Ideas, Inspiration, and Designs for Ecological Engineering. Ecological Engineering 36: 839-849.

McFarlane, C. (2008). Sanitation in Mumbai's informal settlements: State, slum and infrastructure. Environment and Planning A. 40 (1): 88-107.

Mehta, L. and Punja, A. (2007). Water and Well-being, Explaining the Gap in Understandings of Water (chapter 8: 189-210). In Baviskar, A. (2007). Waterscapes, the Cultural Politics of a Natural Resource. Permanent Black, New Delhi.

Menzies, C. R., Butler, C. (2006). Understanding Ecological Knowledge: in Menzies, C. (ed). Traditional Ecological Knowledge and Natural Resources Management. University of Nebraska Press, Lincoln NB.

Mielke, K., C. Schetter and A. Wilde (2011). Dimensions of Social Order: Empirical Fact, Analytical Framework and Boundary Concept. ZEF Working Paper Series 78. Center for Development Research, University of Bonn, Germany.

Millar, D. and W. Hiemstra (2008). An Evolving Framework for Endogenous Development in Africa: Walking the COMPAS 'Bushpath'. In Millar, D., A. A. Apusigah, C. Boonzaaijer (eds). Endogenous Development in Africa-Towards a Systematization of Experiences. COMPAS/UDS. EDU, Barneveld, the Netherlands.

Moser, G. (2009). Quality of life and sustainability: toward person-environment congruity. Journal of Environmental Psychology 29: 351-357.

Mosey, A. C. (1981). Occupational Therapy: Configuration of a Profession. New York: Raven.

Morales, M. R. Barberena, J. B. Belardi, L. Borrero, V. Cortegoso, V. Duran, A. Guerci, R. Goni, A. Gil, G. Neme, H. Yacobaccio, M. Zarate (2009). Reviewing human-environment interactions in arid regions of southern south America during the past 3000 years. Palaeogeography, Palaeoclimatology, Palaeoecology 281: 283-295.

Morphy, H. (1998). Cultural adaptation. In G. Harrison and H. Morphy (eds). Human adaptation pp.99-150. New York and Oxford: Berg.

Muhlhhausler, P. and A. peace (2006). Environmental discourses. Annual Review of Anthropology 35: 457-79.

Nanan, D., White, F., Azam, I., Afsar, H. & Hozhabri, S. (2003) Evaluation of a Water, Sanitation, Hygiene Education Intervention on Diarrhoea in Northern Pakistan. *Bulletin of World Health Organisation*, 81(3), pp. 160-165.

Oberkircher, L. and Hornidge, A. K. (2011). 'Water is Life'- Farmer Rationales and Water Saving in Khorezm, Uzbekistan: A Lifeworld Analysis. Rural Sociology 76 (3): 394-421.

Odumosu, A. (2010). How can postgraduate students work effectively with NGOs and the partners? Links to WASH cluster approach. Presented at postgraduate workshop on sustainable future for water and sanitation. Royal Holloway, University of London. 17th June.

Orlove, B. and S. Carton (2010). Water Sustainability: Anthropological Approaches and Prospects. Annual Rev. Anthropol. 401-415.

Parker, W. (2004). Rethinking Conceptual Approaches to Behaviour Change: the Importance of Context. Communicating Aids Needs Project. Centre for AIDS Development, Research and Evaluation.

Paul, B. D. (1957). The Role of Beliefs and Customs in Sanitation Programs. Sanitation Programmes vol 48, No.11, A. J. P. H. 1502-1502

Pierotti, R., Wildcat, D. (1997). The Science of Ecology and Native American Tradition. Wind. Change; A Mag. Am. Ind. Sci. Technol, 12 (4), 94-98.

Radcliffe, S. A. and N. Laurie (2006). Culture and Development: Taking Culture Seriously in Development for Andean Indigenous People. Environment and Planning D: Society and Space 24: 231-248

Ramanantsoa, A. (2004). Rapport Final. Capitalization etrecherche de Solutions sur les Latrines a Madagascar. WaterAid Madagascar. Antananarivo.

