EFFECTIVE PUBLIC COMMUNICATION CAMPAIGN FOR GEOTHERMAL ENERGY POLICY INNOVATIONS FOR SUSTAINABLE ENERGY IN AFRICA

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ABSTRACT

Developing effective geothermal energy policy communication strategy in Africa will enhance public awareness, knowledge, attitudes, and positive actions for sustainable supply of clean energy for all. The media have a social responsibility to promote geothermal energy policy development for sustainable energy technology innovations for social, economic, political, and environmental stability in Africa. The objectives are to: assess the current national status of geothermal energy; determine the extent of the national geothermal energy technology innovations diffusion for a sustainable clean energy for all; profile the SDGs with a focus on the targets of SDG 7; state the social responsibility of the press (media) in promoting geothermal energy research, policy, and technology innovations to achieve SDG 7; as well as to establish the social, economic, political, and environmental benefits of geothermal energy in eastern Africa. This is a review of policies, projects, and legislations from the national, regional, and international partners in geothermal energy exploration in eastern African states. Geothermal energy is critical for household, institutional, commercial, industrial, and sub-regional energy needs. Geothermal energy is available for sustainable development efforts. Awareness and knowledge of the geothermal prospects of energy innovations, exploitations, research, challenges and benefits accrued from use of geothermal energy is still very limited to public domain. Geothermal energy is accessible, green, sustainable, and environmentally friendly, promotes energy markets, creates local job opportunities, commercially viable, promotes rural electrification, research, and health. International collaborations are working, public private partnerships (PPP) for the energy awareness is still too low, less coordinated stakeholders, capacity needs, data weaknesses, and policy gaps exist. Exploiting geothermal energy is very imperative for sustainable energy for all in Africa. To this end, effective communication campaigns will help coordinate and mobilise the stakeholders. In this case, the media have a social responsibility to: promote media awareness advocacy campaigns, provide extensive coverage of geothermal energy policy and technology outputs, hold the key national or sub-regional stakeholders to account for the persistent energy crisis amidst abundant geothermal endowments in the region, host talk shows on radio or television to promote awareness, explain the socio-economic or environment gains, and mainstream geothermal issues into regular news coverage.

1. INTRODUCTION

Innovative geothermal energy, product, and process information diffusion is vital for the achievement of sustainable development goals in Uganda. Public awareness of the benefits of geothermal energy resources exploitation policy development as well as technology innovations in Uganda and other African communities are still very limited among the key stakeholders. Awareness of geothermal energy benefits among all the key stakeholders will enhance investments in explorations for development within a suitable policy framework. Public awareness will significantly fast track the process of geothermal policy formulation, development, implementation, monitoring, and evaluation for effectiveness. The low levels of awareness among citizens on geothermal energy services, products, and processes setbacks national policy implementation process for achievement

of the sustainable development goals (SDGs) in Africa. All sustainable development goals (SDGs) depend on geothermal energy services. SDGs are a set of 17 goals, scores of targets, and over 300 indicators that were approved in 2015 by the United Nations (UN) to be achieved by each country by the end of 2030; following the expiry of the millennium development goals (MDGs) in 2015. Geothermal energy has been produced commercially for electricity generation and direct use. Geothermal energy, with its proven technology and abundant resources, can make a very significant contribution towards reducing the emission of greenhouse gases worldwide (Scitech, 2015). It is necessary, however, that governments implement a legal and institutional framework and fiscal instruments allowing geothermal resources to compete with conventional energy systems and securing economic support given the significant environmental benefits of this energy source (Scitech, 2015)

On the other hand, an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations (Oslo Manual, 2005). The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new (or significantly improved) to the firm (ibid, 2005). Recent surveys have established low public awareness among Ugandans on the opportunities and benefits of the east African Community (EAC) economic and political integration (Eyotaru, 2013). Innovative geothermal energy offers critical options for social, economic, environmental, political, and legal challenges at local, regional, and national levels.