Ramaswamy, G. (2005). India Stinking: Manual Scavengers in Andhra Pradesh and their Work. Chennai: Navayana.

Robbins, P. (2004). Political Ecology: A Critical Introduction. Malden, MA: Blackwell.

Roy, E. D., Martin, J. F., Irwin, E. G., Conroy, J. D., Culver, D. A. (2010). Transient Social and Ecological Stability: the Effect of Invasive Species and Ecosystem Restoration on Nutrient Management Compromise in Lake Erie. Ecol. Soc. 15 (1), 20.

Saravanan, V. S. Peter P. Mollinga, Bogardi, J. Janos (2011). Global Change, Wastewater and Health in Fast Growing Economies. Current Opinion in Environmental Sustainability, 3: 461-466.

Scott, J. C. (1998). Seeing like a state: how certain schemes to improve the human condition have failed. New Haven: Yale University Press.

Sen, A. (1999). Development as freedom. Delhi: Oxford University Press.

Sen, S. R. (1962). The Strategy for Agricultural Development and other Essays on Economic Policy and Planning, New York: Asia Publishing House

Shalinsky, W. (1986). Disabled Persons and their Environments. Environment, 17 (1), 1-8.

Sheat, A. (1992). Public Perception of Drinking Water Quality: Should We Care? New Zealand Water Supply and Disposal Association Annual Conference, Christchurch, New Zealand.

Sodeinde, O., Adeyemo, A. A., Gbadegesin, A. R. & Ademowo, G. O. (1997) Persistent diarrhoea in Nigerian children aged less than five years: A hospital-based study. *http://www.icddrb.org/images/jddr153_persistent-diarrhoea.pdf,* accessed 16th June 2007.

Strang, V. (2005). Common Senses: Water, Sensory Experience and Generation of Meaning. Journal of Material Culture, 10: 1, 92-120.

Turner, B. L. (1997). Spirals, Bridges and Tunnels: Engaging Human-Environment Perspectives in Geography. Cultural Geographies 4 (2): 196-217.

UN-Habitat (2003). Water and sanitation in the world's cities: local action for global goals, London. Earthscan.

Van der Geest, S. (1998). Akan Shit: Getting Rid of Dirt in Ghana. Anthropology Today 14 (3): 8-12.

Van der Ploeg, J. D. (1993). Potatoes and knowledge. In: An Anthropological critique of development: the growth of ignorance, edited by Mark Hobart, 209-29. London: Routledge

Van Wijk-Sijbesma, C. (1998) Cinderella and the missing slipper: Sanitation and gender. Report for The Hague, The Netherlands.

Walters, C. (1986). Adaptive Management of Renewable Resources. Macmillan Publishing Company, Newyork. USA:

Wellin, E. (1955). Water Boiling in a Peruvian Town. In B. D. Paul (Ed). Health, Culture and Community. Pp 71-103. NY: Russell Sage.

White, G., Bradley, D. and White, A. (1972). Drawers of Water. Chicago: Chicago University Press, pp. 162-176

WHO (2010). UN-water global annual assessment of sanitation and drinking-water (GLAAS) 2010: targeting resources for better results, Geneva: World Health Organization.

WHO/UNICEF (2010). Joint monitoring programme for water supply and sanitation. Meeting the MDG drinking water and sanitation target: mid-term assessment of progress. WHO; Geneva: UNICEF, New York.

Wicker, A. W. (1979). An introduction to Ecological Psychology, Cambridge, MA: Havard University Press.

Yoder, P. S. (1997). Negotiating Relevance: Belief, Knowledge, and Practice in International Health Projects. Medical Anthropology Quarterly 11 (2): 131-146. American Anthropological Association.