In addition, increasing frequencies of power shortages as well rising demands for electricity, natural disasters like droughts, floods, and landslides are common risks in Africa (GoT, 2006, 2012). Others include; infrastructure destruction, submerging roads, homes, businesses, schools, markets, contaminating fresh water, frequent floods, and droughts. All these provide specific geothermal energy science, engineering, and technology (GESET) options and opportunities to succeed. Geothermal energy science, engineering, and technology (GESET) face complex demands with vast roles. The roles of professional GESET in sustainability include these principles (Pennington & Steiner, 2014 in Bourn and Neal, 2008):

1. Contribute to building a sustainable society, present, and future.
2. Apply professional and responsible judgement and take a leadership role.
3. Do more than comply with legislation and codes.
4. Use resources efficiently and effectively.
5. Seek multiple views to solve sustainability challenges.
6. Manage risk to minimise adverse impact on people or environment.

2. THE STATUS OF GEOTHERMAL ENERGY DEVELOPMENT

Uganda's geothermal is a renewable energy source that has not been developed (Kamese, 2004). The exploration for geothermal energy in Uganda has progressed to a level of attracting independent power producers' investment in Uganda. This is in line also with the government policy of increasing the use of renewable energy to 61% of the total energy consumption by the year 2017 **(**Nyakabwa-Atwoki, 2013). For example, the proposed Katwe Geothermal Project with an estimated potential in the range of100 – 200 Mega Watts, will be developed as a turnkey project in partnership with an American Investor on finance, design, build, operate, and transfer basis employing a venture capital of approximately USD one billon. The project has encountered a myriad of challenges that affected the completion of geo-scientific surveys, environment impact assessment and drilling of three test wells, greatly affecting the 2015 completion of this phase that was expected **(**Nyakabwa-Atwoki, 2013). The project carried out sensitization and awareness missions for local and other stakeholders on the acceptance and importance of the project taking into account that the it is located within the Queen Elizabeth National Park. Besides, it has implemented other requisite activities with regard to compensation, gender mainstreaming, and corporate social responsibility.

Effective public communication strategies inform and enhance public participation based on gender equality; to mitigate the challenges of energy deficiency through an inclusive energy supply process in Uganda. As stated already stated above, some modest but significant investment development in geothermal energy explorations and exploitations have already begun to take root in different parts of Uganda. For example, surface studies and development concessions are already in progress by private sector investors in areas including: Katwe, Kibiro, and Buranga as shown in Table 1 (below).

Table 1: Geothermal development status in Uganda

Geothermal areas	**Status of development**	**Developer**	**Source of Funding**
Katwe	Up to surface studies	Concessioned to Cozumel	Cozumel, looking for further investments to conduct exploratory drilling
Kibiro	Up to surface study	Concessioned to a private developer	Private developer, not much activity reported
Buranga	Up to surface study	Concessioned to GIDS Consult	GIDS, not much activity reported
Data source: Economic Consultants Associated Ltd, October 2012			

To build awareness, organizers have to identify the audience segments that can impact the issue and gather information about each segment's level of awareness, relationship to the issue, personal values and sources of information (MG, 2009). This information helps organizers prioritize the audiences, develop effective messages and select the best channels to deliver the messages and build awareness. Messages are tested with audiences for resonance and impact and are customized with audience involvement to work within the cultural context of each audience segment (MG, 2009). According to Hayashi et al (2015), campaign for geothermal development in the developing countries, not only requires financial support but also human resource development of public sector. For technical needs, JICA focuses on fostering capacity building to improve the success rate of exploratory drilling, the accuracy of evaluating geothermal reservoirs, and the acceleration of the geothermal development. Aid for human resources development and financial support are fundamentally related to implement both and simultaneously to make greater impacts on risk mitigation in geothermal development (Hayashi, et al., 2015). JICA has set up a basic policy in the energy development sector particularly on energy with low-cost, low-carbon and low-risk policy. Geothermal development demand in African Great Rift Valley has attracted big support through donor funding for capacity building.

There is need to give an overview of Uganda's geothermal prospects and then introduce the figure below

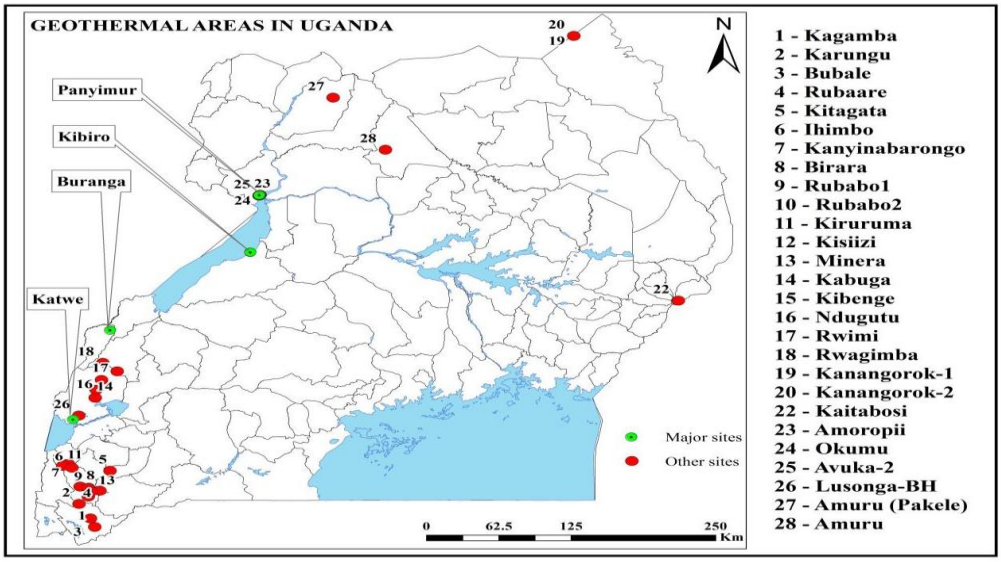

Fig.1: The spatial distribution map of geothermal prospects in Uganda
Source: Project Management – Uganda Geothermal Resources Development Project.

2.1. Geothermal project opportunities

1. Governments of Africa-Business partners.
2. Geoscience related services.
3. Exploration drilling, completion as well as supervision.
4. Power Generation; Transmission; Distribution.
.5. Well logging and testing services.
6. Laboratory services.
7. Direct uses application.
8. Training.
9. Equipment.
10. Services.
11. Geothermal resources assessment.
12. Reservouir assessment.
13. Project feasibility studies
14. Environment impact studies.
15. Project development.
16. Power plant design.
17. Financing
18. Machinery parts, maintenance, and repair.

3. GEOTHERMAL TECHNOLOGY INFORMATION DIFFUSION

The primary objective of developing the geothermal energy resources of Uganda is to compliment the role of hydro- and other energy resources in the generation of electricity; a crucial element in the development process of the country (Isabirye Mugadu, 2001). Like with the other resources, geothermal energy ushers in both primary and secondary benefits that accrue from the development of geothermal resources are many. For example, the primary benefits include: direct electricity supply to all socio-economic development sectors, environmental conservation, climate change mitigation, rural electrification, telecommunications infrastructure, agricultural production and marketing services, as well as water pumping for urban and rural industries. The secondary benefits include: entertainment, social networking, informal education, media and adult education, local security, access to internet, better sanitation systems, social inclusion, improved rural education standards, improved health, and community well-being. However, the term 'geothermal' is yet to

become a catchword in the energy vocabulary of our people. The general feeling is that it is too exotic and ambitious to be a priority. Geothermal energy is an indigenous resource, the sources of which the country is abundantly endowed with. The onus is on us, the geothermal community, to present a case for public awareness (Isabirye Mugadu, 2001).

The diffusion of innovation theory explains how information about innovations or new things spread to individuals or groups in a society (Everret, 1962; 1995; Okaka, 2012). Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system (Everett Rogers, 1962; 1995). An innovation is an idea, practice, or object which is perceived to be new by an individual, a group, or other unit of adoption (Rogers, 1995).The diffusion of innovation theory analysis how the social members adopt the new ideas and how they make the decision towards it. Both the mass media and interpersonal communication channel are involved in the diffusion process.

There are so far several communication gaps that require tailoring geothermal energy messages to the citizens to plug technology information and knowledge gaps. The current geothermal energy technology information diffusion challenges include: wrong attitudes, behaviour, strategies or methods, perceptions, communication and geothermal energy project implementation strategies. There are basic failures in information flows, message reach, communication coordination, concepts, strategies, planning, budgeting, and implementation. Geothermal energy policy outreaches are vital if well planned, implemented, monitored, and evaluated for participation, transparency, effectiveness, trust, sustainability, gender equality, and local community project ownership. Information is conveyed through integrated grassroots outreach and traditional media techniques. Grassroots outreach provides direct person-to-person communication to connect the issue to existing values, deliver messages with veracity and validity, and create engagement and ownership (MG, 2009).