Young, O. R., F. Berkhout, G. C. Gallopin, M. A. Janssen, E. Ostrom, and S. van der Leeuw (2006). The globalization of socio-ecological systems: an agenda for scientific research. Global Environmental Change 16: 304-16.

Zerubavel, E. (1981). Hidden Rhythms: Schedules and Calendas in Social Life. Berkeley: University of California Press.

Zimmerer, K. and T. J. Bassett (eds.) (2003). Political ecology: an integrative approach to geography and environment.-development studies. New York: Guilford.

ZEF Working Paper Series, ISSN 1864-6638
Department of Political and Cultural Change
Center for Development Research, University of Bonn
Editors: Joachim von Braun, Manfred Denich, Solvay Gerke, Anna-Katharina Hornidge and Conrad Schetter

31. Mollinga, Peter P. (2008). For a Political Sociology of Water Resources Management.
32. Hauck, Jennifer; Youkhana, Eva (2008). Histories of water and fisheries management in Northern Ghana.
33. Mollinga, Peter P. (2008). The Rational Organisation of Dissent. Boundary concepts, boundary objects and boundary settings in the interdisciplinary study of natural resources management.
34. Evers, Hans-Dieter; Gerke, Solvay (2009). Strategic Group Analysis.
35. Evers, Hans-Dieter; Benedikter, Simon (2009). Strategic Group Formation in the Mekong Delta - The Development of a Modern Hydraulic Society.
36. Obeng, George Yaw; Evers, Hans-Dieter (2009). Solar PV Rural Electrification and Energy-Poverty: A Review and Conceptual Framework With Reference to Ghana.
37. Scholtes, Fabian (2009). Analysing and explaining power in a capability perspective.
38. Eguavoen, Irit (2009). The Acquisition of Water Storage Facilities in the Abay River Basin, Ethiopia.
39. Hornidge, Anna-Katharina; Mehmood Ul Hassan; Mollinga, Peter P. (2009). 'Follow the Innovation' – A joint experimentation and learning approach to transdisciplinary innovation research.
40. Scholtes, Fabian (2009). How does moral knowledge matter in development practice, and how can it be researched?
41. Laube, Wolfram (2009). Creative Bureaucracy: Balancing power in irrigation administration in northern Ghana.
42. Laube, Wolfram (2009). Changing the Course of History? Implementing water reforms in Ghana and South Africa.
43. Scholtes, Fabian (2009). Status quo and prospects of smallholders in the Brazilian sugarcane and ethanol sector: Lessons for development and poverty reduction.
44. Evers, Hans-Dieter; Genschick, Sven; Schraven, Benjamin (2009). Constructing Epistemic Landscapes: Methods of GIS-Based Mapping.
45. Saravanan V.S. (2009). Integration of Policies in Framing Water Management Problem: Analysing Policy Processes using a Bayesian Network.
46. Saravanan V.S. (2009). Dancing to the Tune of Democracy: Agents Negotiating Power to Decentralise Water Management.