Traditional communication tools such as mass media relations and advertising and other communication tools (brochures, pamphlets, Web content, events and activities) reinforce direct outreach by supporting early adopters to champion the issue, creating a fertile environment in which others become ready, and willing to discuss the issue, and providing environmental clues that provide a sense of being part of a larger movement (MG, 2009). Effective campaigns should (Okaka, 2012)capture the attention of the right audience, define the target audience, select channels to reach the audience, attract sufficient attention, deliver an understandable and credible message, source credibility, message clarity fit with prior knowledge, duration of exposure, deliver message that influences the beliefs or understanding of the audience, provide information, direct attention, trigger norms, change underlying values and preferences toward desired outcomes, and understand the pressures that govern the behaviour of interest. In this case, information sharing will help to coordinate the key stakeholders: the government, international development partners, private sector, the civil society including the media, geothermal professionals and researchers, and the community.

Equally crucial for media geothermal energy development information campaign strategy, is the use of diffusion of innovations theory (Rogers, 1995),which studies on how, why, and at what rate new technology, practice, or idea spread in cultures. The focus of diffusion of innovations theory is creating awareness of the potential and benefits of geothermal energy technology via information dissemination to the audience. Diffusion model identifies the problem as lack of information and the goal is behaviour change. The solution to lack of information is effective information transfer to spur the required knowledge, attitude and practice. The types of interventions include; social media, marketing, entertainment, education (Rogers, 1995; Okaka, 2012). The mass media is more influential in spreading awareness of new ideas, technologies, objects, and practices of innovations Diffusion of innovations approach studies how, why, and at what rate new ideas spread through cultures. The focus of information diffusion is information dissemination as a precondition for awareness, interest, attitudinal, and behaviour change for adoption of intended new ideas or practice.

The diffusion of geothermal energy technology innovation has so far been too slow, hesitant, and wanting in Africa. An effective geothermal energy policy should be formulated, developed, and

implemented to address critical information from different social, economic, environment, and political sectors. The development of communications campaigns strategy for widespread diffusion of geothermal resources for innovative research, teaching, and learning activities by African universities will ensure a speedy progress in the achievements of the sustainable development goals (SDGs) in Africa. Public understanding of geothermal energy resources exploration, exploitation, and investment development activities in the eastern Africa sub-region; can be best improved by a good communication strategy. A Kenyan evaluation study done on the communication strategy for Jomo Kenyatta Grounds (LVTFJKG, 2006; Okaka, 2012) in Kisumu, found that the most critical communication problems in the entire LVB include; lack of access to public information by the public; lack of systems to handle the policy information needs of the audience; poor flow of public information for sustainable development among the government, civil society, and private sector. In the same findings, the current slow process of geothermal development in Uganda can be attributed to vital gaps in geothermal energy policy, decision, funding, international cooperation, community outreach, university education and training curriculum, access to ICT, research, and new technology.

4. THE 2030 SDGS (MAJOR TARGETS AND INDICATORS OF SDG 7)

Public will building communication approach builds up public support for social change by integrating grassroots outreach methods with traditional mass media tools in a process that connects an issue to the existing, closely held values of individuals and groups (MG, 2009). This approach leads to deeper public understanding and ownership of social change. It creates new and lasting community expectations that shape the way people act, think and behave towards geothermal projects. Geothermal energy services, goods, and processes are the pivot of all the 17 SDGs. The proposed SDGs by 192 UN member states contain 17 goals, 169 targets, and 304 indicators covering a wide range of sustainable development issues. These include: ending poverty and hunger, improving health and education, making our cities and human settlements sustainable, combating climate change, protecting oceans, and forests. SDGs provide several opportunities for all geothermal applications. These include geothermal energy: curriculum development and reviews, collaborative research projects, clinical trials, community pilot outreaches, training, exchange visits, technology transfer, fund raising, and public awareness campaigns.

A summary of the approved 17 sustainable development goals are presented below from SDG 1- SDG 17 respectively, are planned: SDG1: End poverty in all its forms everywhere; SDG2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture; SDG3: Ensure healthy lives and promote well-being for all at all ages; SDG4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all; SDG5: Achieve gender equality and empower all women and girls; SDG6: Ensure availability and sustainable management of water and sanitation for all; SDG7*: Ensure access to affordable, reliable, sustainable, and modern energy for all*; SDG8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all; SDG9: Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation; SDG10: Reduce inequality within and among countries; SDG11: Make cities and human settlements inclusive, safe, resilient, and sustainable; SDG12: Ensure sustainable consumption and production patterns; SDG13: Take urgent action to combat climate change and its impacts; SDG14: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development; SDG15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss; SDG16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels; and SDG17: Strengthen the means of implementation and revitalize the global partnership for sustainable development. All these goals depend on access to clean energy.

Although the focus on this paper is SDG 7 in general and geothermal energy in particular, it can be stated that all the rest of the 16 SDGs depends on the sustainable supply of clean to all sectors, in one way or another. Energy is the front-line technology for all manners of socio-economic development

activities. For example, it is unthinkable to tackle SDG 15 on stopping biodiversity loss or promoting sustainable terrestrial ecosystem in the eastern Africa sub-region, where over 90 percent of the population rely on biomass or wood energy for cooking, heating, lighting, brick making, for household, institutional, or industrial activities in tandem with a growing population without a sound rural electrification system. The sub-region in general and Uganda in particular, suffer from acute energy deficiency or crisis for a variety of critical policy, funding, knowledge, technology, decision, and information communication gaps. Geothermal energy is one of the major sources of energy which has largely remained untapped amidst the widening energy demand gaps. Hence, geothermal resources can be developed to beef up the targets for Goal 7, to ensure access to affordable, reliable, sustainable, and modern energy for all; can be best achieved by harnessing the benefits of geothermal resources in tandem with other renewable energy sources in the sub-region by 2030 (UN, 2015):

1. Ensure universal access to affordable, reliable, and modern energy services
2. Increase substantially the share of renewable energy in the global energy mix.
3. Double the global rate of improvement in energy efficiency.
4. Enhance international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel.
5. Technologies, and promote investment in energyinfrastructure and clean energy technologies.
6. Expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, particularly LDCs and SIDS.

Likewise, given that SDG 7 is expected to ensure access to affordable, reliable, sustainable, and affordable modern clean energy for all; the projected geothermal energy research, capacity building, scientific exploration, exploitation, up scaling, and development investments funding; would boost the supply option to meet these indicators within the next 15 years (UN, 2015):

- Share of the population using modern cooking solutions, by urban/rural
- Share of the population using reliable electricity, by urban/rural
- Primary energy by type
- Implicit incentives for low-carbon energy in the electricity sector (measured as US$/MWh or US$ per ton avoided CO_2)
- Share of energy from renewables
- Rate of primary energy intensity improvement
- Official development assistance and net private grants as percent of GNI
- Domestic revenues allocated to sustainable development as percent of GNI, by sector
- Private net flows for sustainable development at market rates as share of high-income country GNI, by sector
- Fossil fuel subsidies ($ or % GNI)
- Share of the population using reliable electricity, by urban/rural
- Implicit incentives for low-carbon energy in the electricity sector (measured as US$/MWh or US$ per ton avoided CO_2)

Ugandan civil society organisations (CSOs) lack basic capacity, initiative, drive, and awareness of their energy policy mandates to mediate in local geothermal energy conflicts for mutual exploitation by the geothermal energy industry and the communities in the country. The role of local governments, civil society organizations (CSOs), cultural, and faith based institutions can play an important role in geothermal energy advocacy, mobilization, and dialogue with local project communities. These institutions contribute to holding the different players accountable with regard to geothermal energy environmental issues and participate in getting the voices of the poor and disadvantaged into designing, monitoring, and implementing programmes in environment and natural resources management. CSOs maybe contracted in the delivery of various services, especially in the communities where geothermal energy activities will be undertaken. Besides, the civil society provides a pivotal role in mobilizing societies and communities to articulate legal demands and concerns over the use, management, and access to geothermal energy as well as natural resources at local, sub-regional, and national levels.

A community outreach strategy should be guided by ethical code of conduct for **(**White, 2011) accepted ethical and behavioural standards of conduct and professional development; develop awareness. Effective outreach delivery should reflect ethnicity, gender equity, cultural diversity of the community and an outreach team may include a bilingual / multilingual members to overcome language barriers and help in delivering the information effectively; and familiarize yourself with interviewing techniques/the target community. Outreach practitioners are advised to use the existing (communication) channels (AICAD, 2011) to enhance the two-way flow of information between the advisors and the farmers and promote ICT application in agricultural outreach knowledge and information system (AKIS). Outreach approaches and methods which adopt prudent multidisciplinary principles backed by deployment of the mass media will result in a wider coverage and better information sharing among the key stakeholders.