47. Huu, Pham Cong; Rhlers, Eckart; Saravanan, V. Subramanian (2009). Dyke System Planing: Theory and Practice in Can Tho City, Vietnam.
48. Evers, Hans-Dieter; Bauer, Tatjana (2009). Emerging Epistemic Landscapes: Knowledge Clusters in Ho Chi Minh City and the Mekong Delta.
49. Reis, Nadine; Mollinga, Peter P. (2009). Microcredit for Rural Water Supply and Sanitation in the Mekong Delta. Policy implementation between the needs for clean water and 'beautiful latrines'.
50. Gerke, Solvay; Ehlert, Judith (2009). Local Knowledge as Strategic Resource: Fishery in the Seasonal Floodplains of the Mekong Delta, Vietnam
51. Schraven, Benjamin; Eguavoen, Irit; Manske, Günther (2009). Doctoral degrees for capacity development: Results from a survey among African BiGS-DR alumni.
52. Nguyen, Loan (2010). Legal Framework of the Water Sector in Vietnam.
53. Nguyen, Loan (2010). Problems of Law Enforcement in Vietnam. The Case of Wastewater Management in Can Tho City.
54. Oberkircher, Lisa et al. (2010). Rethinking Water Management in Khorezm, Uzbekistan. Concepts and Recommendations.
55. Waibel, Gabi (2010). State Management in Transition: Understanding Water Resources Management in Vietnam.
56. Saravanan V.S.; Mollinga, Peter P. (2010). Water Pollution and Human Health. Transdisciplinary Research on Risk Governance in a Complex Society.
57. Vormoor, Klaus (2010). Water Engineering, Agricultural Development and Socio-Economic Trends in the Mekong Delta, Vietnam.
58. Hornidge, Anna-Katharina; Kurfürst, Sandra (2010). Envisioning the Future, Conceptualising Public Space. Hanoi and Singapore Negotiating Spaces for Negotiation.
59. Mollinga, Peter P. (2010). Transdisciplinary Method for Water Pollution and Human Health Research.
60. Youkhana, Eva (2010). Gender and the development of handicraft production in rural Yucatán/Mexico.
61. Naz, Farha; Saravanan V. Subramanian (2010). Water Management across Space and Time in India.
62. Evers, Hans-Dieter; Nordin, Ramli, Nienkemoer, Pamela (2010). Knowledge Cluster Formation in Peninsular Malaysia: The Emergence of an Epistemic Landscape.
63. Mehmood Ul Hassan; Hornidge, Anna-Katharina (2010). 'Follow the Innovation' – The second year of a joint experimentation and learning approach to transdisciplinary research in Uzbekistan.
64. Mollinga, Peter P. (2010). Boundary concepts for interdisciplinary analysis of irrigation water management in South Asia.
65. Noelle-Karimi, Christine (2006). Village Institutions in the Perception of National and International Actors in Afghanistan. (Amu Darya Project Working Paper No. 1)
66. Kuzmits, Bernd (2006). Cross-bordering Water Management in Central Asia. (Amu Darya Project Working Paper No. 2)
67. Schetter, Conrad; Glassner, Rainer; Karokhail, Masood (2006). Understanding Local Violence. Security Arrangements in Kandahar, Kunduz and Paktia. (Amu Darya Project Working Paper No. 3)