Outreach communities should be made aware of their rights, obligations, and levels of participation in the interventions. The call for effective university extension and outreach (Wishitemi, Chebet, & Masita, 2011) should focus on marketing promotion of research and development results using among others: demonstrations, fairs, exhibitions, pamphlets, flyers leaflets, modules, magazines, websites, posters, emails, mobile phones, radio, popular local events, television, cultural and spiritual activities, brochures, annual reports, newspapers, and development communication strategies (Okaka, 2013). Collecting information on the types of relationships and cultural beliefs in the target community can help to identify barriers to behaviour change in order to develop better communication messages using the most appropriate message delivery formats.

5. THE ROLE OF MEDIA IN GEOTHERMAL ENERGY DEVELOPMENT

Public communication is intended to create or raise and sustain awareness of geothermal among the communities regarding the campaign issues. There is a need to know the recipient's attitudes, level of knowledge, listening, and comprehension abilities, social and cultural background to communicate more effectively (Berlo, 1990). These help to make the locals familiar with the geothermal field. All forms of geothermal communication require a sender, a message, a channel, and an intended recipient, who is expected to provide a feedback to the source of the information; and communication requires that all parties have an area of communicative commonality. Developing effective geothermal communications campaign strategy should follow a basic process that involves setting up a realistic goal, assessing the audience, selecting effective media and constructing a message that pre-tests well with the target audience (Day, & Monroe, 2000). It is known that the social responsibility (theory) allows free press without any censorship but at the same time the content of the press should be discussed in public panel and media should accept any obligation from public interference or professional self regulations or both (Baran & Davis, 2003). The theory helped in creating professionalism in media by setting up a high level of accuracy, truth, and information (Baran & Davis, 2003). These are strong allies for engineering awareness raising.

As a result, Ugandan engineers, their counterparts in Africa, and other countries, as well as the public can say something or express their opinion about the media, community opinion, consumer action and professional ethics, serious invasion of recognized private rights and vital social interests, private ownership in media may give better public service unless government has to take over to assure the public to provide better media service, and media must take care of social responsibility or else the government or other organisation may do so (ibid, 2003). Social responsibility theory values media and audience responsibility; limits government intervention in media operation; allows reasonable government control of media; values diversity and pluralism; aids the 'powerless'; appeals to the best instincts of media practitioners and audiences. Denis McQuail (1987) summarized the basic principles of social responsibility theory as:

- Media should accept and fulfill certain obligations to society;
- These obligations are mainly to be net by setting high or professional standards of informativeness, truth, accuracy, objectivity, and balance;

- In accepting and applying these obligations, media should be self-regulating within the framework of law and established institutions;
- The media should avoid whatever might lead to crime, violence, or civil disorder or give offense to minority groups;
- The media as a whole should be pluralistic and reflect the diversity of their society, giving access to various points of view and to rights of reply;
- Society and the public have a right to expect high standards of performance and intervention can be justified to secure the, and a, public good; and
- Journalists and media professionals should be accountable to society, employers, and market.

Community awareness outreaches provide persuasion and demand for geothermal services and goods on offer. An outreach method is a mechanism for delivering a message as a communication strategy. Outreach activities use a variety of methods such as**:** community media (like radio, TV, internet, sign posts, mobile phones, newspapers, other ICTs), school curricula and presentations, public meetings and focus groups, surveys, promotional posters and brochures, contests and special events, telecenters, community centres, internship placements, and field labs (Okaka, 2014). Likewise, monitoring and evaluation play pivotal roles in all university outreaches as they report on the key issues like: cost elements, implementation progress, optional use of available community resources, target beneficiaries, implementation team and timeline, strategy relevance and flexibility, observable outputs, synergies with sectors, and output life cycle management (LCM). As a result, it acts as a roadmap to check if the ensuing results are consistent with the policy framework set out for effective implementation for likely policy reviews or innovations (AICAD, 2011).

Geothermal energy has a critical role to play to achieve sustainable development due to the rapid increase in the challenges and opportunities to achieve sustainable development goals. It is part of business and professional responsibility for geothermal firms and university faculties, departments, colleges, institutes, or schools to sustainability ensure at community, national, sub-regional, regional, and global levels (AaeE, 2007). The geothermal profession may apply the strengths of information flow strategy to examine the process of mass communication in real world; provide the basis for successful public information campaigns; identify barriers to information flow; and help understanding information flow during crisis. This works for geothermal energy promotions because effective campaigns should (Weiss & Tschirhart, 1994): capture the attention of the right audience; define the target audience; select channels to reach the audience; attract sufficient attention; deliver an understandable and credible message; source credibility; message clarity; fit with prior knowledge; duration of exposure; deliver message that influences the beliefs or understanding of the audience; provide information; direct attention; trigger norms; change underlying values and preferences toward desired outcomes, and understand the pressures that govern the behaviour of interest. The media should develop capacity for science journalism and science communication, community journalism, or community media should engage the development stakeholders in the public, private, universities, community leaders, experts, researchers, civil society, and North-South partnership for geothermal.

6. THE BENEFITS OF GEOTHERMAL ENERGY IN EASTERN AFRICA

Geothermal energy is clean, renewable and reliable form of energy which optimises land use, decreases deforestation, increases energy diversity and provides employment opportunities for construction, operation and maintenance. If geothermal resource is developed, government will come near to realising its objective of rural electrification, modernising agriculture and ensuring energy security for all (NAPE, 2005). If the geothermal resource is developed, government will come near to realising its objective of rural electrification, modernising agriculture, and ensuring energy security for all (NAPE, 2005). The energy sector in the country is mainly characterised by high consumption of biomass energy with about 97% of households in the country heavily dependent on biomass energy sources, while another 92% of the population do not have access to electricity (NAPE, 2005). Only about 8% of the country's total population has access to electricity and of these only about 2% are

located in rural areas. Site manifestations of geothermal energy potential like hot springs have already promoted the tourism industry in Uganda and neighbouring states in the eastern Africa sub-region.

Besides boosting energy tourism in the African sub-region, geothermal power requires no fuel and it is therefore immune to fuel cost fluctuations. However, the initial capital costs tend to be high, maintenance is usually cheap making it more attractive. Drilling accounts for over half the costs, and exploration of deep resources entails significant risks (GLI, 2016). The most developed geothermal field is the Geysers in California. In 2008, this field supported 15 stations, all owned by Calpine, with a total generating capacity of 725 MW. Geothermal electricity is electricity generated by geothermal energy(GLI,2016). Technologies in use include dry steam power stations, flash steam power stations and binary cycle power stations. Geothermal electricity generation is currently used in 24 countries, while geothermal heating is in use in 70 countries.. Geothermal power is highly scalable: a small power station can supply a rural village, though initial capital costs can be high.

Likewise, the real credibility of geothermal energy policy, project, plan, institution, service, process, or product is greater than unethical wealth since it is builds up a lasting public awareness; trust, real wealth, and excellence that over live generations. Accordingly, the government of Uganda says it is fully aware of the critical role of geothermal energy in planning, managing, implementing, monitoring, evaluating, and improving national development plan in Uganda for sustainable development. All these need to be recognized among the diverse stakeholders whose interests, roles, and responsibilities should be well defined, identified, understood, articulated, communicated, and coordinated (GoU, 2011).

For example, geothermal energy practitioners need to uphold and advance the integrity, honour. and dignity of the geothermal energy profession by- striving to enhance the competence and prestige of the engineering profession; and being honest and impartial, and shall serve with fidelity the public, their employers and clients; supporting the professional and technical societies of their disciplines using his knowledge and skill for the enhancement of human welfare (Munyaami, 2014). Equally critical to the ethics is the need to develop or infuse sustainable development into all geothermal training, courses, practices, curriculum, projects, communication, and principles. The complementary nature of approaches employed in the teaching of professional ethics to those used in geothermal energy for sustainable development supports the rationale for integrating the global dimension of geothermal energy curriculum. Geothermal development thrives on international cooperation, top level political commitment, and transparency in the Green Climate Fund, as it has a crucial role to play in the mitigations of climate change GHGs.