68. Shah, Usman (2007). Livelihoods in the Asqalan and Sufi-Qarayateem Canal Irrigation Systems in the Kunduz River Basin. (Amu Darya Project Working Paper No. 4)
69. ter Steege, Bernie (2007). Infrastructure and Water Distribution in the Asqalan and Sufi-Qarayateem Canal Irrigation Systems in the Kunduz River Basin. (Amu Darya Project Working Paper No. 5)
70. Mielke, Katja (2007). On The Concept of 'Village' in Northeastern Afghanistan. Explorations from Kunduz Province. (Amu Darya Project Working Paper No. 6)
71. Mielke, Katja; Glassner, Rainer; Schetter, Conrad; Yarash, Nasratullah (2007). Local Governance in Warsaj and Farkhar Districts. (Amu Darya Project Working Paper No. 7)
72. Meininghaus, Esther (2007). Legal Pluralism in Afghanistan. (Amu Darya Project Working Paper No. 8)
73. Yarash, Nasratullah; Smith, Paul; Mielke, Katja (2010). The fuel economy of mountain villages in Ishkamish and Burka (Northeast Afghanistan). Rural subsistence and urban marketing patterns. (Amu Darya Project Working Paper No. 9)
74. Oberkircher, Lisa (2011). 'Stay – We Will Serve You Plov!'. Puzzles and pitfalls of water research in rural Uzbekistan.
75. Shtaltovna, Anastasiya; Hornidge, Anna-Katharina; Mollinga, Peter P. (2011). The Reinvention of Agricultural Service Organisations in Uzbekistan – a Machine-Tractor Park in the Khorezm Region.
76. Stellmacher, Till; Grote, Ulrike (2011). Forest Coffee Certification in Ethiopia: Economic Boon or Ecological Bane?
77. Gatzweiler, Franz W.; Baumüller, Heike; Ladenburger, Christine; von Braun, Joachim (2011). Marginality. Addressing the roots causes of extreme poverty.
78. Mielke, Katja; Schetter, Conrad; Wilde, Andreas (2011). Dimensions of Social Order: Empirical Fact, Analytical Framework and Boundary Concept.
79. Yarash, Nasratullah; Mielke, Katja (2011). The Social Order of the Bazaar: Socio-economic embedding of Retail and Trade in Kunduz and Imam Sahib
80. Baumüller, Heike; Ladenburger, Christine; von Braun, Joachim (2011). Innovative business approaches for the reduction of extreme poverty and marginality?
81. Ziai, Aram (2011). Some reflections on the concept of 'development'.
82. Saravanan V.S., Mollinga, Peter P. (2011). The Environment and Human Health - An Agenda for Research.
83. Eguavoen, Irit; Tesfai, Weyni (2011). Rebuilding livelihoods after dam-induced relocation in Koga, Blue Nile basin, Ethiopia.
84. Eguavoen, I., Sisay Demeku Derib et al. (2011). Digging, damming or diverting? Small-scale irrigation in the Blue Nile basin, Ethiopia.
85. Genschick, Sven (2011). Pangasius at risk - Governance in farming and processing, and the role of different capital.
86. Quy-Hanh Nguyen, Hans-Dieter Evers (2011). Farmers as knowledge brokers: Analysing three cases from Vietnam's Mekong Delta.
87. Poos, Wolf Henrik (2011). The local governance of social security in rural Surkhondarya, Uzbekistan. Post-Soviet community, state and social order.
88. Graw, Valerie; Ladenburger, Christine (2012). Mapping Marginality Hotspots. Geographical Targeting for Poverty Reduction.
89. Gerke, Solvay; Evers, Hans-Dieter (2012). Looking East, looking West: Penang as a Knowledge Hub.
90. Turaeva, Rano (2012). Innovation policies in Uzbekistan: Path taken by ZEFa project on innovations in the sphere of agriculture.
91. Gleisberg-Gerber, Katrin (2012). Livelihoods and land management in the Ioba Province in south-western Burkina Faso.
92. Hiemenz, Ulrich (2012). The Politics of the Fight Against Food Price Volatility – Where do we stand and where are we heading?
93. Baumüller, Heike (2012). Facilitating agricultural technology adoption among the poor: The role of service delivery through mobile phones.
94. Akpabio, Emmanuel M.; Saravanan V.S. (2012). Water Supply and Sanitation Practices in Nigeria: Applying Local Ecological Knowledge to Understand Complexity.