In this connection, many geothermal practitioners have identified the global dimension as including (Pennington & Steiner, 2014, in Bourn and Neal, 2008); the ability to take a broader perspective – application of national curriculum; an appreciation that what we do in developing countries impacts upon ourselves; understanding our cultural limits, seeking other perspectives or approaches; understanding the local context of development; coping with uncertainty; dealing with global issues; challenging stereotypes; recognition of finite resources in the world and the impact of globalisation; potential role of different technologies; and mitigating and adapting to climate change. Geothermal community outreach and mobilization can encompass a range of approaches, including: local community meetings; training or sensitization sessions; community or religious leaders; local drama or theatres /public debates; local radio talks ;farming or agriculture; vulnerable children and adults; cultural activities; matches, music, sports; demonstrations / pilot trials of prototypes; exhibition shows / product demonstrations; research and development; internships or placements of trainees; health education and promotion; environment protection and conservation; energy efficiency and saving technologies; and renewable energy sources

In addition, geothermal outreach interventions using the diffusion of innovation strategy generally investigate the best method communicating within a community and identify role models to change community norms. People's exposure to a new idea, which takes place within a social network or through the media, will determine the rate at which various people adopt a new behaviour. The

diffusion of innovation theory (Rogers, 1963; Okaka, 2013) describes the process of how an idea is disseminated through these four essential elements: the innovation, its communication, the social system, and time. Effective geothermal energy policy communication campaigns outreach activities should increase investments for formative and summative evaluation, and to feed these results more effectively into strategic communication outcomes; development partners and academia to share knowledge and improve applied strategic communication to foster behaviour and social change; and explore public-private partnerships to gain wider reach of communication programmes, to facilitate learning resources for development (UNICEF, 2005). These are enhanced by public service adverts.

In order to be more beneficial, the goal of geothermal energy outreach project should be to affect the knowledge, attitudes, and practices of the target audience. Prior idea of levels or nature of change one wants to effect (knowledge, attitudes, and practice) is vital for effective planning, implementation, and evaluation of outreach activities for the target audience (Okaka, 2011). It is highly recommended that geothermal energy policy, research, or project public awareness communication strategies work best when they are integrated with various strategies for behaviour change or behaviour development, social mobilisation, and advocacy aimed at achieving clearly identified objectives; and when they are linked to other programme elements and service provision (UNICEF, 2005). Uganda is one of the top pilot African countries have ratified the 2015 Paris Agreement on climate investment fund (CIF) with a focus on the national priority targeting solar and geothermal energy development. The African Development Bank (AfDB) that manages the Green Climate Fund for the region, has already provided some funding for geothermal projects in some African Union commission (AUC) member countries.

In a summary, the key factors that facilitate the diffusion of geothermal energy benefits for the speedy achievement in the Eastern Africa by 2030 include: awareness of outreach policy issues, concerns, and needs; accessible outreach policy information communication strategy; incentives for outreach implementation attitudes and behaviour ;relevant outreach policy implementation strategy/community media; outreach policy, management, and administrative commitment; prudent university vision, mission, plan, and national education policy; education and functional literacy levels in target communities; social, economic, legal, political, and environmental sustainability; role models, credible messages; media literacy; identify the current outreach policy communication barriers; quality and reach of outreach policy communication messages; outreach policy usage alignments to key actors at all levels; and outreach policy research be driven by ICT access for social networking. It is the role of the media to work with geothermal energy experts, policy- decision makers, private investors, community leaders, researchers, CSOs, and universities to drum up public awareness of the gains of geothermal energy for socio - economic, and environmental sustainability in the sub-region.

7. CONCLUSION

Geothermal energy development is vital for the speedy, progressive, and timely achievement of the SDG 7 in the Eastern Africa. ; if it employs an effective public awareness communication campaigns strategy on the values, roles, functions, and prospects of geothermal energy products, services, and processes for sustainable inclusive development in Uganda and beyond it. The role of geothermal energy should be fully integrated and mainstreamed in all social, economic, environmental, and political development strategies with visible top political will and commitment. Geothermal energy professionals need to enhance their competencies and competitiveness in their professional career development which includes the application of scientific knowledge and skills to research and develop, plan, design, construct or build, transfer or operate, supervise, monitor, and maintain; engines, systems, structures or infrastructures, samples or species, labs, trials or prototypes, materials, goods, and services; according to the standards for sustainable development. Geothermal energy development is still more of a work in progress and its public awareness communication strategy needs capacity building as a priority. Geothermal energy market is gradually developing as a success story. In addition to its role in boosting the growing tourism industry, socio-economic, and North-South cooperation opportunities, geothermal energy is an ideal and target beneficiary of the climate investment fund (CIF) of the Paris Agreement which many African countries have just ratified.

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