ZEF Development Studies

edited by
Solvay Gerke and Hans-Dieter Evers

Center for Development Research (ZEF),
University of Bonn

Shahjahan H. Bhuiyan
Benefits of Social Capital. Urban Solid Waste Management in Bangladesh
Vol. 1, 2005, 288 p., 19.90 EUR, br. ISBN 3-8258-8382-5

Veronika Fuest
Demand-oriented Community Water Supply in Ghana. Policies, Practices and Outcomes
Vol. 2, 2006, 160 p., 19.90 EUR, br. ISBN 3-8258-9669-2

Anna-Katharina Hornidge
Knowledge Society. Vision and Social Construction of Reality in Germany and Singapore
Vol. 3, 2007, 200 p., 19.90 EUR, br. ISBN 978-3-8258-0701-6

Wolfram Laube
Changing Natural Resource Regimes in Northern Ghana. Actors, Structures and Institutions
Vol. 4, 2007, 392 p., 34.90 EUR, br. ISBN 978-3-8258-0641-5

Lirong Liu
Wirtschaftliche Freiheit und Wachstum. Eine international vergleichende Studie
Vol. 5, 2007, 200 p., 19.90 EUR, br. ISBN 978-3-8258-0701-6

Phuc Xuan To
Forest Property in the Vietnamese Uplands. An Ethnography of Forest Relations in Three Dao Villages
Vol. 6, 2007, 296 p., 29.90 EUR, br. ISBN 978-3-8258-0773-3

Caleb R.L. Wall, Peter P. Mollinga (Eds.)
Fieldwork in Difficult Environments. Methodology as Boundary Work in Development Research
Vol. 7, 2008, 192 p., 19.90 EUR, br. ISBN 978-3-8258-1383-3

Solvay Gerke, Hans-Dieter Evers, Anna-K. Hornidge (Eds.)
The Straits of Malacca. Knowledge and Diversity
Vol. 8, 2008, 240 p., 29.90 EUR, br. ISBN 978-3-8258-1383-3

Caleb Wall
Argorods of Western Uzbekistan. Knowledge Control and Agriculture in Khorezm
Vol. 9, 2008, 384 p., 29.90 EUR, br. ISBN 978-3-8258-1426-7

Irit Eguavoen
The Political Ecology of Household Water in Northern Ghana
Vol. 10, 2008, 328 p., 34.90 EUR, br. ISBN 978-3-8258-1613-1

Charlotte van der Schaaf
Institutional Change and Irrigation Management in Burkina Faso. Flowing Structures and Concrete Struggles
Vol. 11, 2009, 344 p., 34.90 EUR, br. ISBN 978-3-8258-1624-7

Nayeem Sultana
The Bangladeshi Diaspora in Peninsular Malaysia. Organizational Structure, Survival Strategies and Networks
Vol. 12, 2009, 368 p., 34.90 EUR, br. ISBN 978-3-8258-1629-2

Peter P. Mollinga, Anjali Bhat, Saravanan V.S. (Eds.)
When Policy Meets Reality. Political Dynamics and the Practice of Integration in Water Resources Management Reform
Vol. 13, 216 p., 29.90 EUR, br., ISBN 978-3-643-10672-8

Irit Eguavoen, Wolfram Laube (Eds.)
Negotiating Local Governance. Natural Resources Management at the Interface of Communities and the State
Vol. 14, 248 p., 29.90 EUR, br., ISBN 978-3-643-10673-5

William Tsuma
Gold Mining in Ghana. Actors, Alliances and Power
Vol. 15, 2010, 256 p., 29.90 EUR, br., ISBN 978-3-643-10811-1

Thim Ly
Planning the Lower Mekong Basin: Social Intervention in the Se San River
Vol. 16, 2010, 240 p., 29.90 EUR, br., ISBN 978-3-643-10834-0

Tatjana Bauer
The Challenge of Knowledge Sharing - Practices of the Vietnamese Science Community in Ho Chi Minh City and the Mekong Delta
Vol. 17, 2011, 304 p., 29.90 EUR, br., ISBN 978-3-643-90121-7

Pham Cong Huu
Floods and Farmers - Politics, Economics and Environmental Impacts of Dyke Construction in the Mekong Delta / Vietnam
Vol. 18, 2012, 200 p., 29.90 EUR, br., ISBN 978-3-643-90167-5

Judith Ehlert
Beautiful Floods - Environmental Knowledge and Agrarian Change in the Mekong Delta, Vietnam
Bd. 19, 256 S., 29,90 €, br, ISBN 978-3-643-90195-8

Nadine Reis
Tracing and Making the State - Policy practices and domestic water supply in the Mekong Delta, Vietnam
Vol. 20, 272 S., 29.90 EUR, br., ISBN 978-3-643-90196-5

Martha A. Awo
Marketing and Market Queens - A study of tomato farmers in the Upper East region of Ghana
Vol. 21, 192 S., 29.90 EUR, br., ISBN 978-3-643-90234-4